Toward Increased Understanding of Innovation Intermediaries

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Canada spends almost 2% of its GDP on publicly funded research (OECD, 2009). However, a high percentage of research results is never put to work for the benefit of society. Of the subset of research that becomes protected by a patent, too small a proportion is commercialized successfully (Etzkowitz et. al., 2000). For this reason, accelerating the successful transfer of knowledge and the commercialization of research results are among Canada's priorities. Innovation Intermediaries play an essential role as the 'middle men' between solvers (the inventors) and seekers (the invention recipients) toward facilitating the commercialization of research results. This research aims to identify which types of Innovation Intermediaries (IIs) and their corresponding strategies enable the success of research commercialization.

This research is comprised of two stages: exploratory stage and confirmatory stage. The former investigated certain lenses to differentiate between IIs types, while the latter tested the validity and reliability of the suggested model and concurrently validated the scale items. Furthermore, various statistical analysis tools were used to analyze and assess the hypotheses as well as to reveal the statistical properties of the scales.

Frooman's (1999) Stakeholder Influence Strategy Theory (SIST) is a framework designed to address how stakeholders use the power of resource dependency to influence a focal organization. This study is among the first research studies to operationalize the constructs of Frooman's (1999) model in the context of innovation intermediaries who facilitate the research commercialization. These constructs are used to assess the influence that an innovation intermediary receives from its stakeholder(s). Furthermore, this study associates 'stakeholder identification and salience theory' (Mitchell et al., 1997) with Frooman's 'SIST', and then makes an extension to the model. This adjustment implies that only salient stakeholders are to be considered in the model, and that the model accounts for one-to-many relationship between an organization and many stakeholders. The extended model represents the first part of the research framework for this study, while the second part considers the impacts of stakeholders' influence on IIs' operational strategies. Data were collected from a North American (Canada and USA) sample to test two sets of hypotheses for the purpose of examining the two parts of the model; in other words, the hypotheses were tested to investigate how various II types are influenced by their stakeholders and how that influence impacts the IIs' operational strategies.

This study found that the current commercialization efforts of IIs are rarely supported by rigorous evidence-based practice; further, the comparative performance metrics that are used by various IIs are mainly to justify ongoing support. In addition, this study suggests that all types of II could be located on a continuum anchored a 'uni-stakeholder approach' on one end, to 'multi-stakeholders approach' on the other; each of those who hold a uni-stakeholder perspective (USP) perceives one particular stakeholder as most salient to them, upon which they most depends, and by which they are most influenced; IIs with USP have distinguishing characteristics in terms of their main operational strategy (objectives for commercialization, paths used for commercialize, clients who are served, estimates of innovation readiness); thus, they are focused on competencies of their current practices and subsequently are recommended to advance toward a complementary mode in order to create a more comprehensive commercialization ecosystem. On the other hand, one II type was found to hold a multi-stakeholder perspective (MSP); typically, it has no dominate dependency or influence by a particular stakeholder. MSP type shows a broad operational strategy that may allow a comprehensive commercialization ecosystem; furthermore, MSP signifies a high priorities for 'potential societal and environmental benefits from the idea' and 'potential contribution to local society and environment' as criteria for invention selection; accordingly, MSP my represent the most functional approach in the long run.

The study contributes to the literature of II by adding to our understanding as to why there should be more than one type of II to facilitate research commercialization. Moreover, it contributes a new typology for II types and provides a scientific framework to compare and contrast various II types based on evidence. Accordingly, this work stimulates the literature of best practices in the context of IIs. Furthermore, the study validated that the influence by a salient stakeholder(s) -- to a great extent -- explains what IIs do; both the level of the dependency by II on stakeholders and II's perception of its stakeholder's salience level predict the level of stakeholder influence on the II. That in turn facilitates the identifying of the type of influence that each stakeholder may apply on an associated II. In addition, this research provides very essential knowledge for practitioners and managers as well as to stakeholders and clients about the various types and operational strategies for each innovation intermediary type; thus, they are encouraged to evaluate advantages and disadvantages of various II types who follow a uni-stakeholders approach and the one II type who follow a multi-stakeholders approach over the short and long run. Finally, the study reports some limitations and suggests some possible topics for future research.

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Dedication

I dedicate this dissertation to the memory of my mother and father who implanted in me a desire to learn and made sacrifices so I would have access to a high quality education. Without their early support and guidance I would not be where I am today.

This work is also dedicated to my loving wife, Heba Batouk, and my beloved children, Lamys, Ali, Lamar, Yousef and Abdullah; they supported me with prayers, encouraging words that gave me strength to make this dream a reality. I could not have accomplished as much as I have without their support and understanding.

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Chapter 1
Introduction

Canada spends almost 2% of its GDP on publicly funded research (OECD, 2009). There are more than 50 universities and a similar number of government laboratories and research centers in Canada working to put Canada at the forefront of knowledge creators. A high percentage of research completed by universities and governmental laboratories must be transferred to another party (for example, industrial firms) in order to make the research lucrative, informative and useful to society. Therefore, accelerating the transfer of knowledge and the commercialization of research are among Canada's priorities.

Knowledge transfer and technology transfer are essential for innovation. Many authors put technology transfer under the more general umbrella of knowledge transfer (Bozeman, 2000), while others consider the two as being "not separable" (Sahal, 1981). Technology transfer as a concept emerged several decades ago (Bozeman, 2000), and does not have a single unique definition (Geisler, 1993). Definitions have varied due to its multidisciplinary nature in addition to the differing perspectives by researchers who look to the field (Reisman, 1989; 2005). Technology transfer's multidisciplinary nature was inherited from the root "technology" concept. However, Reisman and Zhao (1991) also emphasized that technology's definitions vary based on diverse disciplines and paradigms. Nevertheless, technology is most commonly defined as "the tools, techniques, and procedures used to accomplish some desired human purpose; that is, technology is not restricted to hardware only but may include know-how and software" (Reisman, 1989, p. 31). In this study, technology transfer is defined as the "transfer of specialized know how, which may be either patented or non patented from one [party] to another" (Reddy & Zhao, 1990, p. 295).

Technology transfer literature is broad and disjoint (Reisman, 1989; 2005; Geisler, 1993; Bozeman, 2000). There is a lack of taxonomy, classification and systematic review in the field (Reisman, 1989; 2005). In the various articles, authors typically classify and categorize the field by different aspects from a research point of view in order to aid and facilitate the reading and understanding by the reader (e.g., Agrawal, 2001; Bozeman, 2000; Geisler, 1993; Lichtenthaler, 2005; Reddy & Zhao, 1990; Tran & Kocaoglu, 2009). On the other hand, Reisman and colleague have devoted many articles to moving toward a taxonomy of the technology transfer field (e.g., Kumar, Motwani, & Reisman, 1996; Reisman, 1989; Reisman & Zhao, 1991; Zhao & Reisman, 1992; Reisman, 2005). We see eight diverse branches to the technology transfer field, which are: 1) technology transfer's

definitions, 2) actors, 3) models and processes, 4) transaction types, 5) cross disciplines, 6) transfer objects, 7) policy and motivations, and 8) impacts (Reisman, 1989; Reisman & Zhao, 1991; Zhao & Reisman, 1992; Kumar, Motwani, & Reisman, 1996; Reisman, 2005).

This study is dependent upon deep background knowledge of technology transfer's transaction types and actors. Technology transfer's transaction types, channels, modes and mechanisms are different names that describe the media used to transfer or move technology from providers to recipients (Agrawal, 2001; Reisman, 1991; Bozean, 2000; Reddy & Zhao, 1990; Tran & Kocaoglu, 2009). Transaction types may be either internal or external transfers (Reisman, 1989; 2005). Transaction types have several forms: information exchange (on individual and firm levels), sales, cooperative agreement, licensing, formal information dissemination through publications, informal meetings, patents, consulting, workshops, joint ventures, recruiting, research contracts, sponsored research, employee exchanges, lab visits and use of lab facilities (Agrawal, 2001; Reisman, 1989; Bozean, 2000). Reddy and Zhao (1990) reported that selecting appropriate transaction type "mode" significantly contributed toward effective technology transfer. Thus, it is essential for technology transfer actors to understand each channel's characteristics in order to judge which channel is suitable.

On the other hand, the actors in technology transfer are provider (transferor), receiver (transferee) (Agrawal, 2001; Reisman, 1989; 2005; Bozean, 2000; Rose, Uli, Kumar & Wahab, 2009) and intermediaries (Dalziel, 2010; Howells, 2006; Bendis, Seline & Byler, 2008). Actors' roles (Agrawal, 2001; Reisman, 1989; 2005; Bozean, 2000; Rose et al., 2009), characteristics (Agrawal, 2001), and relationships (Bozean, 2000; Rose et al., 2009) are the main categories present in the existing literature regarding technology transfer actors. The first two actors, which are providers (transferors) and receivers (transferees), could be individuals, groups, institutes, organizations and countries (Agrawal, 2001; Reisman, 1989; 2005; Bozean, 2000; Rose et al., 2009; Marshal, 2005; Reddy & Zaho, 1990). In addition, the actual transfer could take place among scientific disciplines, professions, companies or institutions, industries, economic sectors, geographic regions, entire societies or countries (Reisman, 1989; 2005). Technology transfer can occur among one or more providers and one or more receivers (Reisman, 1989; 2005). The third actor is the intermediary, those who work between two parties (communities). Some authors (Dalziel, 2010; Howells, 2006; Bendiset et al., 2008) tend to define innovation intermediaries based on their activities, purpose and effects. For example, Howells (2006) defines an innovation intermediary as an "organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties (p. 720)".

Nevertheless, some examples of intermediaries include technology transfer offices, incubators, accelerators, and brokers.

As seen through the lens of stakeholder theory, this study investigated how intermediaries are involved differently in the commercialization of research (technology). An in-depth understanding of various intermediary types is expected to support researchers and others[1] involved in the commercialization process toward the optimal selection of the suitable intermediary and thereby reduce time, effort and cost.

1.1 Projected Research Possibilities

This study focuses on four main intermediary types who work on the commercialization of research that is produced by universities and government laboratories and diffused to industries. The commercialization of research is defined as that which "involves any possible configuration or scheme that allows those who invest in technological innovation (inventors, research systems, private firms and others) to capture some of the economic benefits generated by their innovation" (Kalaitzandonakes, 1996, p. 3). The four intermediary types are:

1. University Technology Transfer Offices (UTTO)
2. Community Business Incubators/Accelerators (CBI)
3. Industry Facilitators of Open Innovation (IFOI)
4. Independent Innovation Intermediaries (IIIs)

The study examined how intermediaries involved in commercialization of research (technology) differ through the lens of stakeholder theory with respect to seekers (e.g. industries) and solvers (e.g. inventors). In addition, the research examined the intermediaries' definitions of innovation readiness and their dominant commercialization path(s). Innovation readiness is measured by various instruments used by intermediaries who work on commercialization of research to assess initially the potential success of commercializing a specific technology by a specific entrepreneur in a specific market; for example see "the cloverleaf model of technology transfer" (Heslop, McGregor &

[1] Innovation intermediaries' practitioners, inventors, entrepreneurs, and managers
[2] Research centers are often associated with Universities or Government's laboratories

Griffith, 2001). Moreover, commercialization paths to be considered are: sell, rent and build (Pries & Guild, 2005). As a result, gaining an understanding of intermediary types and dominant commercialization paths will significantly affect the method of selecting intermediaries, and accordingly impact the success of commercialization efforts. Intra-firm and inter-firm commercialization were not included in this research as these are beyond the scope of this study. Similarly, the collaboration form of commercialization was also excluded. To summarize, this study's range was limited to the commercialization of the research (by universities and government laboratories) to regional industries through the commercialization paths of sell, rent and build.

1.2 Research Question

The primary questions of this research were:

Which innovation intermediary and accordingly strategy enable the success of research commercialization?

In the research question, the phrase 'which innovation intermediary' refers to the four types of commercialization intermediaries; the word 'strategy' refers to the main categories of: how innovation intermediaries interact with their stakeholders, and how innovation intermediaries operate their organization in terms of objectives, practices, clients, innovation readiness, and commercialization paths. Finally, the term 'research commercialization' includes any research that is produced by universities, government laboratories, research centres, and industry that is commercializable.

Solvers and seekers require intermediaries' support in order to benefit from their experience, networking and resources. Nevertheless, most solvers and seekers are not knowledgeable about which commercialization paths are suitable for their specific cases, particularly at the very beginning. Thus, intermediaries help in this process. Accordingly, a vital aspect of this research aims to discover whether or not the selection of intermediary will lead eventually to a specific dominant commercialization path. For example, if solvers or seekers use university technology transfer office

(UTTO) to commercialize research results or find a solution, then will UTTO dominantly lead to eventual non-exclusive licensing, or rent? On the other hand, if solvers and seekers instead select the community business incubators/accelerators (CBI), then will CBI dominantly lead to eventual spin-out or startup, or build? Similarly, the same inquiry is made for IFOI and III. A subsequent research question investigated if the above dilemma may be resolved by not being limited to one single central commercialization path, and instead being open for all commercialization possibilities even until the late stage.

Nevertheless, the main research question generates many sub-questions:

1. Who are the innovation intermediaries (IIs) that work on facilitating research commercialization? and what classification may be best used to describe them?
2. Why is there more then one type of II to facilitate research commercialization?
3. What theory can explain the existence of more then one type of II who facilitate research commercialization?

Chapter 2
Literature Review

The second chapter discusses the literature review related to this study. It consists of the following five sections: the first section reviews the sources of invention that are based on research and how these were discussed in previous studies; the second section discusses the available channels for the purpose of commercialization of research results, and concludes with the commonly used approach of sell, rent and build; the third section reviews the literature of innovation intermediaries in general and introduces the four types of innovation intermediaries that are assumed to work in the context of this study; the fourth section focuses on innovation readiness, objectives, and practices literature which were used as a proxy tool to measure the business strategy for innovation intermediary; finally, the fifth section discusses the best practices in the context of innovation intermediaries.

2.1 Technology Transfer of Research-Based Invention to Industry

Universities, government laboratories, research centres and industries produce the most of what is termed research-based invention. Research is based often on either or both of private and public funds; publicly funded research aims to serve the public interest either directly or indirectly; while privately funded research shares some of the above goal of publicly funded research, and focuses more to serve industries' interest toward developing new products/services. Many studies have investigated the economic return from publicly funded research (Teece, 1998); for example, Salter and Martin (2001) listed six benefits that publicly funded research could contribute to society:

1. Increasing the stock of useful knowledge;
2. Training skilled graduates;
3. Creating new scientific instrumentation and methodologies;
4. Forming networks and stimulating social interaction;
5. Increasing the capacity for scientific and technological problem solving; and
6. Creating new firms. (p. 520)

In 2009, Canada spent almost 2% of its GDP on publicly funded research (OECD, 2009). However, a high percentage of it has not been put to work to benefit society. Indeed, most of the subset of research that becomes protected by a patent, is never successfully commercialized (Etzkowitz, Webster, Gebhardt & Terra, 2000). Governments worldwide have formed many polices to make maximum use of publicly funded research. For example, in the USA, the government in 1980 issued the Bayh-Dole Act to assign ownership to universities, to facilitate the patenting activities and to accelerate the commercialization of publicly funded research (Siegel, Waldman, Atwater & Link, 2004). Accordingly, many technology transfer offices were established with this goal in mind (Siegel et al., 2004). Indeed, management researchers have devoted many studies to University-Industry Technology Transfer (UITT), and government's laboratories to industry technology transfer (Shane, 2004; Rothaermel, Shanti & Lin, 2007; Siegel et al., 2004; Tran & Kocagolu, 2009; Bozeman, 2000) that include the research centers[2]. On the other hand, industries have progressed from having R&D department to the extent of devoting chief technology officers to be open to external innovation, as discussed next.

2.1.1 University-Industry Technology Transfer (UITT)

Although universities remain committed to their traditional academic and research missions (Siegel, Waldman, & Link, 2003), 21st century institutes also address their third mission of being an "entrepreneurial university" (Shane, 2004; Rothaermel et al., 2007). Etzkowitz et al. (2000) suggest that universities should maintain a balance between their traditional academic and entrepreneurial roles, with considering the two roles as complementary to each other (Siegel et al., 2004).

A literature review by Agrawal (2001) summarizes and synthesizes the literature of UITT. Agrawal categorizes UITT literature into four streams: 1) research on firm characteristics, 2) research into university characteristics, 3) research on geography "in terms of localized spillovers" (p. 258), and 4) research into channels of knowledge transfer (Agrawal, 2001). An additional stream has emerged over the last two decades: research in technology transfer's intermediary characteristics (Howells, 2006).

To some extent, the firm characteristics stream focuses on studying absorptive capacity of firms (Cohen & Levinthal, 1990), and how this contributes to facilitating the flow of knowledge between

[2] Research centers are often associated with Universities or Government's laboratories

university and industry (Agrawal, 2001). For example, Lim (2000) performed quantitative and qualitative analysis to investigate firm's absorptive capacity in relation to firm's connectedness to knowledge sources. Lim (2000) observed that the absorptive capacity of firm is a function of its connectedness. Connectedness is defined as the extent of links between firm's R&D and the external source of knowledge (Lim, 2000). On the other hand, absorptive capacity is firm's ability to explore and assimilate knowledge from external sources (Cohen & Levinthal, 1990). More of firm characteristics is discussed on Section 2.1.3.

The university characteristics stream has multiple foci on universities' status, culture, policy, role, incentive system, patenting activity, and licensing strategy; on individual's experience and skills; and on external factors such as government policies (Rothaermel et al., 2007; Agrawal, 2001). Much research on government policies has concentrated on the impact of the Bayh-Dole Act (Agrawal, 2001). Nevertheless, several studies have credited the increase in filing patents to the Bayh-Dole Act (Shane, 2004b); yet, different studies have argued that the increase in filing patents is attributed to factors other than the Bayh-Dole Act (Mowery & Sampat, 2001a). Hoye (2006) noticed two common misunderstandings of the act; first, researchers see the Bayh-Dole Act as uniform policy for all USA universities, while in fact the policy is applied only to publicly-funded inventions; second, researchers see the Bayh-Dole Act as an emerging point of university ownership of intellectual property (IP). In fact, many universities were permitted to commercialize their inventions prior to the Act. On the other hand, European universities' policy regards IP right as summarized by Rasmussen (2006):

> *Ownership of intellectual property rights varies between countries. In the Nordic countries the scientific employees at universities (but not hospitals, research institutes, etc.) have traditionally owned the property rights to their work. Denmark and Norway have recently changed legislation, granting the universities the intellectual ownership and giving them a formal responsibility for commercialization. Italy has recently made a legislative change in the opposite direction (p. 520).*

In Canada there is no unique policy for IP; however, each university sets its own policy. In other words, the policy varies from granting the IP right to the institute, between institute and researcher, or solely to the researcher (inventor) (Hoye, 2006).

The study by Landry et al. (2006) asked "why are some university researchers more likely to create spin-off companies than others?" (p. 1599). This exemplifies how research regards individuals'

experience and skills in the university characteristics stream. The authors used a dataset of 1,554 university researchers and drew on resource-based view theory of the firm (RBV). Landry et al. (2006) found that researchers who have prior experience in patenting activities, or have good connectedness with others (e.g. through consulting activities) are likely to create their own startup. In addition, Hoye and Pries (2009) surveyed 172 university faculty and found that 80% of commercialization activities were attributed to only 12% of faculty who had been classified as "repeat commercializers" (p. 687). Moreover, Friedman and Silberman (2003) studied the policy and incentive characteristics that could influence research commercialization. They found that incentives for faculty eventually led to an increase in the number of innovation disclosures (Friedman & Silberman, 2003). Thus, they recommended that universities follow the policy of sharing royalty with researchers (inventors) in order to encourage commercialization (Friedman & Silberman, 2003). Licensing strategy research is discussed on Section 2.2.1 in this chapter.

The third stream of research on UITT explores how location is essential "in terms of localized spillovers" (Agrawal, 2001, p. 285). Alcacer and Chung (2007) studied firms' strategies for selecting location, by using data of new entrants' firms to United States from 1985 to 1994. They found that firms favor locations that are near to university and related academic activity (Alcacer & Chung, 2007).

Finally, the stream research on channels of technology transfer and intermediaries are discussed in Section 2.2 and Section 2.3 respectively.

2.1.2 Government's Lab-Industry Technology Transfer

Following the Bayh-Dole Act, the U.S. Federal Technology Transfer Act was issued in 1986 (Public Law 99-502). This act encourages government laboratories to perform joint research and participate in cooperative research and development agreements (CRADA) with industry. In addition, it allows a government laboratory to assign IP ownership to the inventors (laboratories' employees) or to the industry under specific agreement and condition. Moreover, laboratory researchers are encouraged to make use of federal research through technology transfer and commercialization (Public Law 99-502).

The literature on government laboratories technology transfer uses the words government and federal interchangeably (Tran & Kocagolu, 2009). Some researchers argue that research conducted in

government laboratories for technology transfer does not receive sufficient attention from commercializers compared to research conducted in universities (Tran & Kocagolu, 2009; Bozeman, 2000). Bozeman (2000) views universities and government laboratories for technology transfer as "fundamentally alike in all unimportant respects" (p. 634). Crow and Bozeman (1998) studied US R&D laboratories; they compared and contrasted university and government laboratories based on data collected from 1,200 university, industry, and government laboratories. Table 2-1 reflects the result of this study.

Table 2-1 Contrast Between University and Government Laboratories in the U.S.

Aspects	Universities	Government Laboratories
Viewing technology development as a major mission	23%	51%
Viewing basic research as a major mission	70%	42%
Involvement in technology transfer to industry	40%	52%
Devoting their activity to publishing scientific research	44%	36%
Devoting their activity to patenting and licensing	2%	2%
Devoting their activity to production of algorithm	8%	8%

Note. Information is adopted from Crow and Bozeman, 1998

Crow and Bozeman (1998) added that university and government laboratory scientists possess comparable reward systems and employee symmetrical tenure processes, read the same scientific journals, and attend similar conferences. Moreover, Carr (1992) studied the technology transfer and its related phenomenon by interviewing technology transfer professionals in university and government laboratories. Carr (1992) suggested that the differences between university and government laboratories are attributable to the way in which both market their inventions. On the other hand, Bozeman (2000) counts government laboratories' ability to achieve interdisciplinary team research and their capability of having expensive scientific equipment and facilitates on site as an advantage for government laboratories over university laboratories. Finally, Kassicieh, Radosevich and Umbarger (1996) analyzed data collected by surveying 213 inventors and 24 spin-offs in three government laboratories and found that government laboratories' inventors were less willing to start

their own spin-offs. The authors attributed this unwillingness to inventors' older age, higher level of education and root connection with their laboratories (Kassicieh et al., 1996).

2.1.3 Industry Technology Transfer and Open Innovation

In addition to the above two sources of research from universities and government laboratories, industries are the third source of research that could be commercialized. Although in past decades industries have tended to use the closed innovation model to develop or improve technology (Chandler, 1977, 1990), in recent decades much industries have adopted the open innovation model for the same purpose of gaining a competitive advantage over rivals (Chesbrough, 2003). In the former, research is mostly conducted internally through R&D; while in the latter, research is conducted both internally and externally.

In the closed innovation model, large firms are reliant on their own research and development department (R&D) to offer new technologies. Indeed, R&D is defined as "a set of actions aimed at discovery of new elements, laws, technology or services and applying this knowledge to create a product or service improved, technological processes" (Ughetto, 2008, p. 913; OECD, 1994). Researchers investigate R&D management, team, spillovers, project, expenses, and benefits among other issues (Burki & Cavallucci, 2011). Nevertheless, this study considers research and development as one of the sources that industries use by commercializing the research results to develop new products and processes.

On the other hand, Chesbrough (2003) defined Open Innovation[3] as "systematically performing knowledge exploration, retention, and exploitation inside and outside an organization's boundaries throughout the innovation process" (Lichtenthaler, 2011, p. 77). In other words, the purpose of open innovation is to utilize internal and external knowledge toward improving internal innovation while being open to exploiting external invention (Chesbrough, 2003; Chesbrough, Vanhaverbeke, & West, 2006). In the literature, there are four streams of open innovation resaerch: technology transactions, user innovation, business models, and innovation markets (Lichtenthaler, 2011). The literature of technology transactions focuses on inbound open innovation (Zaho & Anand, 2009), which aligns

[3] Open innovation and open-source software development are sometimes used interchangeably. However, "While open-source shares focus on value creation throughout an industry value chain, its proponents usually deny or downplay the importance of value capture" (Chesbrough et al., 2006, p. 2).

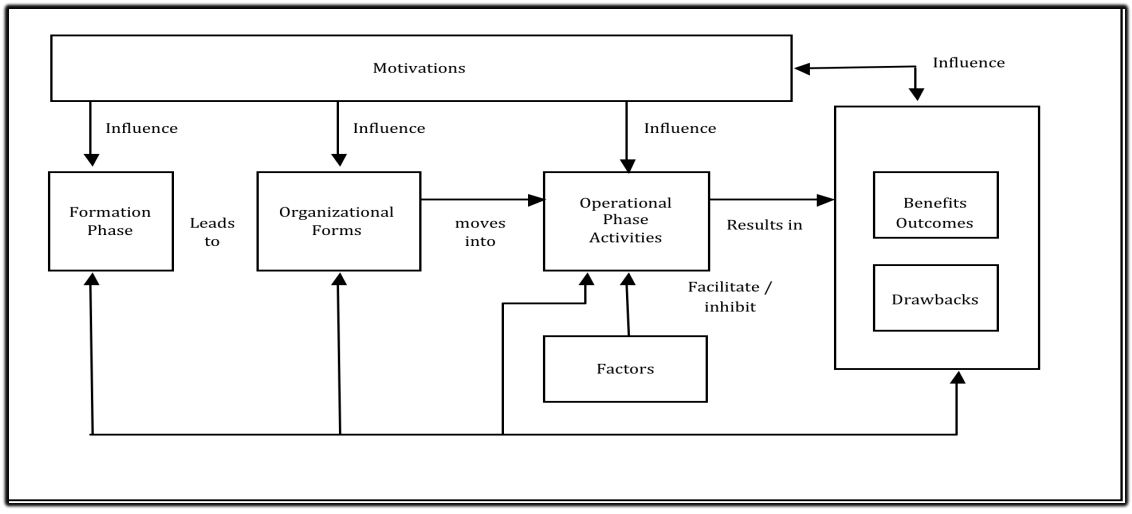
with the focus of this study. Firms who follow the open innovation model are open to exploring and exploiting research (technology) from external sources (Lichtenthaler, 2005). External sources include but are not limited to acquiring, licensing, joint ventures of R&D, contract research, and cooperative and collaborative R&D agreement (Lichtenthaler, 2005; Brikenmeier, 2003; Granstrand, 2000).

This study focuses on the research (technology) that is commercialized through licensing-in to the parent firm over any of the above external sources; as well, that includes the commercialization of research that has been produced internally by the firm's R&D. However, intra-firm and inter-firm commercialization are beyond the scope of this study and are not included in this research.

2.2 Strategies for Commercialization of Research Results

Commercializing research from universities and government laboratories to industries is accomplished through various channels (paths) (Brennenraedts, Bekkers, & Verspagen, 2006). Ankrah (2007) conducted a systematic review for the relationships between University and Industry; accordingly, he suggested a theoretical framework for the communication between universities and industries (Figure 2-1), which can serve as a guide for the literature on technology transfer channels.

Figure 2-1 Theoretical Framework for the Communication Between Universities and Industries (Adopted from Ankrah (2007))



The framework indicated that the formation of relationship between University and Industry is influenced and commenced based on the motivation that each party has; that in turns leads to a particular organizational form, which results in operating the relationships and performing various activities. Theses activities of the relationships are facilitated and inhibited by various factors. Nevertheless, as an outcome, various benefits and drawbacks resulte from these relationships' activities. That outcome will work as a feedback loop to modify and enhance the communication channels and activities.

For the interests of our study, the commercialization paths between universities, government laboratories and industries will be discussed in the following subsections. But prior to that, it is important to notice that authors used several terms to describe each form of commercialization channel (Chiesa & Manzini, 1998). In addition, although authors attempt to classify the different forms of commercialization channel (see Appendix A), Blackman and Seagal (1991) argued that it is really difficult to show all the different forms of commercialization channel in one framework. Nevertheless, the reported list of commercialization channels is long (see Appendix B); yet, some studies argue that licensing and startup are the dominant channels (Gregory & Sheahen, 1991), particularly in the commercialization of universities and government laboratories. More details on licensing and startup literature are included in Sections 2.2.1 and 2.2.2. Pries and Guild (2005) argued that "a key feature of the license vs. startup dichotomy is the focus on the legal structures used to affect the transfer of the technology from the research environment to the commercial environment" (p. 470). They added that the license and startup categories are neither comprehensive nor distinct (Pries & Guild, 2005). Thus, drawing on economic theories, they suggested an alternative view of commercialization paths: build, rent or sell. The alternative view "focuses on the substance of the available methods rather than their legal form" (Pries & Guild, 2005, p. 470). These commercialization options are explained in Sections 2.2.3.1, 2.2.3.2 and 2.2.3.3, respectively. Finally, Section 2.2.4 (path change) discusses the concerns about which commercialization path should be followed, what factors support or hinder the selection of appropriate channels, and what is the cost of changing paths.

2.2.1 Licensing

A 'license' is defined as an agreement between two parties to transfer an intellectual property (IP) right fully or partially (Kollmer & Dowling, 2004); the first party (licensor) is usually the owner of

the IP, while the second is the licensee. Intellectual property types include patents, trademarks and copyrights; more details on IP policies are in Section 2.1.1. Licensing agreements could be exclusive or non-exclusive (OECD, 2002). Large firms prefer the former, while the latter is appropriate when intellectual property has a large potential market and applications (Feldman et al., 2002). Moreover, Table 2-2 shows advantages and disadvantages of both approaches – from the perspectives of the licensor and the licensee.

Table 2-2 Advantages and Disadvantages of Exclusive Versus Non-Exclusive Licensing for Companies and Public Research

	Exclusive	Non-exclusive
	Licensor (University & Government Laboratories)	
Advantages	• Effective in attracting investors, especially for SMEs and spin-offs	• Fosters broader diffusion • Broader revenue base from royalties • Reduces risk of conflict of interest
Disadvantage	• May limit the diffusion of knowledge • Raises obstacles to research requiring patented knowledge • Review process may be slow • Risks of litigation	• Requires more resources to manage and advertise licensing
	Licensee (Companies & Industry)	
Advantages	• Speeds technology transfer • Reduces development risk • Generates monopoly returns	• Larger companies benefit from market power
Disadvantages	• If it is given to large companies, small companies may be disadvantaged • Higher share of royalty burden on companies	• Competitors may develop technology first

*Adopted from (OECD 2002a, p. 54)

By licensing intellectual property, the licensor gains revenue in one or more forms: an upfront fee from the licensee, percentages on sales (royalties), and usage fees (Feldman et al., 2002). University and government laboratories (as licensors) look to gain revenue from licensing activity; thus, they assess licensees' characteristics to evaluate their viability for licensing and their compatibility with national and institute policies (Heslop, McGregor & Griffith, 2001). For instance, some national policies encourage universities and government laboratories to license their inventions (research

results) to small local firms instead of large foreign firms as well as to new startup firms instead of established firms; other policies may emphasize 'global opportunities'.

2.2.2 Startups

A 'startup' is defined here as a new company that has been established by an inventor or entrepreneur to commercialize research results (technology). Researchers tend to use different names for these firms, often interchangeably. For example, they call them spin-offs, new-technology-based companies (NTBCs), research-based spin-offs (RBSOs), and spin-outs; nevertheless, other researchers differentiate between them. For instance, Smilor, Gibson and Dietrich (1990) distinguish a spin-off as being formed by an individual who was part of a parent firm (university or government laboratories); however, a startup could be started by an entrepreneur who is not the inventor of the commercialized technology. In general, practitioners define a 'startup' as "a human institution designed to create a new product or services under conditions of extreme uncertainty" (Ries, 2011, p. 27). Lately, Blank (2014) defined startup as "an organization formed to search for a repeatable and scalable business model" (Blank, 2014). One of the main differences between university startups and startups in general is that the former should be formed based on research results. Steffensen et al. (1999) classified startups based on their originating idea: university startups, government laboratory startups, and private R&D startups. The focus of this study is limited to startups that were established based on research results. On the other hand, Pries and Guild (2007) in a study of 57 public startups concluded that startups operate either in market for technology or through product markets. They added that there are differences in their business activities and that these differences can be distinguished in practice (Pries & Guild, 2007).

Djokovic and Souitaris (2008) suggested three categories for research on startups: macro, meso, and micro. The macro level includes research on how the government encourages the formation of startups, as well as what types and factors of technology and the market lead toward the formation of a startup (Djokovic & Souitaris, 2008). Bozeman (2000) described how the government shifted from a 'market failure' paradigm to a 'cooperative' technology paradigm, which reflects government encouragement of publicly funded research as playing a main role in technology development, as demonstrated by government-issued policies such as the Bayh-Dole Act (see Section 2.1.1). On the other hand, the existence of suitable complementary assets within university/government laboratories resources is among the key factors involved in forming a startup (Lowe, 1993).

Although Djokovic et al. (2008) limit the classification of research under the meso level to universities' support, culture, policies and resources that are related to startup formation, this study, adds research on intermediary-startup support under the same stream of research. The former was discussed in Section 2.1.1, while the latter is explored in Section 2.3 (Innovation Intermediaries). For example, based on RBV theory, O'Shea et al. (2005) found a positive relation between university resources and the extent of success in creating a startup; however, research in this stream tends to provide evidence about the effectiveness of the startup as a vital channel of commercializing research. For example, Bray and Lee (2000) found that startups create 10 times more income than licensing; thus, he suggested that a startup as a commercialization channel is the first option unless the "technology is not suitable for a [startup] company" (p. 385). Then, the licensing option would be second.

The third stream focuses on the individual's (inventors, scientists, surrogates, and intermediaries' staff) roles, characteristics, skills, expertise, and norms that influence startup formation. For instance, Nicolaou and Birley (2003) classified academic inventors' role in startup formation as falling within three categories: technological, hybrid and orthodox. In the orthodox type, academic inventors leave the university to form the startup; in the technological type, the academic inventor has no role in the new startup; finally in the hybrid type, the academic inventor continues at the university but also participates in the formation of the startup (Nicolaou et al., 2003). Parker and Zilberman (1993) make connections between TTO's mission and staff skills; they suggested that university technology transfer offices hire a mix of scientists and lawyers in cases focusing on patents and licensing and hire a mix of scientists and entrepreneurs/businessmen in cases focusing on startups. More information on intermediaries' staff roles is discussed in Section 2.3 (Innovation Intermediaries).

2.2.3 Commercialization Paths

As demonstrated above, selling, renting and building are appropriate options (mechanisms) for commercialization paths. Pries and Guild (2005) preferred this approach to commercialization over the license vs. startup dichotomy; saying that it "focuses on the substance of the available methods rather than their legal form" (Pries & Guild, 2005; p. 470). Moreover, the sell/rent/build trichotomy is perceived from the point of view of researchers/universities/government laboratories, and each option could be implemented by using any of the dominant mechanisms – licensing and startup (Pries & Guild, 2005) – as described in the following sections.

2.2.3.1 Sell

Selling means transferring the intellectual property (technology) rights of use to an existing company (Pries & Guild, 2005). In other words, it means licensing the technology on an exclusive basis to an established firm; thus, all benefits and risks will be transferred to the licensee, while the original owner (university/inventor) will have no right to use the technology or develop it (Pries & Guild, 2005). On the other hand, creating a new firm "to invent and sell technologies" (p. 474) is classified as commercializing through the sell option (Pries & Guild, 2005).

2.2.3.2 Rent

Renting means transferring to one or more established firms the right to use the intellectual property (technology) in their business (Pries & Guild, 2005). In other words, it means licensing the technology on a non-exclusive basis to one or more established firm; thus, unlike the sell option, the rights of use of the IP and all benefits and risks are not transferred exclusively; where the original owner (university/inventor) continues to have the right to use and develop the technology (Pries & Guild, 2005); while the licensee has the rights to use the technology. On the other hand, creating a new firm to "develop and market technology to other firms" (p. 474) is classified as commercializing through the rent option (Pries & Guild, 2005). Particularly, this is what was called RENT through newly created venture (RENT_nv here and after).

2.2.3.3 Build

To build is to "create a new business based on the [IP] technology" (Pries & Guild, 2005; p. 474). In other words, it is to start up a new firm based on the technology, either by being the inventor of that technology or by licensing it exclusively from the owner (university/inventor). Thus, intellectual property (new technology) will represent the "key source of competitive advantage for the new business" (Pries & Guild, 2005; p. 474).

2.2.4 Path Change

After exploring the various commercialization channels (paths), it is vital to know why a particular commercialization path is followed, and what characteristics support or hinder the selection of

appropriate strategies (paths). Ismail et al. (2010), in studying decision making to form a startup in the United Kingdom, concluded that the inventor is the one who initiates the decision regard choosing to startup; while, TTOs (intermediaries) and inventors share the decision making in regard to patenting and licensing. On the other hand, many studies concluded that, in order to choose the appropriate commercialization path, it is necessary to assess the characteristics of the new technology, individuals (entrepreneurs), market, and intermediaries' capability (Heslop et al., 2001). For example, Shane (2001) found that early-stage technology is commercialized through startups, while established firms may license a technology in its prototype stage or maybe a later stage. Ismail et al. (2010) found that individual's prior expertise is a key factor in creating a startup. Hoy and Pries (2009) also concluded that 80% of startups are attributed to 12% of inventors who have expertise in commercialization. McAdam et al. (2004) suggested that high market expectation for the commercialized technology could increase the number of failed startups. Moreover, intermediaries' (TTOs) experience, support, and skilled staff are important factors in selecting commercialization paths (startups) (Lockett, Vohora, & Wright, 2003). Additional information about these different factors will be included in Section 2.4 (Innovation Readiness). Finally, no literature was found on the impact of changing commercialization (strategies) paths after an initial commitment. In other words, if the inventor decides to build (startup) in order to commercialize his invention, and afterwards finds out that it is better to sell or rent it, then what is the impact on the inventor, on technology and on the commercialization process in general? (The case of 'PicStream' company is an example for path change).

2.3 Innovation Intermediaries

In the open innovation context, intermediaries facilitate innovation by connecting solvers and seekers (Teece, 2000). In the context of this study, solvers are the researchers and faculty from universities, government laboratories, and rarely from private firms; while seekers are industries and individuals. Solvers and seekers are among the primary stakeholders for innovation intermediaries (Siegel et al., 2003).

Dalziel (2010) answered the question of "why do innovation intermediaries exist?" (p. 1) by stating that innovation intermediaries are there to enhance the national/local/sectoral innovation systems through bridging the innovation gap between businesses and research communities. However,

researchers have called innovation intermediaries by different names: third party (Ankrah, 2007), middleman (Lien, 1979), bridgers (Sapsed et al., 2007; Bessant and Rush, 1995), and brokers (Hargadon & Sutton, 1997; Lim & Park, 2010). Innovation intermediaries are defined in different ways (discussed in detail in Section 2.3.2).

Bessant and Rush (1995) determined five characteristics for consultants that could serve as borders for generic innovation intermediaries: 1) services introduced ranging from experts to processes, 2) services introduced to the sector specifically or to various sectors in general (global), 3) size ranges from small firms with one man/woman to multidisciplinary large firms, 4) focus placed on one technology (application), as opposed to the extent of being general, and 5) innovation intermediaries with a traditional background to the end of the new entrant. In addition, Howells (2006) concludes that innovation intermediaries work in a range from a simple triadic (one-to-one-to-one) to a complex relationship (many-to-many-to-many). Moreover, innovation intermediaries facilitate moving the technology to market (technology push) and look for solutions for market needs (market pull) (Howells, 2006; Lien, 1979).

In the following sections, four interesting types of innovation intermediaries focusing on the commercialization of research results are listed and discussed in Section 2.3.5. General innovation intermediaries' roles, functions and activities are presented in Section 2.3.3. Section 2.3.4 provides a review for the innovation intermediaries' performance and impacts. At the outset, the next section (Section 2.3.1) discusses the literature of innovation intermediaries typology.

2.3.1 Typology of Innovation Intermediaries

Classification, typology, grouping, and taxonomy are different terminologies used to describe the various approaches of subdividing a group into classes (Marradi, 1990). Nevertheless, in the social studies field, researchers use classification and typology terminologies more so than other terminologies, and at times these are used interchangeably (Karlsen & Karlsen, 2013). However, according to Hoehne:

> *Comparing the two methods we could say that a classification is formed when we subdivide a given number of people (or objects) by a well-defined measurement of our own choosing[4]. A typology emerges when we find clusters of persons or objects with a characteristic combination of values[5]. These clusters then form the content of our typology, while in contrast to our classification the remaining people fade into the background ("cluster analysis"). (1980, p. 1099)*

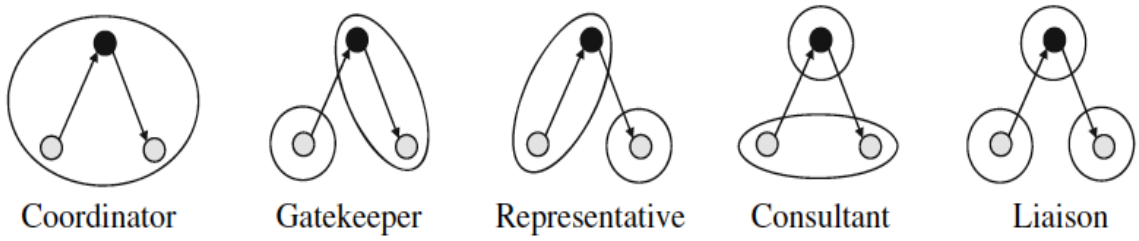
Despite the above various terminologies, numerous typologies for IIs in general and for particular type of IIs (e.g. incubators or university technology transfer offices) have been found in the literature (see Table 2-3). These typologies appear to be distinctive and no unified typology has been identified; however, most of the typologies tend to use similar criteria for classification (Bakkali, Messeghem, & Sammut, 2014). For example, typologies in many cases were based on how IIs support technology transactions (Czarnitzki et al. 2001; Tietze, 2010); IIs' physical structure and environment (e.g. human based agents versus computer based agents) (Verona et al., 2006; Datta, 2007); IIs' different organizational forms (e.g. public organizations (Bozeman, 2000; Tran et al., 2009); university-based organizations (Agrawal, 2001; Siegel et al., 2003); being part of private organizations (Cooper, 1979, 1993, 1999; Albert et al., 2003); being part of for-profit organizations (Hargadon & Sutton, 1997; Zhang & Li, 2010; Wu, 2011; Albert et al., 2003)); and objectives, structures, funding sources, and services (e.g. Etzkowitz, 2002; Allen & McCluskey, 1990; Aernoudt, 2004; Carayannis & Von Zedtwitz, 2005; Von Zedtwidtz & Grimaldi, 2006).

On the other hand, various contexts were considered while developing these typologies; for example, some studies considered the intermediary role to be only among industries, while others considered this role to be among universities and government in addition to industries (Etzkowitz, 2002). In addition, typologies take into account one or more diverse mediating positions. Case in point, Chesbrough (2006) indicated that innovation intermediaries could be: "(1) agents, representing only one side of the technology transaction, and (2) brokers or market makers, who match buyers and sellers of a technology, shape the terms of the transaction and sometimes assist in the commercialization process" (Gredel, Kramer, & Bend, 2012, p. 538). As well, Gould and Fernandez

[4] According to Hoehne (1980), "For studying people such a variable could be height, weight, age, color of skin, language, or religion" (p. 1099).
[5] According to Hoehne (1980), "For example, a light-skinned person with blond hair, blue eyes, a high narrow nose, and thin lips will immediately evoke in us the image of someone of Northwestern European origin. This example characterizes clearly defined, typical morphological constellations of man" (p. 1099).

(1989) specified five mediating roles[6] that can be applied to innovation intermediaries (see Figure 2-2)

Figure 2-2 Five Graphic Types of Mediating Roles (Gould & Fernandez, 1989)[7]



Nevertheless, Bakkali et al. (2014) argue that existing typologies suffer from two main limitations: the absence of a unique definition for innovation intermediaries (i.e. incubator in the referenced study), and a focus on the structure as the base for classification. As a solution, Bakkali et al. (2014) suggest HR management as a base for the typology (see Table 2-3).

[6] According to Lim and Park (2010), "first, a 'coordinator' mediates technological knowledge flowing between the other two technologies, where all three technologies belong to the same industry. Second, a 'gatekeeper' absorbs technological knowledge from outer-industry technologies, passing it to within-industry technologies. Third, a 'representative' diffuses within industry technological knowledge to external industries. Fourth, a 'consultant' is the outer-industry technologies that mediate technological knowledge between different technologies in another industry. Finally, a 'liaison' is an arbitrator to enhance technological knowledge interactions between other industries when all three technologies belong to different industries" (p. 546).

[7] Nodes represent technology classes; edges indicate directions of technological knowledge flows; circles correspond to industry boundaries. The black nodes play the role of technological knowledge intermediaries between the source technology and the recipient technology.

Table 2-3 Systematic Review for Innovation Intermediaries' Typology

#	Focus	Based on	Classification/Typology	Citation
1	Business Incubators	• Networking dynamics	1) Intra-networking, 2) Inter-networking, 3) Extra-networking	(Etzkowitz, 2002)
2	Business Incubators	• Sources of value added	1) For-profit property development, 2) Not-for-profit development corporation, 3) Academic, 4) For-profit seed capital, 5) Hybrid and corporate	(Allen & McCluskey, 1990)
3	Business Incubators	• Main philosophy • Objectives • Sectors involved	1) Mixed, 2) Regional development, 3) Technology, 4) Social, 5) Basic research	(Aernoudt, 2004)
4	Business Incubators	• Competitive focus • Strategic objectives	1) Regional Business, 2) University, 3) Independent commercial, 4) Company internal, 5) Virtual	(Carayannis & Von Zedtwitz, 2005) and (Von Zedtwidtz & Grimaldi, 2006)
5	Business Incubators	• Many factors, including private/public nature, institutional mission, industrial sector, location, market, origin of ideas, phase of intervention, sources of revenue, services offered, management team	1) Business innovation centre, 2) University business, 3) Corporate business, 4) Independent business	(Grimaldi & Grandi, 2005)
6	Business Incubators	• Level and complexity of activities performed • Heterogeneity of resources deployed	1) Low selective model, 2) Supportive model, 3) Incubator model	(Clarysse et al., 2005)
7	Business Incubators	• Source of technology • Type of technology	1) Fast profit, 2) Leveraging, 3) In-sourcing, 4) Market	(Becker & Gassman, 2006)
8	Technological knowledge Intermediaries	• Highlighting industry affiliations of source technologies and recipient technologies	1) An intra-industry mediator, 2) An outward diffuser, 3) An inward absorber, 4) An inter-industry mediator	(Lim & Park, 2010)
9	Technology Market Intermediaries	• Business models (nature of services and degree of transformation)	1) IP Distributors, 2) IP Contractors, 3) IP creators, 4) IP Attractors, 5) IP Brokers, 6) IP landlords	(Tietze, 2010)
10	Innovation intermediaries	• Literature Review (functional roles)	10 Functions for innovation intermediaries	(Howells, 2006)
11	University Technology transfer	• Transactions method	1) Direct transactions, 2) Indirect transactions	(Czarnitzki, & Licht, 2001)
12	Business Incubators	• HR management	1) Bureaucratic structure, 2) Professional structure, 3) Adhocratic structure, 4) Entrepreneurial structure, 5) Missionary structure	(Bakkali, Messeghem, & Sammut, 2014)
13	Business Incubators	• Several criteria, including the final aim (for profit or not), the dominant activities of the projects (general or high tech), and aims (economic development, promotion of technology, etc.)	1) Economic development incubators, 2) Academic and scientific incubators, 3) Business incubators, 4) Private investment incubators	(Albert et al., 2003)
14	Innovation intermediaries	• Business model for two dimensions: source of ideas (innovations), and type of value creation (services or infrastructures)	1) Innovation consultants, 2) Innovation traders, 3) Innovation incubators, and 4) Innovation mediators	(Lopez & Vanhaverbeke, 2010)

Finally, an innovation intermediary has been viewed in the literature as a process or an organization (Howells, 2006). In terms of process, researchers (Howells, 2006; Bendis et al., 2008; Dalziel, 2010) have observed that an innovation intermediary has a "highly dynamic pattern of growth and development" (Howells, 2006, p. 725). Tietze (2010) conducted a study of the intermediaries' typology and predicted that, in the future, some existing roles and activities for innovation intermediaries will disappear while new ones will emerge. This change will occur because the innovation intermediary evolves as it conforms to its clients' needs.

2.3.2 Definition of Innovation Intermediaries

In the literature, the term innovation intermediary (II) has several definitions. Each author follows a different approach upon which to base his/her definition, which results in the lack of a consistent definition. Chesbrough (2006) emphasized II's main function in the commercialization context and accordingly defined them as those who accelerate finding solutions for industry problems, as well as finding users for inventors' inventions. He added that they do that by drawing upon a wide range of ideas and networks. As well, Winch and Courtney (2007) emphasized the facilitation role of innovation intermediaries, thus they defined them as "an organization acting as a member of a network of actors [...] that is focused neither on the organization nor the implementation of innovations, but on enabling other organizations to innovate" (p. 751). On the other hand, based on the activity that innovation intermediaries perform, Howells (2006) defined innovation intermediaries as the "organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties" (p. 720). Furthermore, Bendis, Seline and Byler (2008) placed more emphasis on resource assimilation. Thus, they defined innovation intermediaries as "organizations situated at the centre of a region's effort to align local technologies, assets, and resources to work together on innovation" (p. 76). Finally, Dalziel (2010) expanded upon the definition to include more activities, particularly those which do not require a central position. She defined innovation intermediaries as "organizations or groups within organizations that work to enable innovation, either directly by enabling the innovativeness of one or more firms, or indirectly by enhancing the innovative capacity of regions, nationals or sectors" (p. 1).

For the purposes of this study, the definition by Howells (2006) will be adopted with minor modification to be: an Innovation Intermediary is any organization or body that acts as an agent or broker in any aspect of [research commercialization] process between two or more parties; our

modification reflects the focus of this study on the commercialization of research results. Nevertheless, Howells' (2006) definition is appropriate for this study due to its comprehensive meaning that aligns with the context of this study: understanding innovation intermediaries and finding an exemplary practice toward the commercialization of research. Moreover, it provides us with broad scope to introduce the four types of innovation intermediaries that represent the basis of this study (see Section 2.3.5).

2.3.3 Roles, Functions and Activities

In the innovation intermediaries' literature, it is often difficult to distinguish among intermediaries' roles, functions and activities. Despite the linguistic differences of these words, this study use 'role' to report what researchers articulated as indirect goals for establishing innovation intermediary organizations; while, use 'function' to describe what innovation intermediaries do in general as a direct role, which leads somehow to achieving their indirect roles. As well, it uses 'activity' to name the task that the innovation intermediaries are doing in order to operate their functions.

In the next few paragraphs, the general roles, functions, and activities of various types of innovation intermediaries are reviewed and listed. Although roles, functions, and activities overlap, there is currently no consensus as to what are the main roles for innovation intermediaries. Researchers have reported many roles for innovation intermediaries at different levels. First, on the governmental level, they look to innovation intermediaries as organizations that create a supportive and innovative environment for new firms (startups) (Peters et al., 2004); this created entrepreneurial environment (Goktepe-Hulten, 2010) contributes to developing the regional economy (Swamidass & Vulasa, 2008; Peters et al., 2004) by creating jobs (Chandra & Fealey, 2009; Bergek & Norrman, 2007). Second, at the university and governmental laboratory level, the innovation intermediary is seen as an essential player in helping both scientists and businesses communicate (Muscio, 2010) by bridging the gap between suppliers (i.e., universities and government laboratories) and recipients (i.e. firms, entrepreneurs) (Seiegl et al., 2007) which facilitate the utilization of research results (Goktepe-Hulten, 2010) and increase the rate of technology transfer and the commercialization of new inventions (Phillips, 2002). Accordingly, this leads to the generation of revenue for universities (Goktepe-Hulten, 2010; Swamidass & Vulasa, 2008). Third, at the firm level, innovation intermediaries contribute in fostering new firms to increase their survival rates (Allen & Rahman, 1985), stimulating the emergence of new technologies (which comes from research) (Bergek &

Norrman, 2007; Mian, 1997; Peters et al., 2004; Phillips, 2002), reducing the overhead costs of new firms (Bergek & Norrman, 2007), shortening the learning curve for new firms (Smilor, 1987a) and bridging the gap between new firms and their environment (Merrifield, 1987; Brooks, 1986). Most innovation intermediaries try to play the similar roles. However, they emphasize different functions and employ different activities to achieve them.

Many studies have identified several functions for innovation intermediaries. Seiegl et al. (2003) emphasized the technology transfer function for innovation intermediaries (TTOs). Moreover, studies on incubators highlighted some functions such as: intermediation (Peter et al., 2004), network mediation (Peter et al., 2004), and the provision of services and resources (Mian, 1997). Lynn et al. (1996) stated that innovation intermediaries have two main functions: information scanning and gathering, and communication. Other researchers have emphasized the innovation intermediaries role as finding a new use and application for an existing technology. Hargadon and Sutton (1997) found that innovation intermediaries gather information in central repositories and combine it or add some information to it, which makes it useful for other clients. Birkenmeier (2003) identified four main functions for intermediaries: providing information, providing consultation, supporting in legal issues and helping in project management (Tietze, 2010, p. 11). Howells (2006) conducted a study on 22 UK intermediaries and concluded that innovation intermediaries do more than what has been reported by previous studies. He reported ten functions for intermediaries as listed in the middle column in Table 2-4. Finally, Lopez-Vega (2009) categorized these ten functions into three broad categories: 1) facilitating the collaboration between organizations, 2) connecting services between an organization and its environment, and 3) providing various services to stakeholders. Table 2-4 illustrates Lopez-Vega's categorization and Howell's list of functions.

Innovation intermediaries undertake many activities to operate their functions. Activities include, but are not limited to, patenting and licensing (Siegel et al., 2003), receiving/recording invention disclosures (Goktepe-Hulten, 2010), managing and protecting intellectual property (IP) (Muscio, 2010), and consultation (Smilor, 1987b, Chandra & Fealey, 2009). In addition to these activities, incubators work on selecting new firms or startups to enter and utilize the incubation services and other available resources (Bergek & Norrman, 2007). Innovation intermediaries provide both financial and non-financial services and resources to the new firms (Hackett & Dilts, 2004b), with non-financial services and resources dominating. These services may be either tangible or intangible and are classified as administrative and business support services (Bergek & Norrman, 2007).

Connecting with investors is part of the financial services, which also includes supporting new firms in securing funds from various levels and agencies of the government, assisting in bank loan procedures, utilizing networks to facilitate grant access and, in some cases, providing direct funds by innovation intermediaries (Chandra & Fealey, 2009; Chandra & Fealey, 2007). Table 2-4 maps some of the activities to their upper umbrella (function).

Table 2-4 Functions and Activities of Innovation Intermediaries

Category	Function	Activity
1. Facilitating the collaboration between actors	Foresight and diagnostic	• Foresight and forecasting • Articulation of needs and requirements
	Scanning and information processing	• Scanning and technology intelligence • Scoping (selecting information) and filtering
	Knowledge processing, generation and combination	• Combining knowledge of different partners • Generating new knowledge and recombining
	Commercialization	• Marketing, support and planning • Sales network and selling • Finding potential capital funding and organizing funding
2. Connecting actors	Gatekeeping and brokering	• Matching and brokering by negotiating and deal-making • Providing contractual advice
	Evaluation of outcomes	• Technology assessment • Technology evaluation
3. Providing services for stakeholders	Testing and validation	• Testing, diagnostics, inspections and analysis • Prototyping and piloting • Scaling-up • Validation • Training
	Accreditation	• Specification setter or standard advice provider • Formal standard setting and verification
	Validation and regulation	• Regulation • Self-regulation • Informal regulation and arbitration
	Protecting results	• Intellectual property rights advice regarding the outcome of collaborations • Intellectual property management for clients

* Adapted from (Munkongsujarit & Srivannaboon, 2011).

2.3.4 Impacts and Performance Metrics

Although defining a clear measurement for innovation intermediaries' performance is critical, there is no current consensus among management scientists on a unique metric for innovation intermediaries' performance (Collier, 2008). The argument regarding the measurement of innovation intermediaries' performance lies on which are the right metrics: measuring innovation intermediaries' outcomes (macro and micro level), measuring innovation intermediaries development level or measuring their clients' success (Bergek & Norrman, 2007; Somsuk et al., 2010; Hackett & Dilts, 2004b; Chandra & Fealey, 2009).

Measuring the outcomes is controversial, particularly, in terms of which outcomes should be part of the innovation intermediaries performance measurement. Bergek and Norrman (2007) emphasized that the measured outcomes should be those which "correspond to [innovation intermediaries] goals" (p. 22). However, some studies used financial performances to assess innovation intermediaries' performance (Collier, 2008). Many other studies (i.e. Siegel et al., 2003; Muscio, 2010) used non-financial performances or a mixture of financial and non-financial indicators. Financial performance indicators are represented, but not limited to, innovation intermediaries' revenue (Goktepe-Hulten, 2010; Swamidass & Vulasa, 2008), royalty and regional economic development (Seigal et al., 2003). However, non-financial performance indicators are represented by, but not limited to, numbers of patents, inventions, licenses, startups, job creation, and disclosed inventions (Siegel et al., 2003; Muscio, 2010; Collier, 2008). Moreover, in the case of incubator functions, innovation intermediaries' performance indicators include: incubators' occupancy, firms graduated, tenant revenues, number of patent applications per firm, number of discontinued businesses, fit degree between incubators' services and market needs, sustainability and growth of the incubators' activities, incubators' ability to provide comprehensive services, incubatees' financial performance and incubators' management policies (Allen & McClusky, 1990; Phillips, 2002; Autio & Kloftsen, 1998; Somsuk et al., 2010; Hackett & Dilts, 2004b; Mian, 1997). Nevertheless, this lack of complete consensus on the unique evaluation framework (Bhabra-Remedios & Cornelius, 2003) leads to a lack of benchmarking, which is essential in defining best practices for innovation intermediaries (Bergek & Norrman, 2007) (See Section 2.5).

On the other hand, innovation intermediaries may rely on public funds to operate; thus, it is essential for them to report the activities of funds in order to continue receiving subsidization (Hackett & Dilts, 2004b). Accordingly, this financial dependency represents an essential obstacle for

innovation intermediaries to report their actual outcomes (Hackett & Dilts, 2004b). They tend to highlight the successful results, while hiding the stories of failure in order to overcome the consequences of decreasing the subsidies as a result of bad or weak performances (Hackett & Dilts, 2004b).

Despite the absence of agreed performance metrics, several studies showed innovation intermediaries positive impacts; yet, some limited studies reported negative impacts or no impact at all. For instance, Bessant and Rush (1995) studied consultants as innovation intermediaries and found them playing a positive role in bridging firms' innovation gap, such as recognizing, exploring, selecting and managing technology. Another recent study by Zhang and Li (2010) found positive impacts of innovation intermediaries on the products of new firms; they surveyed 500 new Chinese manufacturers. Shearmur and Doloreux (2000) concluded that there was no relationship between opining innovation intermediaries (science parks) and raising employment numbers in Canadian high technology sectors.

2.3.5 Four Types of Innovation Intermediaries

Demonstrating the above innovation intermediaries' definitions, characteristics, typology, roles, functions, activities, impacts, and performance metrics; focusing on the commercialization of research results as a main function for innovation intermediaries; and reading about existing and emerging business models for innovation intermediaries from the practitioners point of view (e.g. Millien & Laurie, 2007); it seems that there are four main types of innovation intermediaries:

1. University technology transfer offices.
2. Community business incubators/accelerators.
3. Industry facilitators of open innovation.
4. Independent innovation intermediaries.

The next subsection discusses some special characteristics and examples for each of these four agents (see Appendix C for a comparison).

2.3.5.1 University Technology Transfer Offices

University technology transfer offices (UTTO) are agents working toward creating an entrepreneurial environment and facilitating the utilization of research results (Goktepe-Hulten, 2010) through licensing to the industry (Seiegl et al., 2003). The UTTO follows the technology push approach (Siegel et al., 2007). Thus, its primary function is to work on patenting and licensing university research (Seiegl et al., 2007). In general, the UTTO is a not-for-profit organization and operates under university governance. Therefore, it is located inside, or very close to, a university (Seiegle et al., 2003). UTTO is also expected to be on the side of solvers (university researchers and faculty) due to its association with a university.

Normally, UTTO's staff do not have a high absorptive capacity in a specific field, due to the nature of the UTTO role in commercializing multidisciplinary research from different faculty departments. Finally, according to Shane (2001), established firms may license a technology in its prototype stage or a later stage. Technology transfer offices and liaison offices are some examples of UTTO type.

2.3.5.2 Community Business Incubators/Accelerators (CBI)

The National Business Incubation Association (NBIA) of the United States defines business incubators as organizations that "accelerate the successful development of entrepreneurial companies through an array of business support resources and services, developed or orchestrated by incubator management and offered both in the incubator and through its network of contacts" (NBIA, 2009). In other words, the main function of the CBI is to support startups toward success by mapping potential market needs to the possible applications of the new inventions. Often, the CBI is working under the governance of its sponsor(s) (often the government) as a not-for-profit organization. Moreover, by comparing the CBI with a UTTO, it is interesting to often notice that users (solvers) are themselves the clients (entrepreneurs). Therefore, it is assumed that both users and solvers (who are one entity as the incubatee) receive the same favors from the CBI. Finally, some studies found that early-stage technology is commercialized through a startup strategy (Shane, 2001), which motivates the CBI to have a medium level of absorptive capacity about the different aspects related to that new technology, which explains the existing specialized CBI. Incubators and accelerators that are supported mainly by government are some examples of CBI type.

2.3.5.3 Industry Facilitators of Open Innovation (IFOI)

In large firms and some small and medium enterprises (SMEs), there is a unit that this study names Industry Facilitators of Open Innovation (IFOI), which works on connecting a parent firm to external knowledge by finding, acquiring and exploiting new inventions when possible. The IFOI is operated under the firm's governance and has two structures: as a separate department and under any of the following departments: research and development (R&D), strategic business unit (SBU), and the marketing and production department. The IFOI's staff is required to have a very high absorptive capacity that makes them better at knowledge assimilation. In addition, the IFIO is looking after its parent firm's sake; thus, it is assumed that the IFIO favor seekers (parent firms) over solvers (inventors). Finally, according to Shane (2001), established firms tend to license a technology in a prototype stage or maybe in a later stage. It is seldom acquired during early stage inventions. Chief technology officers or advanced technology departments in large companies are examples of IFOI type.

2.3.5.4 Independent Innovation Intermediaries (III)

The independent innovation intermediary (III) is any organization or individual who work independently to facilitate the commercialization of research, either directly or indirectly. In other words, III is working under the independent governance structure, but not under the governance of a university, government, or established firm. Accordingly, III is a for-profit organization and is expected to deal with seekers and solvers in balance. This balance has allowed III to expand their horizon in putting technology push and market pull approaches in the same priorities, which makes them open to any commercialization paths. As a result, they deal with inventions in all stages which range from the early stages to the prototype stages. Moreover, to maintain these balances, III's staff are required to have more than a medium level of absorptive capacity, particularly in the specific field in which they work. On the other hand, compared with the other agents, III has no tendency to be located in any particular location. Moreover, it could be a virtual (see Yet2.com for an example). Consultants offices, angel investors, and venture capital are some examples of III type.

2.4 Innovation Readiness

Innovation intermediaries typically lack useful tools to enable them to predict which inventions will make it to the market successfully (Galbraith et al., 2006, 2007; Heslop et al., 2001; Graettinger

et al., 2002; Rahal & Rabelo, 2006). In other words, innovation intermediaries evaluate the innovation readiness of new inventions in order to select the most promising among them, often due to the limits of funding and resources (Galbraith et al., 2006, 2007; Heslop et al., 2001; Graettinger et al., 2002; Rahal & Rabelo, 2006). Researchers generally agree that evaluating innovation readiness is part of the commercialization process; yet, there is little consensus as to its order in the commercialization process (Lane, 1997; Heslop et al., 2001). Most researchers consider the process of innovation readiness evaluation to be essential for any new inventions (Udell, 1989; Astebro & Gerchak, 2001; Graettinger et al., 2002; Rahal & Rabelo, 2006; Galbraith et al., 2006; Bandarian, 2007a); it filters out non-practical ideas (invention) (Bandarian, 2007a); it offers empirical sources of credibility (Udell, 1989), particularly if done by a third party (innovation intermediaries); it saves time and effort of developers if done early (Bandarian, 2007a); it solves the problem of lacking funding and resources by allocating them to the most promising inventions (Rahal & Rabelo, 2006); it works as a gatekeeper prior to investing in formal patent application (Galbraith et al., 2006); and finally, it helps innovation intermediaries in decision-making for selecting new inventions (Udell, 1989; Astebro & Gerchak, 2001; Graettinger et al., 2002; Rahal & Rabelo, 2006; Galbraith et al., 2006; Bandarian, 2007a). Moreover, it is advised by "the commissioner of [the] U.S. patent and trademark office" (Udell, 1989, p. 157). Astebro and Gerechak (2000) went further by reporting that the value of the information that is offered to inventors by innovation readiness evaluators is very valuable and has a higher value more than the fees and social cost of the evaluation. In contrast, Galbraith et al. (2007) did not count the evaluation of innovation readiness significant, and examined whether experts are capable of accurately assessing future technology success; they found that experts "provide little predictive power" (Galbraith et al., 2007, p. 1).

Innovation readiness evaluation is used for many purposes: as part of new product development (Cooper, 1979, 2009), and as part of the commercialization process, among other purposes (Heslop et al., 2001; Astebro & Gerchak, 2001). Thus, the literature on innovation readiness evaluation factors is extracted from several research areas including: 1) commercialization critical success and failure factors (Balachandra & Friar, 1997; Panne et al., 2003), 2) new product development (Cooper, 1979), and 3) technology and commercial readiness and evaluation of new invention (Lane, 1997; Heslop et al., 2001; Graettinger et al., 2002; O'Connor et al., 2002; Renshaw, 2003; Bandarian, 2007).

In addition, the form of innovation readiness evaluation ranges "from formal software tools [...] to informal face-to-face discussions" (Graettinger et al., 2002, p. 8). For example, the 'ProGrid'

program, which seeks to assesses the commercial readiness of technology, is a good example of software tools for innovation readiness evaluation (McCullough, 1998). Moreover, the 'Cloverleaf' model is a checklist for innovation readiness evaluation (Heslop et al., 2001) among many other formal and informal forms. Liao and Witsil (2008) studied many forms of these tools and mapped them to user organizations (e.g., university TTO, angel investors) based on compatibility between user need and tools' characteristics to optimize its benefits.

Udell (1989) reviewed new invention evaluation services and suggested four important attributes that make the innovation readiness evaluation acceptable by both evaluators and inventors. He suggested that innovation readiness evaluation should be: 1) cost-effective evaluations, 2) workable even with little data, 3) providing feedback to inventors, and 4) replicable in its results (Udell, 1989). He emphasized that innovation readiness evaluation has two important aspects to its value: first, the evaluation report, and second, its explanation, which helps inventors understand the strengths and weaknesses of their inventions (Udell, 1989). In addition, Balanchandra and Friar (1997) argued that one general evaluation is unlikely to fit all types of innovation; thus, they suggested developing different models for different types of innovation based on context and situation. That suggestion sheds more light on the importance of back-and-forth discussion between evaluators and inventors in building robust evidence and evolving a customized local evaluation tools.

A limited amount of literature has discussed innovation readiness evaluation for the purpose of commercialization, particularly for research results (invention) commercialization. In this study context, researchers shed light on questions such as how, who, when, what and why to study innovation readiness evaluation. For example, many authors highlighted who can do the evaluation: Lane (1997) stated that innovation intermediaries are among those who do the evaluation; Udell (1989) added that they should be trained and should possess expertise relevant to the evaluated technology; Bandarian (2007a) added that developers are not good evaluators of their own inventions. He also suggested “evaluation methods ranging from intuitive judgment to complex options models [...] expressed in score, index, or monetary value” (p. 76). He added that a scoring model is used widely but the evaluation tends to be subjective (Bandarian, 2007b).

Heslop et al. (2001) introduced “The Cloverleaf Model of Technology Transfer” (p. 369) – one of the very important scoring tools in the field – which consists of 54 factors and 4 main categories: market, technology, commercial, and management. Heslop et al. (2001) used data from Canadian and U.S. technology transfer offices and government laboratories and found that ten out of fourteen U.S.

offices and nine out of sixteen Canadian offices use either formal checklists or invention disclosure forms as a tool for innovation readiness evaluation. They added that, “technology transfer professionals [...] relied heavily on their 'gut feeling'” (p. 373). Astebro and Gerchak (2000) studied the Canadian Innovation Centre's (CIC) tool, called the ‘Inventors Assistance Program’ (IAP), which was used for innovation readiness evaluation. It included 37 different criteria under four categories: technical, production, market and risk (Astebro & Gerchak, 2000). Later, Astebro (2004) suggested four categories – market, technology, environment, and organization characteristics – which were in consensus with the categories suggested by Balanchandra and Friar (1997) and Panne et al. (2003) earlier. Rahal and Rabelo (2006) identified 43 determinants of successful commercialization that fell into five main categories: institutional, inventor, technology, market, and intellectual property determinants.

In this study, categories suggested by Balanchandra and Friar (1997), Panne et al. (2003) and Astebro (2004) are adopted with minor modifications; namely, the first category used was 'technology' and the next two categories (environment and market) were combined into one category ('market'), while using 'entrepreneurs and new business venture' instead of ‘organization’. In sum, innovation readiness evaluation aims to evaluate a new invention’s potential readiness for commercialization based on four main categories: technology readiness, market readiness, entrepreneurial readiness and new business venture readiness as explained in the next sections. Nevertheless, this study considers innovation readiness evaluation for research results (invention) (Section 2.1), which is performed during the early stage of technology (invention) life, and is done by innovation intermediaries as described in Section 2.3.

2.4.1 Technology Readiness

Technology readiness is the degree to which a new technology possesses characteristics and factors that facilitate its move toward market (commercialization). There is a lack of literature on technology readiness evaluation in the context of this study; however, there is some research on commercialization critical success and failure factors (Bandarian, 2007a; Panne et al., 2003), research on new product success and failure (Copper, 1979, 2009; Balachandra & Friar, 1997), and a limited research on innovation readiness (Heslop et al., 2001; Rahal & Rabelo, 2006; Bandarian, 2007b) provide many of characteristics and factors that are used in technology readiness evaluation. In this study, factors and determinants that have been suggested repeatedly by different studies and have

high rank are reported; moreover, these factors are as reported from the perspective of innovation intermediaries.

NASA and other United States government agencies use technology readiness level (TRL) (Graettinger et al., 2002), which consists of nine levels (see Appendix D) (Graettinger et al., 2002), to assess the maturity of new technology. Level one, the lowest level of technology readiness, means that the technology is in the stage of its basic principles (scientific research); level nine, the highest level of readiness, means that the technology is in its final form and ready to operate or be used within an application (Graettinger et al., 2002). It is helpful to know what level that specific new technology (invention) is in, as this allows organizations to assess the readiness level of new technology in order to incorporate it into a system; however, this is insufficient to be able to decide in advance if it is ready for commercialization. Shane (2002) suggested that in practice, inventions are mostly commercialized at their early stages (levels 1 to 5).

In fact, researchers studied success and failure factors for commercialization and new products to use them in the assessment of new technology. For example, Balanchandra and Friar (1997) and Panne et al. (2003) reviewed the literature on new products and innovative projects respectively, and suggested many factors that could lead to success: technology complexity, superiority, uniqueness, patentability, and whether it is technology push or market pull, among other factors. Moreover, Cooper (1979, 1993, 2009), among many other studies, discussed the new product success and failure factors for products developed internally in a corporation. He suggested that a technology's sophisticated, uniqueness, superiority, and patentability are among its success factors. O'Connor et al. (2002) stated that technology reliability should be part of readiness evaluation. In addition, Heslop et al. (2001) introduced a tool for innovation readiness evaluation, where technology readiness evaluation is part of that tool; they were in consensus on the above-mentioned factors of technology uniqueness, superiority, and patentability; and they added technology newness and whether it represents a breakthrough technology. They emphasized the importance of making sure that: patent and literature search are complete and clear, no other dominant patents exist, and there are no pending publications. Finally, Rahal et al. (2006), through a literature review, identified determinant factors that influence or impact the commercialization of research; in addition to agreeing with the afore-mentioned studies in suggesting technology uniqueness, superiority, and patentability as success factors, they added the following determinant factors as part of the top 12 factors were concluded in

their study: technical feasibility, sustainable competitive advantage, and significant identifiable and quantifiable benefits.

In sum, evaluating the factors as in Table 2-5 should help innovation intermediaries in judging whether a specific technology is ready for commercialization as part of the comprehensive innovation readiness evaluation. In the next section, the second component of innovation readiness evaluation – market readiness – is discussed.

2.4.2 Market Readiness

Another main category in innovation readiness evaluation is market readiness. It is based "on the identification and assessment of market demand for the [commercialized] technology," (Bandarian, 2007a, p. 79) which in turn is a result of the market, perception, and economic evaluation of that targeted technology (Bandarian, 2007a). According to Friar and Balachandra (1999), defining the market for a new technology is difficult and falls into one of four categories (see Figure 2-3): 1) targeting new customers with an existing application (diffusion); 2) (substituting) or replacing what customers already have; 3) evolving new application for existing customers to solve a problem (expansion); and 4) creating a novel product for unknown customers (creation). The authors added that targeting the wrong opportunity (market) is among the main reasons for failure in commercialization. In addition, Schrage (2005) suggested that the success of an invention in the real marketplace is derived not by entrepreneurs alone but by customers and entrepreneurs together.

Figure 2-3 The Product-Market Options (Adopted from Corkindale, 2010)

Applications	Markets: Existing	Markets: New
Existing	Substitute	Diffusion
New	Expansion	Creation

Table 2-5 Summary of Factors as Suggested by Different Studies

Factors	Studies that suggested, ranked and reported success factors						
Technology Readiness Factors	Udell (1989)	Balachandra & Friar (1997)	Heslop et al. (2001)	O'Conner et al. (2002)	Panne et al. (2003)	Rahal et al. (2006)	
Technology complexity					√		
Technology superiority	√	√	√		√	√	
Technology uniqueness	√		√		√	√	
Technology patentability (Patent and literature search are complete and clear, no other dominant patents exist, there are no pending publications)		√	√	√		√	
Technology push	√	√			√		
Market pull	√	√			√	√	
Technology is sophisticated and reliable			√	√			
Technology newness			√		√		
Technical feasibility		√	√			√	
Significant identifiable and quantifiable benefits			√			√	
Existence of competitor (s)	√	√		√	√		
Market Readiness Factors							
Strength of market	√	√	√	√	√	√	
Customer perception	√			√	√		
Growth of the market	√	√	√	√	√	√	
Speed to market		√	√		√	√	
Clear identification of the market and its benefits	√		√	√	√	√	
Access to venture capital			√		√		
Government funding	√		√				
Expected value of ROI	√		√	√	√		
Identifying buyers or customers for the new technology		√	√				
Entrepreneurs' Readiness Factors							
Inventors' commercialization skills and experience			√		√		
Inventors' management capabilities		√	√				
Inventors' credibility and recognition			√				
Inventors' involvement as team players			√				
Having realistic expectations			√				

Demonstrating the above complexity in identifying the market for a new technology, researchers tend to evaluate the market readiness for new inventions based on several factors. These factors are suggested by a literature review of critical success factors of commercialization and new products in addition to the scant literature on market readiness in the context of this study. Balanchandra and Friar (1997) concluded that strength of market, customers' perception, growth of the market, and speed to market are important factors to success in new product innovation. Heslop et al. (2001) were in consensus with the elements suggested by Balanchandra and Friar (1997); nevertheless, they added that clear identification of the market and its benefits in addition to related financial (economic) aspects, such as access to venture capital or government funding, expected value of ROI, and identifying buyers or customers for the new technology are important information for evaluators to assess market readiness. Rahal and Rabelo (2006) added that size of potential market and absence of dominant competitors are important determinants of commercialization. Finally, many other authors agreed with the suggestion that the above factors are among the most important factors in assessing the potential commercial and market value of new technology (Udell, 1989; O'Conner et al., 2002; Panne et al., 2003). In the next section, entrepreneurs' readiness is highlighted.

2.4.3 Entrepreneurs' Readiness

Although technology and market readiness are introduced first, if an entrepreneur is unable to move the new invention (technology) to the market, then the commercialization will fail (Balachandra & Friar, 1997). Entrepreneurs are either inventors (individual or team) who start up a new company to commercialize a specific invention, or a combination of inventors (licensor) and recipient firms (licensees). Jensen and Thursby (2001) found that almost three-quarters of new inventions require the continuous involvement of inventors (researchers) to succeed. Inventors' and organizations' characteristics, skills and relationships are very critical factors in the successful commercialization of new inventions. However, in this section, more attention will be paid to the factors and determinants of inventors, entrepreneurs and management team. Next section discusses organizations' characteristics in terms of new business venture.

In contrast to the former two categories – technology and market readiness – literature on critical success factors of new products did not discuss entrepreneurs' (inventors') readiness. On the other hand, factors are collected from scattered literature on commercialization and limited articles on innovation readiness. For example, recall that Hoye and Pries (2009) surveyed 172 faculty members

from a major Canadian university and found that "12% of the faculty who are repeat-commercializers account for 80% of the commercialized innovations" (p. 682). That emphasized the importance of inventors' commercialization experience. In addition, Heslop et al. (2001) suggested that inventors' commercialization skills and experience, management capabilities, and credibility and recognition are the main factors in assessing entrepreneur's readiness for inventors. Moreover, Rahal and Rabelo (2006) were in complete consensus with the factors suggested by Heslop et al. (2001); nevertheless, both articles emphasized the importance of inventors' involvement as team players and having realistic expectations in regard to successful commercialization of the new invention.

In sum, although researchers used different words to express similar factors, Table 2-5 summarizes factors of main categories as many investigators have suggested them.

2.4.4 New Business Venture Readiness

Table 2-6 Summary of New Business Venture Factors as Suggested by Different Studies

Factors	Studies that suggested, ranked, and reported factors				
New Business Venture Readiness Factors	Abetti (2004)	Balanchandra & Friar (1997)	Heslop et al. (2001)	O'Conner et al. (2002)	Åstebro & Michela (2005)
Quality of draft of business plan	√	√		√	
Emphasis on international markets	√				
Potential growth	√	√	√	√	
Technology foundation of the new business venture	√	√	√		√
Potential Return on Investment (ROI)		√	√	√	√
Potential commitment to research and development		√	√	√	√
Potential contribution to community and region					√

Many innovation intermediaries assess the innovation readiness of new business ventures in order to provide services to them. The probability for potential success or failure of a new business venture

is assessed through one or more stages of evaluation (Zacharakis & Meyer, 2000). Incubators, accelerators, consultants, angel investors, and venture capital agents are among the innovation intermediaries who conduct these assessments. Their screening ranges from a conservative assessing of a new business venture to the extent of having almost no criteria (Abetti, 2004). Nevertheless, some IIs start the assessment by initial screening[8] followed by due diligence for those who pass the initial screening (Zacharakis & Meyer, 2000). For example, many incubators have a strict selection process to ensure the quality of the accepted tenants (Abetti, 2004); as well, the success of many of the new business ventures that are backed by venture capital is partially attributed to venture capital's rigorous screening and due diligence process (Zacharakis & Meyer, 2000). However, researchers emphasize that new business venture readiness overlaps with other constructs of technology as well as market and entrepreneur readiness, and assert that new business venture readiness should be practical within the available information (Abetti, 2004). Although there are many criteria to evaluate new business venture readiness which vary from one II to another, Table 2-6 provides a list of the common criteria for new business venture readiness as extracted from many studies.

2.5 Best Practices for Innovation Intermediaries

Best practice is defined as a process/method/technique that is consistently evident to be the most efficient and effective toward performing and achieving the wanted result (Bergek & Norrman, 2008). Simply stated, a best practice takes the right actions correctly (Mosselman et al., 2004). Many studies associate best practices with a benchmarking concept, where the latter describes the former (Camp, 1989). Spendolini (1992) defines benchmarking as "a continuous and systematic process for evaluating the products, services, and work processes of organizations that are recognized as representing the best practices for the purpose of organizational improvement" (p. 9). Benchmarking may be performed internally within the organization, externally against competitors/peers, and/or externally to any existing best practice (Spendolini, 1992; Yasin, 2002; Abetti, 2004; Wolpert, 2002). However, researchers recommend the use of 'intelligent benchmarking', and warn against the traps of 'casual benchmarking'[9] (Pfeffer & Sutton, 2006a; Lundvall & Tomlinson, 2001; Polt et al., 2001). The latter occurs when any organization benchmarks itself to another organization that has different goals, or operates in a different environment. According to Pfeffer and Sutton (2006a), some best

[8] Typically, initial screening is a review of the business model (Zacharakis & Meyer, 2000).
[9] It is also called 'naive benchmarking'.

practices "that help one organization can damage another" (p. 7); as well, Lundvall and Tomlinson (2001) suggest that "what is best practice in one country or region will not be best practice in another" (p. 122). Therefore, 'intelligent benchmarking' is recommended, and can be achieved by developing best practices "through learning by comparing" (Lundvall & Tomlinson, 2001, p. 122).

On the other hand, researchers and practitioners tend to identify and apply best practices in order to achieve better performance with less failure or difficulty; that in turn enhances their organizations' situation of continuing to receive subsidies and support from their main stakeholders (e.g. government and financiers among others) (Lalkaka, 2001). As well, adapting best practices may help an organization become superior to its rivals to the extent of being the best (Abetti, 2004). Moreover, appropriate benchmarking to best practice helps in identifying an organization's gap that must be closed in order to catch up with the leader (Abetti, 2004). Abetti (2004) stated that "the significance of these best practices for the future is obvious: if all incubators learn from each other and adopt the best practices, adapted as necessary, this will raise the added value of all the incubators in the region for their clients and for society and their prestige among peers worldwide" (p. 34).

Nevertheless, best practice is identified through various approaches and based on diverse factors; for example, some researchers pursue organizations with the highest performance for the purpose of identifying best practices (Polt et al., 2001). Others expand their criteria to include various factors (e.g. location, culture, goals, and structure) rather than performance, and accordingly use quantitative measurement for comparison (Bergek & Norrman, 2008; McAdam, Keogh, Galbraith, & Laurie, 2005; Voisey, Gornall, Jones, & Thomas, 2006). On the other hand, some researchers use case study to explore best practices (Voisey, Gornall, Jones, & Thomas, 2006; Lalkaka, 2001), while others survey large N samples (Souder, Nashar, & Padmanabhan, 1990). As well, some researchers attempt to identify the right actions that are needed for best practices (Bergek & Norrman, 2008), while others explore how best practices should occur. These approaches are rarely combined. Finally, as discussed below, best practices are disseminated as a process, as a list of practices, or as a framework.

Limited studies have been conducted to identify best practices in the context of innovation intermediaries; however, most studies have been limited to a particular type of innovation intermediary. For example, Souder et al. (1990) studied the technology transfer process in general, and analyzed the input from panels of 40 successful technology transfer programs. As a result, a list of best practices was reported for each of the four stages that compromise the technology transfer process. Best practices for each stage describe what should be done as essential, important, or

optional (Souder et al., 1990). Ab Aziz, Harris, and Norhashim (2011) conducted an investigation of the top commercialization producer among Malaysian universities. Their study focused on "strategic orientation, structure and key initiatives employed to enable, drive and enhance the research, development and commercialization by the university" (Aziz et al., 2011, p. 179). Accordingly, a descriptive guideline process was suggested that listed focal aspects. Moreover, Bergek and Norrman (2008) argue that a holistic approach is required in order to identify best practices; thus, a framework is suggested "that can serve as a basis for identifying best practice incubator models and for more rigorous evaluations of incubator performance[10]" (p. 20). The framework uses three components: selection, business support, and mediation (Bergek & Norrman, 2008, p. 20); in other words, the framework stresses that benchmarking should be against the appropriate equivalent organization.

Finally, the process of finding and applying best practices faces several misunderstandings. For instance, some believe that one best practice should fit all (Hackett & Dilts, 2004a; Bergek & Norrman, 2008); however, as discussed at the beginning of this section, this is not true[11] (Pfeffer & Sutton, 2006a; Lundvall & Tomlinson, 2001). As well, researchers tend to simplify the research problem which may lead to leaving some important aspects out of the identified best practices (Polt et al., 2001); consequently, applying the identified best practices will not be as useful as expected. For example, incubators tend to have multiple goals that represent the interest of multiple stakeholders (OECD, 1997). Considering some of these goals while ignoring others when identifying best practices will result in incomplete and possibly misleading best practices (Bergek & Norrman, 2008).

[10] The authors stated that performance should be for the outcomes that are correspondent to an organization's goals.

[11] See also Allen and McCluskey (1990) who stated that "no two incubators are alike" (p. 64).

Chapter 3
Theoretical Background Research Model and Hypotheses

This research explores the question of which innovation intermediary and related strategy enables the success of research commercialization; by focusing on the extent to which the characteristics of innovation intermediaries influence their commercialization path in the context of commercializing research results. The study focuses on innovation intermediaries' operational strategies to show the effect of influences that each II type receives from its stakeholders. The study is based on stakeholder theory and resource dependency theory (both of which are antecedents of stakeholder influence strategy theory). In addition, absorptive capacity theory and models based on the dichotomy of technology push vs. market pull are used to describe parts of this study. This chapter commences by reviewing the above-listed theories, and then discusses a research model based on some of these theories in order to introduce the hypotheses that are proposed for this research.

3.1 Theoretical Background

3.1.1 Stakeholder Theory

A 'stakeholder' is normally defined as "any group or individual who can affect or is affected by the achievement of a organization's objectives" (Freeman, 1984, p. 46). This definition is very broad (see Maio, 2003). To narrow it down, Clarkson (1995) suggested two types of stakeholders: primary and secondary. The former are those who are vital for the survival of the organization, while the latter are stakeholders who are not. On the other hand, Goodpastor (1991) suggested two types of stakeholders: strategic stakeholders (i.e. those who can influence an organization), and moral stakeholders (i.e. those who are influenced by an organization).

Freeman (1984) used the word 'stakeholder' instead of 'stockholder' to reflect the importance of balancing the interest of all stakeholders (as in the definition above) as opposed to only favoring the stockholders. He calls for strategic management based on the balance that will maintain support and satisfaction for each stakeholder. By calling for this, Freeman (1984) is contrary to the view that some shareholders should have more privilege than other stakeholders (Orts & Strudler, 2002).

According to Donaldson and Preston (1995), there are three approaches of stakeholder theory: normative, descriptive and instrumental. In a later descriptive stakeholder theory approach Mitchell, Agle and Wood (1997) suggested three attributes that serves as indicators of a stakeholder's importance: power, legitimacy, and urgency. Power is the extent of the stakeholder's ability to push the organization toward his will; legitimacy is the organization's "perception of the stakeholders' actions as desirable, proper, or appropriate" (McAdam, Miller, McAdam & Teague, 2012, p. 59); and urgency is the extent to which stakeholders call for immediate action of high priority. Nevertheless, Mitchell et al. (1997) stated that power, legitimacy, and urgency are dynamic variables. In other words, each stakeholder will, at different times, have and lack these attributes. Nevertheless, they added that these attributes are socially constructed, and thus depend on how the organization perceives them (Mitchell et al., 1997).

Table 3-1 Stakeholders Degree of Having Attributes

Relationship types	Stakeholders degree of having attributes		
	Power	Legitimacy	Urgency
Definite	O	O	O
Dependent		O	O
Dangerous	O		O
Dominant	O	O	
Demanding		O	O
Discretionary		O	
Dormant	O		

Note: Information adopted from Mitchell et al. (1997)

These three attributes are used to assess the importance of stakeholders to the organizational management (Mitchell et al., 1997). Accordingly, Mitchell et al. (1997) suggested seven relationship types between organizational management and stakeholders; these relationship types connect organizational management's attention to the degree to which stakeholders possess a combination of the three attributes – power, legitimacy and urgency (see Table 3-1).

On the other hand, stakeholders may have different interests to such an extent that they contradict each other's interests or run contrary to the organization's goals. As a result, conflicts are inevitable

unless intervention is applied by organizational management to balancing stakeholders' interest. Toward that goal, organizational management needs to identify its stakeholder's degree of importance; in addition, organizational management needs to be aware of strategies that stakeholders have and to act accordingly. This awareness of stakeholders' strategies and the perceived importance of each stakeholder serve as tools to inform the organization's management in regard to decisions about balancing and allocating their limited resources and time amongst their stakeholders. The former was addressed by Mitchell et al. (1997), who suggested the aforementioned three attributes of power, legitimacy and urgency as ways to assess the importance of stakeholders to the organizational management; while the latter was not addressed by stakeholder theory alone, a combination of resource dependency theory with stakeholder theory brings forth a tool to address the second concern, as discussed in next sections.

3.1.2 Resource Dependency Theory

Resource dependency theory (RDT) is used often in "organizational theory and strategic management" (Hillman, Withers, & Collins, 2009, p.1404). It was introduced by Pfeffer and Salancik (1978), who state that "to understand the behavior of an organization you must understand the context of that behavior (...) that is, the ecology of the organization" (p. 1). Pfeffer and Salancik (1978) notice that: 1) organizations consist of internal and external stakeholders, 2) an environment's resources are limited to the point of being scarce, and 3) organizations seek to acquire and control these limited resources to reduce the organization's dependence on others and to increase others' dependence on the organization. Urnich and Barney (1984) suggested that power is achieved by controlling resources. Thus, Pfeffer and Salancik (1978) concluded that organizations attempt to reduce the power that external stakeholders have over them in order to become independent, and they may seek to increase their power over others by controlling and acquiring the required resources. In sum, "organizations are constrained and affected by their environments and that they act to attempt to manage resource dependencies" (Pfeffer & Salancik, 2003, p. xxiii).

In 2009, Hillman et al. reviewed RDT-related development research, empirical research and applications and found that the structure suggested by Pfeffer and Salancik (1978) is useful. It comprised five options for minimizing environmental dependencies for firms: mergers / vertical

integration; joint ventures (JVs) and other inter-organizational relationships; boards of directors; political action; and executive succession. The RDT political action branch is the branch most related to this study, in that it discusses organizational dependency on government among many other related issues (Hillman et al., 2009). For example, Meznar and Nigh (1995) found a correlation between organization tendency toward political activity and organization dependency on government. On the other hand, Hillman et al. (2009) stated:

> *Although the general statement that "firms are dependent upon the government, therefore they will engage in corporate political action" has taken on almost a truism status and is often accompanied by a citation to Pfeffer and Salancik (1978), not much of the work in this area has invoked RDT in a meaningful way. (p. 1412)*

Finally, resource dependency theory 'RDT' suggested that organizations' are somehow influenced by their dependency on external entity (e.g. stakeholder); however, the theory did not address the question of what type of influence and to what extent.

3.1.3 Stakeholder Influence Strategy Theory

Combining the aforementioned theories (i.e., stakeholder theory and resource dependency theory), Frooman (1999) suggested stakeholder influence strategy theory (SIST), in which he concluded that the balance of power in an organization-stakeholder relationship would determine the stakeholders' influence strategies. Accordingly, he suggested that there are four types of organization-stakeholder resource relationships that match with the four strategies that stakeholders use to influence an organization's strategy.

Frooman (1999) based his theory on "the resource dimension of a relationship and the power that stems from it" (p. 192). He indicated that the power attribute suggested by Mitchell et al. (1997) is for the stakeholder's degree of importance, while the power in the RDT is for the relation between an organization and its stakeholders. Frooman (1999) suggested two types of influence strategies that stakeholders could use over the focal organization depending on their power to control the flow of resources going to the focal organization: 1) control of resources and 2) influence on pathways. The former offers two options: withholding strategy and usage strategy. The latter also has two options: direct strategy and indirect strategy. A withholding strategy means that the stakeholder pushes the

organization to do or stop a certain behavior; otherwise, the resource flow will stop completely (Frooman, 1999). A usage strategy means that the "stakeholder continues to supply a resource but with strings attached" (Frooman, 1999, p. 197). On the other hand, the difference between direct and indirect strategies is that the former is applied by the stakeholder himself while the latter could be applied through formal or informal groups of stakeholders or third parties (i.e., another stakeholder) (Frooman, 1999).

Ultimately, Frooman (1999) suggested four strategies that stakeholders use to influence an organization which match with the four organization-stakeholder relationship types: 1) indirect withholding in cases of low interdependence between the organization and the stakeholder; 2) direct usage in cases of high interdependence between the organization and the stakeholder; 3) indirect usage in cases where the organization has power over the stakeholder; and 4) direct withholding in cases where that stakeholder has power over the organization (See Table 3-2).

In sum, SIST addresses how stakeholders use the power of resources' dependency to influence a focal organization; however, it does not address what kind(s) of response that organization could use in facing each of these strategies, and to what extent that response affects its strategy and performance.

Table 3-2 Typology of Stakeholder Influence Strategies

Is the organization dependent on the stakeholder?		Is the stakeholder dependent on the organization?	
		No	Yes
	No	Indirect/withholding (low interdependence)	Indirect/usage (organization power)
	Yes	Direct/withholding (stakeholder power)	Direct/usage (high interdependent)

Note: adopted from (Frooman, 1999)

3.1.4 Absorptive Capacity

The concept of absorptive capacity was introduced by Cohen and Levinthal (1990) as a key driver of an organization's competitive advantage. They defined 'absorptive capacity' as "the ability of [an organization] to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128). Later, Mowery and Oxley (1995) and Kim (1998) redefined the concept by emphasizing the skills of human capital and the organization's ability to learn and solve problem, respectively, as the concept's main constructs. Zahra and George (2002), in a reconceptualization review, considered the aforementioned definitions and accordingly defined absorptive capacity as "a set of organizational routines and strategic processes by which [organizations] acquire, assimilate, transform, and exploit knowledge for purpose of value creation" (p. 198).

The four dimensions highlighted by the definition of Zahra and George (2002) are "distinct but complementary" (p. 189). 'Knowledge acquisition' refers to an organization's ability to find and gather the knowledge that is important for its operations (Zahra & George, 2002). Knowledge assimilation is the organizations' "routine and processes that allow it to analyze, process, interpret, and understand" the external acquired knowledge (p. 189). By acquiring and assimilating external knowledge, an organization will potentially be able to exploit it; thus, Zahra and George (2002) called these two constructs (i.e., acquisition and assimilation) the 'organizational potential absorptive capacity'. Nevertheless, they called the other two constructs (i.e., transformation and exploitation) the 'organizational realized absorptive capacity'. It refers to an organization's ability to transform and exploit its potential absorptive capacity (Zahra & George, 2002). Transformation of knowledge is an organization's ability to facilitate the process of combining internal and acquired (i.e., external) knowledge. Moreover, knowledge exploitation is the ability to operationalize this transformed knowledge and make use of it commercially (Zahra & George, 2002).

According to Zahra and George (2002), potential absorptive capacity and realized absorptive capacity are the main constructs of absorptive capacity and are complementary; where an organization cannot benefit from the former if it lacks the capabilities to transform and exploit it; and the latter will not be useful if the organization has little or no knowledge to transform and exploit it (Zahra & George, 2002). The authors called the ratio of the latter to the former the "efficiency factor (η)", which indicates an organization's efficiency in creating value out of its knowledge.

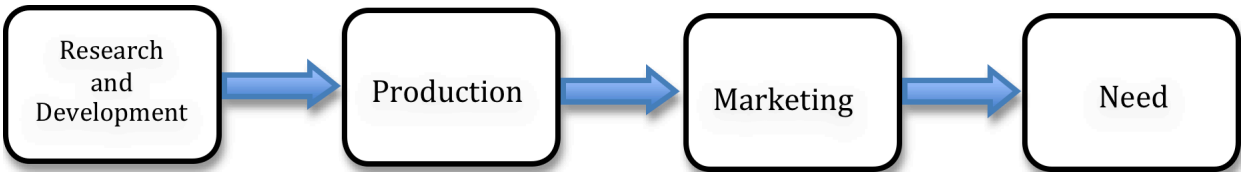
Importantly, researchers have emphasized that prior related knowledge that is hold by an organization's individual members, as well, employees' skill and education, both cumulatively represent an organization's absorptive capacity (Cohen & Levinthal, 1990; Zahra & George, 2002).

Finally, literature proposes several measurements for an organization's absorptive capacity. For example, Cohen and Levinthal (1990) and Veugelers (1997) suggested measuring the existence of fully staffed R&D and its intensity, while Mowery and Oxley (1995) and Keller (1996) emphasized the measurement of human capital and its role in acquiring, assimilating, transforming, and exploiting knowledge. Thus, they suggested an organization's number of employees, their education, their skills, and their training intensity as dimensions for measuring an organization's absorptive capacity. Recently, Flatten et al. (2011) and Brettel, Greeve, and Flatten (2011) developed and validated a multidimensional scale to measure the aforementioned four constructs that comprise the absorptive capacity; more detail about this scale is in Chapter 4.

3.1.5 Technology Push and Market Pull

Technology push (TP) and market pull (MP) are "fundamentally different models of development and diffusion of technological innovations" (Drury & Farhoomand, 1999, p. 8). According to Chau and Tam (2000), the concept was introduced by Schon (1967) in his book 'Technology and Social Change', which introduced TP and MP as driving forces for new technology innovation. The concepts of TP and MP, however, are the subject of debate in a wide range of literature, particularly in the literature on product innovation and diffusion of technology (Munro & Noori, 1988). The debate regards the question of whether innovation is driven by the former or the latter. Nevertheless, the debate is inconclusive (Chidamber & Kon, 1994).

Figure 3-1 Technology Push Approach

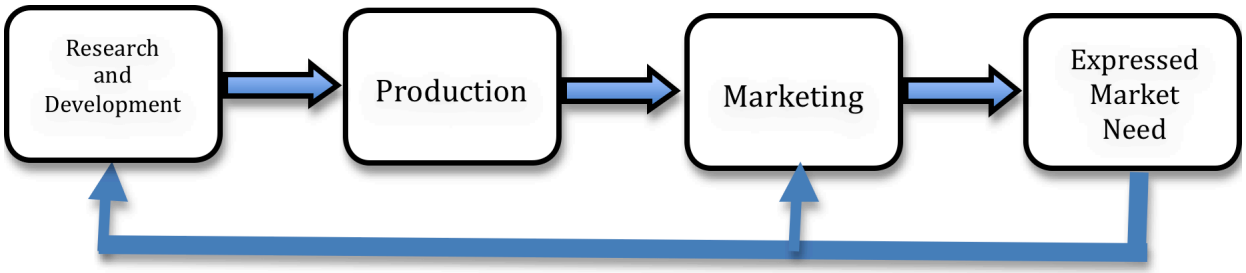


Note: adopted from (Martin, 1994)

'Technology push' is when innovation (i.e., technology) generates a market demand. This approach suggests that scientific discovery is the driving force for innovation, which (i.e., scientific discovery) triggers a chain of events toward diffusion or application (Munro & Noori, 1988) (see Figure 3-1). The key impetus for TP is by recognizing the potential of the new technology to enhance performance (Chau & Tam, 2000), which could lead to competitive advantages (Porter & Millar, 1985). As a result, Munro and Noori (1988) describe this force of potential benefits as tending "to be more opportunistic than defensive in nature" (p. 63). Moreover, Souder (1989) suggested TP as an effective strategy for marketing radical technology.

On the other hand, MP is opposite to TP in that the market need (demand) is the key impetus behind the adoption of new technology. According to Munro and Noori (1988), the MP approach was proposed first by Langrish et al. (1972) as an alternative to TP. MP starts from the buyer (consumer) as a pressure on the producer, who will follow the same linear chain as in TP with the aim to satisfy that market need (see Figure 3-2). For example, Munro and Noori (1988) suggested that market need is generated by performance deficiencies or market opportunities, where the former is a defensive mode and the latter is more opportunistic. Although many researchers are oriented toward to be TP, other groups see the MP as a more dominant approach (e.g., Langrish et al., 1972). For example, Meyers and Marquis (1969) examined organization's innovation and found that more than 70% are MP-oriented. Moreover, Zmud (1984) suggested that commercial success of an innovation is associated more with MP more than with TP.

Figure 3-2 Market Pull Approach



Note: adopted from (Martin, 1994)

Although each approach has its proponents, there are some researchers who see innovation as succeeding when both approaches are considered simultaneously (Fischer, 1980). For example,

Munro and Noori (1988) suggested that integration of both technology push and market pull could lead to more success in innovation.

Finally, in a study investigating organization's reaction to technology push and market pull in the IT context, Dury and Farhoomand (1999) concluded that "different management strategies and practices are required" (p. 3). In other words, the management strategy will be varied based on the approach that is followed by the focal organization.

3.2 Research Model and Hypotheses

In the context of commercializing research results, this study attempts to answer, at least in a preliminary way, the question of which innovation intermediary and according strategy enables the success of research commercialization (see Section 1.2).

Notably, the literature on the commercialization of research aims to address and theorize both formal and informal commercialization, yet little attention is given to informal commercialization. For example, Grimpe and Fier (2010) state:

> *Existing literature has confined university technology transfer almost exclusively to formal mechanisms (...) Relatively little is known about informal technology transfer that is based upon interactions between university scientists and industry personnel. Moreover, most studies are limited to the United States, where the Bayh-Dole Act has shaped the institutional environment since 1980. (p. 637)*

Siegel (2003b) confirmed the existence of the informal commercialization path by stating: "firms may contact the scientist and arrange to work with him/her and engage in informal commercialization and knowledge transfer" (p. 126) (see also Markman et al., 2008).

In this study, it is assumed that commercialization of research is achieved through four types of innovation intermediaries:

1. University technology transfer offices (UTTO)
2. Community business incubators/accelerators (CBI)
3. Industry facilitators of open innovation (IFOI)

4. Independent innovation intermediaries (III)

To a great extent, these four innovation intermediaries cover both formal and informal commercialization of research results, which address part of the researchers' concerns. The first two intermediaries have received an extensive amount of attention in research, whereas the last two, to our knowledge, have received very little or no attention in the context of research results commercialization.

As demonstrated in Section 2.3.4, each agent (innovation intermediary) has distinguishing characteristics. Thus, in its exploratory stage this study looks through various lenses to compare and contrast the aforementioned types of innovation intermediaries. In particular, this study explores innovation intermediaries through stakeholders' lens, absorptive capacity lens, and business orientation lens (technology push vs. market pull) (see the exploratory model in Appendix E).

Selecting the above three lenses above other potential characteristics/lenses does not mean that other characteristics/lenses have no influence or are unimportant. Nevertheless, according to the literature, it is expected that these selected lenses have a role in influencing II's strategy (Frooman, 1999; Dury & Farhoomand, 1999; Cohen & Levinthal, 1990; Zahra & George, 2002).

Propositions similar to the hypothesis in this chapter were tested in the exploratory stage. The findings of the exploratory stage suggest that the aforementioned lenses are suitable for comparing and contrasting II types; nevertheless, stakeholder's lens proved more promising than the other two lenses (see Chapter 5 for results and findings of the exploratory stage). However, it was not practical to continue incorporating these three lenses in the confirmatory stage due to limitations in time and resources, and for the sake of parsimony. Thus, a combination of stakeholder's lens and business orientation lens was used to framework the confirmatory stage, with more emphasis on stakeholder's lens, as discussed below.

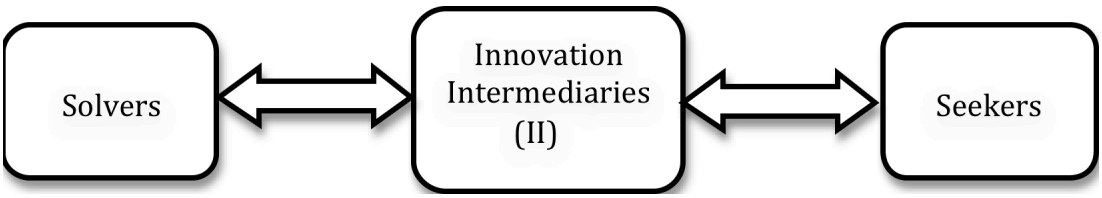
Moreover, through the literature review and as a result of the exploratory study, five main stakeholders were identified: Government, Community, Industry (and/or parent firm), Educational Institution (university, college), and Financiers (funding partners, shareholders) (see Section 5.2.5). Therefore, the following sections rationalize the research model and hypothesis as based on: 1) stakeholder's lens, including stakeholder's salience level, dependency on and by stakeholders, and influence by stakeholders; and 2) a combination of both stakeholder's lens and business orientation

lens in terms of operational strategies, including clients, performance, objectives, commercialization paths, innovation readiness, and practices.

3.2.1 Salience Level of Innovation Intermediaries' Stakeholders

By demonstrating Freeman's (1984) definition of stakeholder, and in considering the aforementioned five main stakeholders, it is interesting to observe that some stakeholders lean more toward one of the commercialization parties[12] than another. For instance, university faculty and researchers are the inventions' suppliers ('solvers'); thus, university as a stakeholder leans more toward solvers, while industries are the inventions' recipients and lean more toward the 'seekers'. In the context of this study, innovation intermediaries play the role of intermediary between solvers and seekers in facilitating the commercialization of research results (Figure 3-3).

Figure 3-3 Commercialization Parties and Innovation Intermediaries



Accordingly, and based on Mitchell, Agle, and Wood (1997), stakeholders possess various levels of power, urgency, and legitimacy attributes. Therefore, perception of II's managers regarding each stakeholder's attributes allows II managers to determine the salient level of each stakeholder.

Each II type has at least one salient stakeholder[13]; thus, we suggest the following:

H1a: UTTO perceives Educational Institution (university, college) as a salient stakeholder.

H1b: IFOI perceives Industry (and/or parent firm) as a salient stakeholder.

H1c: CBI perceives Government as a salient stakeholder.

[12] Solvers and seekers together are called commercialization parties.
[13] The null hypothesis is that each II type has no salient stakeholder (all equal stakeholders).

H1d: III perceives Financiers (funding partners, shareholders) as a salient stakeholder.

H1e: No II type perceives Community as a salient stakeholder.

These variances in perceiving different levels of salience for stakeholders may result in the granting of special favours from innovation intermediaries to their most salient stakeholder(s).

3.2.2 Innovation Intermediaries and Stakeholders Dependency

Goodpastor (1991) suggested that Freeman's (1984) definition of stakeholder implies two types of stakeholders: strategic stakeholders (i.e. those who can influence an organization) and moral stakeholders (i.e. those who are influenced by an organization). In the context of this study, Government, Industry (and/or parent firm), Educational Institution (university, college), and Financiers (funding partners, shareholders) are classified as strategic stakeholders. Frooman (1999) elaborated upon this classification by introducing his "stakeholder influence strategy theory" (see Section 3.1.3 for more details). Frooman (1999) suggested that stakeholders influence an organization by four strategies that match with the four organization-stakeholder dependency relationship types. In the context of this study, organization is any one of the four types of innovation intermediaries, while the aforementioned four stakeholders are the stakeholders who are considered to have power over the innovation intermediaries in particular cases. In order to find the II-stakeholder dependency relationship, the dependency level of each II on each stakeholder and the dependency level of each stakeholder on each II are required. Next, the balance between these dependencies will determine the type of relation between each II and each stakeholder as suggested by Frooman (1999). Nevertheless, each II type has higher dependency on a particular stakeholder; for instance, UTTO works under a university's governance (Swamidass & Vulasa, 2008; Collier, 2008). Thus, UTTO depends on the university more than on any other stakeholder for their main resources. Similar relationships exist between the other types of IIs (CBI, IFOI and III) and the other stakeholders (Government, Industry [and/or parent firm], and Financiers [funding partners, shareholders] respectively).

Each II type is dependent on at least one of its stakeholders[14]; therefore, we suggest the following:

H2a: UTTO is highly dependent on the Educational Institution (university, college) more so than on other stakeholders.

[14] The null hypothesis is that each II type has no dependency on its stakeholders.

H2b: IFOI is highly dependent on the Industry (and/or parent firm) more so than on other stakeholders.

H2c: CBI is highly dependent on the Government more so than on other stakeholders.

H2d: III is highly dependent on the Financiers (funding partners, shareholders) more so than on other stakeholders.

In addition: each II type has at least one of its salient stakeholders who is most dependent[15]; therefore:

H3a: Educational Institution (university, college) is highly dependent on UTTO compared to other stakeholders.

H3b: Industry (and/or parent firm) is highly dependent on IFOI compared to other stakeholders.

H3c: Government is highly dependent on CBI compared to other stakeholders.

H3d: Financiers (funding partners, shareholders) is highly dependent on III compared to other stakeholders.

This leads to the subject of the relation between level of II dependency on salient stakeholder and managers' perception regarding stakeholders' saliency. We suggest:

H4[16]: Level of II dependency on salient stakeholder is positively associated with managers' perception regarding stakeholders' saliency.

3.2.3 Influence Level of Innovation Intermediaries' Stakeholders

After identifying the level of dependency between IIs and stakeholders, and according to Frooman (1999), the balance between these dependencies will determine the type of relation between each II and each stakeholder. In other words, this will determine the type of influence that the focal organization (innovation intermediaries in this study) would receive from its stakeholders. For instance, according to Frooman (1999), stakeholders who have power over the focal innovation intermediaries are in the bottom left corner, as shown in Table 3-3 (i.e. direct/withholding strategy may be applied by that stakeholder to influence the focal innovation intermediaries). Nevertheless,

[15] The null hypothesis is that all salient stakeholders have no dependency on their respective II.
[16] The null hypothesis is that there is no relation between managers' perceptions regarding a particular stakeholder's saliency and the level of II dependency on that particular salient stakeholder.

despite the type of influence strategy, the level of influence by each stakeholder is perceived by innovation intermediaries' manager. This level differs from one stakeholder to another and is expected[17] to be parallel to the relation between II on one hand, with the level of stakeholders' salience and level of dependency on stakeholders on the other hand.

Table 3-3 Typology of Influence Strategies

Are the innovation intermediaries dependent on the stakeholder?	Is the stakeholder dependent on the innovation intermediary?	
	No	Yes
No	Indirect/withholding (low interdependence)	Indirect/usage (organization power)
Yes	Direct/withholding (stakeholder power)	Direct/usage (high interdependent)

Note: adopted from Frooman (1999)

II's salient stakeholder influences II's operational strategies toward its own purposes[18]; therefore:

H5a: Salient stakeholder (Educational Institution [university, college]) influences UTTO strategy more so than other stakeholders.

H5b: Salient stakeholder (Industry [and/or parent firm]) influences IFOI strategy more so than other stakeholders.

H5c: Salient stakeholder (Government) influences CBI strategy more so than other stakeholders.

H5d: Salient stakeholder (Financiers [funding partners, shareholders]) influences III strategy more so than other stakeholders.

In addition: II's dependency on stakeholder influences II's operational strategies in favour of that particular stakeholder[19].

[17] This expectation is based on the findings of the exploratory stage (see Chapter 5).
[18] The null hypothesis is that II's salient stakeholders do not influence their II's operational strategies.

H6a: High dependency of UTTO on Educational Institution (university, college) stakeholder influences UTTO's strategy toward purposes of Educational Institution (university, college) more so than other stakeholders.

H6b: High dependency of IFOI on Industry (and/or parent firm) stakeholder influences IFOI's strategy toward purposes of Industry (and/or parent firm) more so than other stakeholders.

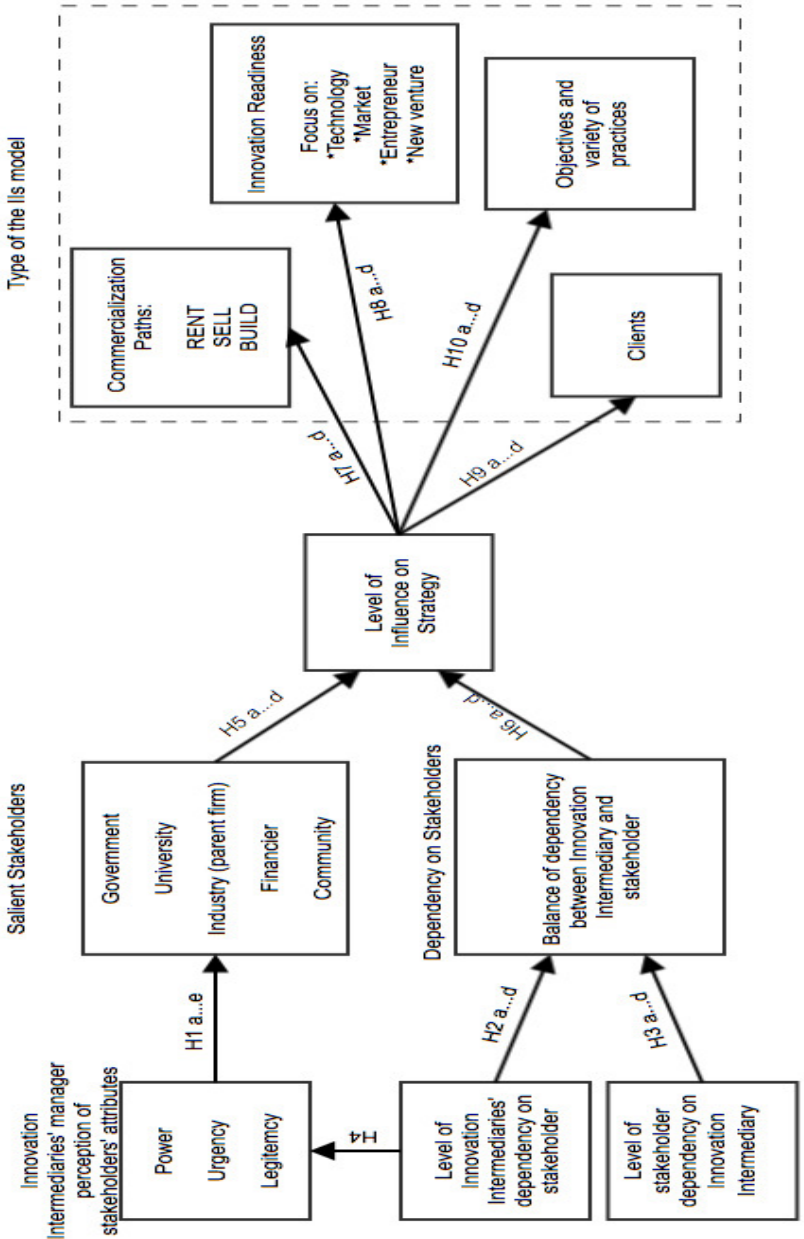
H6c: High dependency of CBI on Government stakeholder influences CBI's strategy toward purposes of Government more so than other stakeholders.

H6d: High dependency of III on Financiers (funding partners, shareholders) stakeholder influences III's strategy toward purposes of Financiers (funding partners, shareholders) more so than other stakeholders.

Moreover, the relation between each II type on one hand, and II's dependency on stakeholders and its stakeholders' salient level on the other hand, is examined to show if a combination of the two variables[20] can explain the influence level better than one of the variables[21].

[19] The null hypothesis is that II's dependency on any stakeholder has no relation to that particular stakeholder's influence on its II's operational strategies.
[20] II's dependency on stakeholders **and** II's stakeholders' salient level
[21] II's dependency on stakeholders **or** II's stakeholders' salient level

Figure 3-4 The Research Model



3.2.4 Innovation Intermediaries' Operational Strategies

The stakeholder lens has been used to hypothesize the relation between innovation intermediaries and the main stakeholders. Moreover, according to Frooman (1999), an organization (innovation intermediary in this study) is influenced by its stakeholder when a dependency relationship exists between both the organization and the stakeholder. The next issue is to understand how this influence by the various stakeholders affects innovation intermediaries' operational strategies (Tankhiwale, 2009)[22]. Selecting a particular commercialization path, having a precise objective, performing a specific practice, dealing with certain clients, and considering particular criteria to select a new invention are among the top[23] operational strategies that innovation intermediaries perform to commercialize research results. Based on the combination of stakeholders lens and business orientation lens, the next subsections present a rational description followed by hypothesizing about how each innovation intermediary type, in terms of its operational strategies, is influenced by stakeholders.

First, let us recall what is meant by business orientation lens in this study. Technology push (TP) and market pull (MP) are both "fundamentally different models of development and diffusion of technological innovations" (Dury & Farhoomand, 1999, p. 8). Commercialization of research results is more complicated than it looks at first glance. It appears that some innovation intermediaries push the technology (invention) toward the market without considering market need; nevertheless, that is only part of the truth. In fact, innovation intermediaries seem to fall on many points between the extremes of technology-push oriented to market-pull oriented. Accordingly, innovation intermediaries' strategy in general, and their commercialization strategy in particular, are influenced by their business strategy orientation (i.e. prioritizing technology-push, market-pull, or a balance between the two) (Dury & Farhoomand, 1999).

3.2.4.1 UTTO's Operational Strategies

As indicated above, university technology transfer offices (UTTO) work under a university's governance (Swamidass & Vulasa, 2008; Collier, 2008) and are dependent on this governance for its

[22] "Tankhiwale (2009) identifies that external pressures from external stakeholders and regulations are often the drivers of business model innovation" (Miller, McAdam, & McAdam, 2014, P.268).
[23] This conclusion is based on the literature review and on the learning that was gained from the exploratory study.

resources. Thus, according to Frooman (1999), UTTO expect to be influenced by Educational Institution (university, college) stakeholder. Nevertheless, in general, Educational Institution (university, college) as stakeholder looks forward to increasing the commercialization success rate and speed; in fact, some universities expect to benefit from wealth created by commercialization. Thus, they encourage UTTO to focus on helping faculty, students, and staff, and to commercialize their technology (research results) more so than any other potential clients. Hence, we anticipate that it is noticeable for UTTO to follows the technology-push strategy, and does not pay as much attention to potential applications or problems that could be solved by this new invention (technology). Researchers on UTTO have noticed this tendency. For example, Swamidass and Vulasa (2008) concluded that marketing and business skills among UTTO staff are poor, and added that UTTO are significantly short on marketing skills for high technology in particular. Siegel et al. (2003) suggested that UTTO should "hire more licensing professionals with stronger marketing and business skills" (p. 45) in order to expand their business strategy orientation. Thus, as a result of being influenced by Educational Institution (university, college) stakeholder, and of being technology-push-oriented, UTTO has a greater focus on technology criteria compared to the other constructs of Innovation Readiness (i.e. market, entrepreneur, and new business venture). Furthermore, UTTO often push the invention toward the market without knowing its real value; consequently, UTTO tend to use 'rent' as their dominant commercialization path, which gives both commercialization parties a second chance for later re-evaluation. Accordingly UTTO's objectives and practices will serve the above described focus scope. Therefore, we suggest that:

UTTO which are characterized as dependent on salient stakeholder (Educational Institution [university, college])

H7a: Are more likely to use 'RENT' as their dominant commercialization path in comparison to the other commercialization paths.

H8a: Are likely to focus more on 'TECHNOLOGY' compared to other constructs of innovation readiness.

H9a: Are likely to serve internal clients (i.e. affiliated clients, students, faculty, and university staff) more than other clients.

H10a: Are more likely to have focused objectives and practices that may be related to patenting and licensing.

3.2.4.2 IFOI's Operational Strategies

Innovation intermediaries which are 'industry facilitators of open innovation' (IFOI) work under the governance of their parent firms, either as a separate department or under any of the following departments: research and development (R&D), strategic business unit (SBU), or marketing and production department (Hofer & Schendel, 1978). Thus, IFOI depends on the parent firm for their main resources. This gives the parent firm power over IFOI. According to Frooman's (1999) theory, this eventually leads the parent firm to influence IFOI strategy. Thus, the parent firm influences IFOI to focus on helping internal inventors and to commercialize their technology (the R&D research results) more than any other potential clients, as well as to find a suitable external invention to be licensed-in and acquired by the parent firm. On the other hand, in most cases IFOI are obviously following the market pull (MP) strategy. IFOI consider satisfying market needs and solving existing problems as a better approach for achieving innovative products. For example, in an examination of organization innovation, Meyers and Marquis (1969) found that more than 70% of firms are MP-oriented. Moreover, Zmud (1984) studied invention commercialization in firms, and suggested that the commercial success of an innovation is associated more with MP than with TP. Thus, IFOI tends to use 'sell' as their dominant commercialization path as a result of being influenced by Industry (and/or parent firm) stakeholder and of being market pull oriented (MP). Additionally, IFOI uses 'sell' because firms look forward to increasing their competitive advantage (Porter, 1985) by acquiring some technology that is difficult to be imitated, and because IFOI know exactly what applications and solutions are needed. This prevents their competitors from having the same technology. As well, IFOI tends to focus on market readiness criteria more so than the other constructs of Innovation Readiness (i.e. technology, entrepreneur, and new business venture). Consequently IFOI's objectives and practices serve the focus scope that is described above. Therefore, we suggest that

IFOIs which are characterized as dependent on salient stakeholder industry (and/or parent firm):

H7b: Are more likely to use 'SELL' as their dominant commercialization path in comparison to the other commercialization paths.

H8b: Are likely to focus more on 'MARKET' compared to other constructs of innovation readiness.

H9b: Are likely to serve internal clients (i.e. affiliated clients, parent firm's employees) more than other clients.

H10b: Are more likely to have focused objectives and practices that may be related to patenting, licensing, and acquiring.

3.2.4.3 CBI's Operational Strategies

Community business incubators/accelerators (CBIs) have less dependency on commercialization parties, and depend neither on solvers nor on seekers. However, CBI generally works under the indirect governance of the government (see Section 2.3.4.2). Thus, CBI depends on government for its main resources, which gives governmental power over CBI that eventually leads the government, according to Frooman's (1999) theory, to influence CBI strategy. Moreover, it is interesting, on the one hand, to notice that the government is counted neither in the solvers' party nor in the seekers' party; on the other hand, it is equally interesting to notice that inventors (solvers) are sometimes the entrepreneurs (seekers) who create startups. Therefore, it is assumed that both solvers and seekers (who are one entity as the 'incubatee') receive similar favours from the CBI. Nevertheless, researchers suggest that commercialization of research results is supported by government as a means to support the national economy – by starting up a new venture (Swamidass & Vulasa, 2008; Peters et al., 2004) – and as a means to create opportunities for new jobs (Chandra & Fealey, 2009; Bergek & Norrman, 2007). Thus, government encourages CBI to focus on helping entrepreneurs to commercialize their invention; yet it does not encourage CBI to be limited to this particular client.

Yet CBI seems to be balanced in its business strategy orientation. Some researchers see an innovation as successful when both approaches are considered simultaneously (Fischer, 1980). For example, Munro and Noori (1988) suggested that integration of both technology push and market pull could lead to more success in innovation. For CBI, in most cases, both commercialization parties are one entity (i.e. incubatees); thus, after communicating with candidate incubatees, CBI possesses a better understanding about an invention's perceived potential (technology push), intended solution, and application (market pull). This dialogue (most often called 'Innovation Readiness' evaluation) allows CBI to decide whether to accept or reject a candidate incubatee in benefitting from its services. Thus, as a result of being influenced by Government stakeholder and of holding a balanced business orientation, CBI tends to have a greater focus on entrepreneur criteria compared to the other constructs of Innovation Readiness (i.e. technology and market). Furthermore, CBI uses 'build' as their dominant commercialization approach to create a suitable environment for the incubatee to transform and exploit its invention toward the intended solution and application that in turn will

satisfy government aspirations. Accordingly, CBI's objectives and practices serve the above described broad scope. Therefore, we suggest that:

CBIs which are characterized as dependent on salient stakeholder (Government):

H7c: Are more likely to use 'BUILD' as their dominant commercialization path in comparison to the other commercialization paths.

H8c: Are likely to focus more on 'ENTREPRENUR' compared to other constructs of innovation readiness.

H9c: Are more likely to serve external clients (i.e. not necessarily affiliated clients).

H10c: Are more likely to have broad objectives and practices that may be related to creating a new business venture.

3.2.4.4 III's Operational Strategies

Independent innovation intermediary (III) is similar to CBI in terms of having little or no dependency on commercialization parties. Thus, III shares many characteristics with CBI. However, III works under the governance of a board that is dominated by financiers (partners, shareholders) stakeholder; as well, III depends mainly on financiers (partners, shareholders) stakeholder. In general, financiers (partners, shareholders) look to maximize profit from the commercialization process, and prefer the path that increases the duration in which both IIs and their clients work together for ongoing knowledge exchange. Thus, it is assumed that III prefers build over other commercialization paths. However, III exists to help any client who can pay for its services.

On the other hand, although III maintains a more balanced strategy orientation that is similar to that of CBI, commercialization parties in the III context may not always represent one entity. Thus, III has preferences to focus on new business venture criteria, with the essential criterion that a client is able to pay for the services. Therefore, we suggest that:

IIIs which are characterized as dependent on the salient stakeholder of financiers (funding partners, shareholders):

H7d: Are more likely to use BUILD as their dominant commercialization path in comparison to the other commercialization paths.

H8d: Are likely to focus more on ‘NEW BUISNESS VENTURE’ compared to other constructs of innovation readiness.

H9d: Are more likely to serve external clients (i.e. not necessarily affiliated clients).

H10d: Are more likely to have broad objectives and practices that may be related to creating a new business venture.

3.3 Conclusion

This chapter introduced the background theories that lay the foundation of this study. In addition, the characteristics of each of the four types of innovation intermediaries are discussed in light of these background theories. Finally, ten hypotheses (each containing four sub-hypotheses) are proposed to examine the influence of the main stakeholders on each type of innovation intermediary, particularly in terms of their operational strategies.

Chapter 4
Methodology

This chapter discusses the methods used to investigate the hypotheses that were introduced in the previous chapter. The study's ultimate goal is to explore and characterize exemplary practices as perceived by innovation intermediaries in terms of how to successfully commercialize an idea or invention resulting from research. The methods are comprised of two main stages. First, exploratory research studies the status quo of innovation intermediaries, investigates certain lenses to differentiate between IIs types, and simultaneously extracts some attributes that can describe the characteristics of innovation intermediaries. This in turn helps in developing and improving scales to measure both independent and dependent variables accurately (see Section 4.1). The second stage tests the validity and reliability of the proposed model and concurrently validates the scale items (see Section 4.2).

In this study, data were collected regarding the perceived role of innovation intermediaries' characteristics from a sample of innovation intermediary organizations; hence, the population of this study is comprised of innovation intermediaries from North America (Canada and USA). That covers the four types of innovation intermediaries, which include university technology transfer offices (UTTOs), community business incubators/accelerators (CBIs), industry facilitators of open innovation (IFOIs), and independent innovation intermediaries (IIIs). In particular, innovation intermediaries' managers and staff (commercialization experts) were asked to answer a questionnaire about the perceived characteristics and behaviours of their organizations in light of the most recent research regarding commercialization. The exploratory stage sample was limited to Ontarian innovation intermediaries.

The following sections discuss the purpose, method, sample, instruments, and analysis tools for each of the two stages of this study.

4.1 Exploratory Stage

As described above, the first stage was an exploratory study to broaden our understanding of innovation intermediaries by investigating various issues. The exploratory stage consisted of two phases of interviews: a telephone and an in-person interview. Each phase has specific goals, as discussed in Section 4.1.2 and Section 4.1.3; as well, both phases target almost the same sample, as discussed in Section 4.1.1. The exploratory study was conducted between October 1st, 2012 and April 25th, 2013.

4.1.1 Sample (Exploratory Stage)

A sample of one innovation intermediary (II) of each proposed type (if possible) in each major city or region within Ontario, Canada, was targeted for the first phase of the exploratory stage. The initial list was identified by the research team through the Ontario Network of Entrepreneurs website (ONE)[24]. This list includes innovation intermediaries who are located in major cities and who are perceived by the research team as fitting into one of the proposed innovation intermediary types. As ten major cities were initially identified, ten innovation intermediaries were identified and invited to participate in the telephone interviews.

In addition to answering a number of questions, these ten participants were asked to nominate IIs who conform to any of the suggested four types, with the condition that they know each other and are located in the same city. Nominated IIs were then reviewed and invited to participate. Thus, 34 IIs from nine cities/regions participated in telephone interviews, and from them, 29 IIs from eight cities who met the criteria[25], were willing to continue with the in-person interview phase. Chief executive officers (CEOs) or upper level managers represented the majority of participants. Table 4-1 summarizes the samples for both the telephone and in-person interviews for each city. This sample represents a significant portion of Ontario's population of innovation intermediaries, particularly for the types UTTO and CBI.

[24] The Ontario Network of Entrepreneurs (ONE) retrieved from http://www.onebusiness.ca/locations?city=&page=5
[25] Qualification was based on a city/region's capacity to have at least two IIs of different types who knew each other and who were willing to participate.

Table 4-1 Samples for Telephone and In-person Interviews for Each City

#	City/Region	Telephone interview				In-person interview			
		UTTO	CBI	IFOI	III	UTTO	CBI	IFOI	III
1	Hamilton	√	√	√	√	√	√	√	√
2	Guelph	√	√	√	√	√	√	√	√
3	Kingston	√	√		√	√	√	√*	√
4	London	√	√						
5	Ottawa	√	√		√√	√	√		√
6	Sudbury								
7	Thunder Bay	√	√		√	√	√		
8	Toronto	√√	√√	√	√	√√	√	√*	√
9	Waterloo	√	√	√	√	√	√	√	√
10	Windsor	√	√	√	√	√	√	√	√
Total Sample		10	10	5	9	9	8	5	7
		34				29			

* This same innovation intermediary was used for both cities. √ Indicates one participant. √√ Indicates two participants from that particular type.

4.1.2 First Phase Interview: A Structured Questionnaire for Eliciting Participants

A questionnaire comprised of 17 semi-structured questions[26] (see Appendix F) was employed through a telephone interview during the first phase of the exploratory study. The purpose of the telephone interview was to identify innovation intermediaries who fell into one of four proposed types of innovation intermediaries and who met specific criteria of being from the same region and knowing one another. The telephone interview also aimed to probe the understanding of various types of innovation intermediaries and their various characteristics by focusing on factual information including demographics, stakeholders, selection criteria, and performance. Furthermore, the interview examined the extent to which practitioners (innovation intermediaries) understand the suggested types of IIs. The average length of each telephone interview was 30 minutes for a sample of 34 innovation intermediaries (as described in Section 4.1.1).

[26] The questionnaire was based on an initial understanding gathered from the existing literature combined with some input from perspectives of published practitioners.

4.1.3 Second Phase Interview: A Structured Questionnaire for Eliciting Constructs

The second phase interview took place in person. These interviews targeted 29 of those who participated in the first phone interviews, particularly those who met the criteria[27] and who were willing to continue with the in-person interview phase. The in-person interviews probed how innovation intermediary experts perceive themselves as belonging to one or more proposed intermediary types, and looked at how innovation intermediary experts view similarities or differences between themselves and other innovation intermediaries in their region. These tasks were accomplished by using semi-structured techniques that identified the different ways in which an expert construes (interprets/gives meaning to) his or her experiences[28]. This process enabled the extraction of the various attributes that describe the characteristics of innovation intermediaries from various lenses: stakeholders, absorptive capacity, and business orientation. This helps in developing and improving some scales to measure both independent and dependent variables accurately; as well, it helps in identifying the most viable lens through which to compare and contrast the different types of innovation intermediaries.

The in-person questionnaire included nine questions, six of which were open-end (see Appendix G). This questionnaire was built based on the underlying theories (Chapter 3) along with the learning from initial analysis of the first phone interviews. Customized software interfaces were built to ensure that the interview process/protocol was smooth and efficient (see Appendix G for some photos).

4.1.3.1 Repertory Grid Technique (RGT)

Repertory grid technique was developed by psychologist George Kelly based on his theory of personal construct psychology (Kelly, 1955). This technique is built on the notion that "individuals act as scientists" (Edwards, McDonald, & Michelle, 2009, p. 586). Thus, individuals interact with their surrounding items and events by constructing, classifying, and modifying these items and events based upon their experience (Kelly, 1955; Wacker, 1981). The RGT aims to understand this process

[27] Qualification was based on a city's or region's capacity to have at least two IIs of different types who knew each other and who were willing to participate.
[28] This methodology, is called repertory grid, was developed by American psychologist George Kelly (Kelly, 1955); more details are presented in Section 4.1.3.1.

by focusing on extracting as much as possible of the constructs that comprise experts' experience of a particular topic (Wilson & Hall, 1998).

RGT includes three main components, called elements, constructs, and links (Tan & Hunter, 2002), and ranges from being designed to extract all of the main components to simply extracting the links (Edwards et al., 2009). In other words, when an individual is asked to identify elements, constructs, and links, this is called a full repertory grid. However, if an individual is supplied with elements and constructs and is asked to evaluate the links, then this is called fixed grid (Edwards et al., 2009). Partial repertory grid is between these extremes when only the elements are provided and the individual is asked to identify the constructs and links (Edwards et al., 2009). Furthermore, elements are the central objects under investigation, while constructs represent the interpretations that participants hold in their minds to compare and contrast the elements in a specific situation. Constructs are normally extracted in bipolar form (i.e. long term profit – short term profit; radical – incremental). Finally, links are the ratings that participants provide to connect elements with constructs.

Researchers tend to use RGT due to its power in extracting knowledge from experts in cases when most traditional direct questions are inefficient (e.g. Hisrich & Jankowicz, 1990). RGT enables researchers to construct a model of how experts perceive events and how they are able to differentiate between items. Much research has indicated that RGT represents a valuable tool for obtaining intuition and personal experience (e.g. Ford et al., 1990). Thus, RGT has been used in many fields including management and business. For example, Diaz De León and Guild (2003) used RGT to identify intangible criteria in assessing business plans; as well, Hisrich and Jankowicz (1990) used RGT to study intuition in venture capital decisions.

The in-person interviews of the exploratory stage of this study used RGT to explore experts' opinions on how to compare and contrast various types of IIs; thus, the partial repertory grid approach was applied as recommended by Edwards et al. (2009). In other words, the elements were provided as the four types of innovation intermediaries, and then participants were asked to compare and contrast among II types through the various lenses of stakeholders, absorptive capacity, and business orientation. Finally, evaluations of links between every element and construct were collected.

There are many methods used to analyze data collected through RGT; however, this study used a combination of quantitative and qualitative analysis, as described below.

4.1.4 Qualitative and Quantitative Analysis

To comprehend the collected data, statistical calculations and content analyses were conducted for the answers to most questions. All statistical analyses were performed using SPSS 21.0 software, while the content analysis was performed manually.

Content analysis is defined by Holsti (1968) as "any technique for making inferences by systematically and objectively identifying characteristics of messages" (p. 603). Essentially, messages are data that are collected from participants (senders) (Berg, 2001). Thus, to understand the sender, it is necessary to analyze his/her messages. Analyses of these messages were performed based on particular dimensions that were predetermined prior to the content analysis (Berg, 2001). These predetermined dimensions of purpose, approaches, sampling, units of analysis, and focus constitute the systematic and objective aspects articulated by Holsti. Therefore, these consistent analysis criteria were expected to eliminate bias that may happen when selecting only material that supports the researcher's hypotheses (Berg, 2001).

Three approaches can be used to perform content analysis: inductive, deductive, or a combination of the two (Elo & Kyngas, 2007). Hsieh and Shannon (2005) describe a very similar concept of these three approaches toward content analysis, though they use different terms. Elo and Kyngas (2007) distinguish between inductive and deductive approaches as follows:

> *Inductive content analysis is used in cases where there are no previous studies dealing with the phenomenon or when it is fragmented. A deductive approach is useful if the general aim was to test a previous theory in a different situation or to compare categories at different time periods (p. 107).*

On the other hand, various statistical methods were performed to analyze the quantitative part of the collected data. In particular, Chi-square, Exact Fisher Test, and ANOVA were utilized to examine if there were any significant differences among IIs types.

All analyses for the two phases of the exploratory stage are reported in Chapter 5. This includes both qualitative and quantitative analysis by using manual content analysis and some statistical procedures, respectively.

4.1.5 Exploratory Research Results

For the purpose of the subsequent sections in this chapter, this section demonstrates some of the conclusions that were extracted from the analysis of the two phases from the exploratory stage; however, full details of the analysis and findings are described in Chapter 5.

The study indicates that much of the demographic information and commercialization paths provides solid ground for comparing and contrasting II types. For example, the various II types have different legal status, locate next to different entities and serve varying numbers of sectors.

In addition, many factors and items for various concepts: stakeholder, innovation readiness criteria, absorptive capacity, impacts and practices/services were extracted to inform the development of scale (as discussed in Section 4.2.1); though, it helps offer comprehensive list of items for what practitioners meant by each concept in the context of IIs, it helps to confirm many of the items that were extracted directly from the literature; as well, it helps in wording the items by using vocabulary and expression that were familiar for those who work in the fields of IIs.

Furthermore, the study shows that the following lenses - stakeholder theory, innovation readiness, absorptive capacity theory and practices - are valid as approaches to compare and contrast II types among each other.

Nevertheless, the question of how these lenses interact with each other to explain the types of innovation intermediary is arranged to be examined through the confirmatory stage.

4.2 Confirmatory Stage

The second stage for this research is the confirmatory study, which used an online survey instrument to collect data from innovation intermediaries in North America. This stage aimed to confirm the first stage's observations and focused on finding potentially important exemplary practices that may be appropriate for all types of IIs. As well, this process helped in validating the newly developed scales and examining the hypothesis of the suggested model.

To achieve the objective, scale development based on the literature and on learning from the first stage was performed (Section 4.2.1). Next, these scales were used in building a survey instrument (Section 4.2.2) to collect data (Section 4.2.4) from the targeted samples (Section 4.2.2.4).

4.2.1 Scale Development

For the suggested model, many of the required scales to measure the model's constructs were absent in the literature, or at the very least needed to be modified to fit the context of this study. Thus, this section and its subsections provide an explanation of how these scales were developed (see Section 4.2.1.1) and validated (see Section 4.2.1.2).

4.2.1.1 Existing Scale Identification and Routine Elicitation

To develop a scale, many scholars recommend investigating the literature for relevant detailed routines that could be used to measure the targeted construct (Churchill, 1979); furthermore, other researchers suggest conducting exploratory studies to extract some factors that are used by experts/practitioners to measure the targeted construct, particularly when the literature is limited in terms of the required relevant routines (Strauss & Corbin, 1990). On the other hand, from the existing literature, some measurement items could be used to assess some constructs of dependent and independent variables. However, some of these items needed to be modified to fit the context of this study. Later, after having multiple items for each construct, expert opinion and judgment helped in enhancing the quality of the collected items (Churchill, 1979) (see Section 4.2.1.2).

Consequently, this research used two procedures for scale development. The first procedure noted the scales that had been used previously in the literature, and (when necessary) adapted and modified these to fit the context of this study. For example, the scale for the concept of stakeholders' salience (Agle et al., 1999) was modified to fit the context of innovation intermediaries (see the following subsection for more details). The second procedure took place when a scale could not be identified from the literature. In this case, a combination of relevant detailed routines that were extracted from the literature and factors that were extracted from Stage One exploratory study worked to form

borders and definitions for the targeted constructs. This process was recommended by Churchill (1979) to develop and modify scales. For instance, many scales were developed to measure various concepts for the suggested model, including dependence on stakeholders, dependence by stakeholders, and influence by stakeholders. Moreover, scales for IIs' operational strategies variables (dependent variables) including objectives, clients, commercialization paths, practices, and innovation readiness were developed by following this second approach (see Subsection 4.2.1.1.2 for more details).

4.2.1.1.1 Existing Scale Identification and Modification

Scales for some of the required concepts including stakeholder salience, absorptive capacity, and commercialization paths already existed in the literature; however, these needed to be adapted and modified to fit the context of this study.

Table 4-2 shows a summary of the suggested scale from the existing literature. The next paragraphs describe examples of how the scales were extracted and modified to fit the context of this study.

For example, commercialization paths are one of the dependent constructs in this study (different commercialization channels and paths are discussed in greater detail in Section 2.2). According to Pries and Guild (2005), 'sell', 'rent', and 'build' are three different paths for commercializing publicly funded research. Moreover, the authors believe that all scenarios in reality could be mapped to one of these three options (see Appendix H). To measure the commercialization path, Pries (2006) introduces two dimensions: 1) who is the commercializing firm, and 2) who has the "ownership of property rights to the technology" (p.155) (see Appendix H). In other words, according to Pries (2006), knowing the basis of commercializing an invention (exclusive or non-exclusive rights), the purpose of using an invention (product development or manufacturing and distribution), the rights to further develop the technology (to inventors or to commercializing firms), and the returns from technology (fixed license, royalties, and/or equities) will work as a proxy to calculate the commercialization paths; BUILD is the only path that can be measured directly. Based on these dimensions, Pries and Guild (2005), evolved a questionnaire to measure the commercialization paths (see Appendix H). Yet, this questionnaire was targeting faculty and researchers as respondents, thus paraphrase of all questions and further refinement of them to fit the context of this study was done.

Table 4-2 Summary of the Suggested Scale from the Existing Literature.

Model Construct	Routine Name	Scale Availability		Sources
		Yes	No	
Stakeholders' salience	Power, urgency, and legitimacy	√		(Agle et al., 1999) (Mitchell et al., 1997)
Absorptive capacity	Acquisition, Assimilation, Transformation, and Exploitation	√		(Cohen & Levinthal, 1989) (Zahra & George, 2002) (Flatten et al., 2011) (Brettel et al., 2011)
Commercialization path	SELL, RENT, and BUILD	√		(Pries & Guild, 2005) (Pries 2006)
Demographics information		√		(Statistics Canada, 2007)

As well, according to the literature, absorptive capacity has been measured by using a one-dimensional R&D proxy (Cohen & Levinthal, 1989), one which is not useful for measuring absorptive capacity in the context of this study due to the fact that most innovation intermediaries have no R&D department. After Zahra and George's (2002) definition for absorptive capacity, which included four routines – "acquire, assimilate, transform, and exploit knowledge for purpose of value creation" (p. 198) – Flatten et al. (2011) developed and validated a multidimensional scale. Their scale consists of 14 items distributed on the four dimensions of Zahra and George (2002) (see Appendix H). The developed measure was validated empirically by Brettel, Greeve, and Flatten (2011). Therefore, this scale will be used in this study; yet, rewording for the scale items was done to fit them in the context of this study.

Finally, all other constructs that already existed in the literature followed a similar approach to the above examples. The next section shows scales that have been developed for some constructs that were missing from the literature.

4.2.1.1.2 Routine Elicitation and Articulation of Items

This section shows how scales that were developed for some constructs have not been sufficiently evolved in the existing literature to cover the different aspects that this study intended to measure. A recommendation by Churchill (1979) was used to develop a better measure to fit the context of this

study. Accordingly, three steps were taken: 1) defining the "domain of the constructs"; 2) generating a "sample of items"; and 3) refining "the measure" (Churchill, 1979, p. 67).

Defining Domain of the Constructs

The first step toward developing a scale is to articulate an exact definition for each construct. In other words, this step helps in illustrating "what is included (…) and what is excluded" (Churchill, 1979, p. 67) for each construct. Therefore, various constructs were discussed and defined.

Many of the targeted constructs for this study were defined based on understanding from a combination of relevant literature and exploratory study learning; for example, various concepts for the suggested model: dependence on stakeholders, dependence by stakeholders, and influence by stakeholders, in addition to many of the II's operational strategies variables: objectives, clients, commercialization paths, practices, and innovation readiness, were defined in second and fourth chapter.

Generating of Items

The second step toward scale development is to generate a pool of items that are suitable for measuring the proposed constructs (Churchill, 1979). This could be done by checking the existing literature for how those constructs were defined previously, and "how many dimensions" were used for them (Churchill, 1979, p.67). In addition, in cases where a scale was unavailable, a detailed routine was extracted from the existing literature to develop a measure for the proposed constructs; as well, additional factors were extracted from experts/practitioners of IIs fields for the same constructs. Moreover, both existing and developed dimensions should capture the exact intended meaning for each construct (Churchill, 1979). Nevertheless, experts' judgments and insights were used to assess the above steps and to refine items to include all related measures and to edit items to ensure appropriate wording.

Table 4-3 Summary of the Elementary Suggested Scale and Routine for Proposed Constructs from the Existing Literature.

Model Construct	Routine Name	Scale Availability		Detailed – Routines Availability	Sources
		Yes	No		
Resource dependency (both)	Technical, time, knowledge, social, and economic dependence		√	√	(Hakansson & Snehota, 1995); (Somosuk, Punnakitikashem, & Laosirihongthong, 2010)
Influence by stakeholders		√*	√*		(Frooman, 1999)
Objectives		√*	√*		(Statistics Canada, 2007); (Hackett & Dilts, 2004b)
Clients			√		(Statistics Canada, 2007)
Practices/services		√*	√*		(Statistics Canada, 2007); (Munkongsujarit & Srivannaboon, 2011); (Howells, 2006)
Business strategy	(Technology push vs. market pull)		√	Innovation readiness evaluation: Technology readiness, market readiness, entrepreneurial readiness, and new business venture readiness (Chapter 2, Section 4).	(Isoherranen & Kess, 2011); (Balachandra & Friar, 1997); (Udell, 1989); (Heslop et al., 2001); (O'Conner et al., 2002); (Panne et al., 2003); (Rahal et al., 2006)

* Some scales were borrowed partially from literature and partially for the Stage 1 exploratory study.

A summary for various suggested scales and routines for the targeted constructs from the existing literature and exploratory stage was shown in Table 4-3. Furthermore, two examples for how these scales and routines were collected are discussed next; however, all other constructs almost follow the same approach to accumulate.

For example, innovation intermediaries' resource dependency on stakeholders has no exact measure in the literature. Thus, the five dependence dimensions suggested by Hakansson and Snehota (1995): technical, time, knowledge, social, and economic dependence – serve as a base toward developing measurement items for the resource dependency construct (see Appendix H). In addition, the study by Somosuk, Punnakitikashem, and Laosirihongthong (2010), "Determining Enabling Factors of University Technology Business Incubation Program" (p. 1032), will be considered as they developed a list of attributes for different resource types (see Appendix H); moreover,

experts/practitioners suggest some additional resources types to itemize the resource dependency construct.

The other example is business strategy (technology push vs. market pull). Both strategy orientations – technology orientation and market orientation – have been characterized by Isoherranen and Kess (2011) with four key characteristics (see Appendix H). Moreover, it is understood that innovation intermediaries provide the service of connecting solvers and seekers (commercialization parties), and accordingly facilitate the commercialization of research; therefore, the manner in which they provide their intermediation facilitation services could function as a proxy to assess their business strategy; particularly, the practice of innovation readiness evaluation[29] is done by innovation intermediaries to assess the perceived readiness of each new invention for commercialization. Innovation readiness evaluation consists of many items that fall into four main categories: technology readiness, market readiness, entrepreneurial readiness, and new business venture readiness (Chapter 2, Section 4). These items were connected with the characteristics suggested by Isoherranen and Kess (2011) to develop a scale for innovation intermediaries' business strategy (technology push vs. market pull) in the context of this study.

Finally, it is essential to indicate that these collected detailed routines were compared and validated by the expert insights that were learned through the exploratory stage; accordingly all routines and factors were converted into questions/scale items as discussed in next step.

Refining the Measure

The third and final step toward scale development was to merge the above items into a questionnaire to initiate the validation assessment for this questionnaire (Churchill, 1979; Hardesty & Bearden, 2004). Subsequently, an online survey was developed (see Section 4.2.2) by using these existing and developed scales/items. As well, a five-point Likert-scale was used for most of the questions. After that, researchers (faculty members and graduate students) were approached to check the associations between all items and their construct. Researchers were allowed to edit or even drop any item that seemed irrelevant to the construct (Churchill, 1979; Hardesty & Bearden, 2004).

[29] For more details about Innovation Readiness, see Chapter 2 Section 4.

4.2.1.2 Establishing Face Validity

Although all scales/items had already been compared and validated by the expert insights that were learned through the exploratory stage, 12 faculty and graduate students who were knowledgeable about IIs and commercialization fields worked as readers by checking the developed scales to provide responses, comments, and insights related to the face validity of the questionnaire[30]. Accordingly, analysis of their feedback led to the limited removal of some items, modification of wording for some items, and merging of some other items. This in turn contributed to purifying and enhancing the items for each construct. In fact, assessment of the validity of the scale items showed no major issues. Additional validation occurred during the pilot test for the survey design, as discussed in Section 4.2.2.5.

4.2.2 Instrument Development

After finishing the procedures for scale development and conversion into questions/scale items, and following the validation of each construct and its items in the previous sections, this section shows how the developed scales were used in a questionnaire. In particular, this section describes how the web based survey justified the selection of the online survey (Section 4.2.2.1). All branches and sections of the survey are described in detail (Section 4.2.2.2). As well, the discussion describes the ways many mechanisms were used to reduce/eliminate the effect of any potential Common Method Variance Issues (CMV) (Section 4.2.2.3). Section 4.2.2.4 shows the procedure that was used to build the sample list. Finally, a pilot study was performed to examine the appearance and wording of the survey and to double validate all developed scales (Section 4.2.2.5).

4.2.2.1 Survey Background

Following the first stage of developing a scale for dependent and independent variables, a questionnaire (survey) was used to collect confirmatory data from the proposed samples. According to Babbie (1998) and Trochim (2002), there are many approaches to conducting a survey, including

[30] Many researchers indicate that it is not necessary that all items collected from literature or exploratory study need to be in the final scale; thus consulting experts is very useful to refine the scale (Churchill, 1979).

personal interviews, telephone interviews, mailed questionnaires and electronic questionnaires. In this study, the online survey (electronic questionnaires) approach was used with the following justification; comparing to mailed questionnaires, online surveys are expected to have a higher response rate (Cobanoglu et al., 2001); they are more convenient and effective (Dillman & Bowker, 2001); they offer faster responses (Cobanoglu et al., 2001); and they lead to an electronic format response that is useful for more instantaneous validity check, and helpful in reducing data-entry time (Cobanoglu et al., 2001). Moreover, e-mail contact for the targeted sample was used to send the invitation to participate in the survey. Later, e-mail multiple reminders were used to increase the response rate. Nevertheless, some researchers (e.g., Dillman & Bowker, 2001) noticed that online surveys are sent sometimes to incorrect or out-dated e-mail contacts, which raises the non-delivery rate. Finally, this study was reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo prior to any communication with participants for both stages.

4.2.2.2 Survey Design

The survey consisted of 485 items that measure the following nine aspects (and their sub aspects) in the context of innovation intermediaries who facilitate the commercialization of research;

- The Demographic aspect, which included 55 items that are distributed into two sub aspects: organizational (48 items) and personal (7 items) demographics.
- The Stakeholders aspect included 183 items and was comprised of seven sub aspects namely: salience (31 items), perception (20 items), influence (18 items), resources dependency (44 and 32 items), representation in the board (24 items), and as clients (14 items).
- The Innovation Readiness aspect contained 77 items and included: evaluation constructs (5 items), team capability (6 items) and criteria to assess: idea (21 items), market (12 items), entrepreneur (10 items) and new venture (23 items).
- 30 items to reflect Services/Practices, 22 items for organization goals, 22 items for the performance and 10 items were used to capture the commercialization paths. In terms of uni and multi stakeholders approaches 45 items were used.

- The fifth aspect explored when some commercialization phenomena were more likely to happen (35 items) and which approach was preferred and followed by the majority of IIs (10 items).
- Finally, the sixth aspect measured the effect of some variables that were expected to have some effects on the proposed models (41 items): innovation stages (30 items) and control variables (11 items).

Table 4-4 Logic Branching that was Used in the Questionnaire

#	The question	The answer	The action
Q1, 1	In the past, we helped commercialize at least one idea that emerged from research.	No	Exit the survey
		Yes	Continue with the survey
Q25	What type of governance entity does your organization have:	No governance entity	Skip Q26 and Q27
		A board	Continue with the survey
		A steering committee	
		Other (please specify)	
Q40	Have you met, read, or heard about another innovation intermediary that operates by maintaining balanced care for all stakeholders? (e.g., adheres to the multi-stakeholder approach)	No	Skip Question 41 (3 items)
		Yes	Continue with the Survey

Items in the third and fourth aspects were the dependent variables for this research; they measured the effect of stakeholders influence on selection criteria, services, goals, and performance and commercialization paths. See Table 4-5 for details.

The web-based survey[31] that was used in this study had the logic branching feature that was used in three locations within the survey, leading to various actions as explained in Table 4-4.

[31] www.surveygizmo.com

Table 4-5 Online Survey Components

	Survey Components	Question #	# Of Items	Screen #
Organizational demographics	General focus	1	5	2
	Age	3	1	5
	Location	4	2	5
	Served sectors	5	7	5
	Employees	6	5	5
	Co-location with	7	14	5
	Legal status	8	12	5
	IIs type	10	2	6
Personal demographics	Affiliation	2	2	2
	Gender	45	1	22
	Position	46	2	22
	Educational level	47	2	22
Stakeholders	Stakeholders' importance level (salience)	11, 12, 13, 14, 15	31	7, 8
	Stakeholders' perception about org.	12A, 13A, 14A, 15A	20	8
	Stakeholders' influence on org.	16, 17, 18, 20	18	8, 9
	Organization dependency on stakeholders	19	44	9
	Stakeholders' dependency on org.	21	32	9
	Clients	22, 23	14	10
	Governance entity (board)	25, 26, 27	24	11
Innovation readiness	Focuses of evaluation	30, 35	5	12, 14
	Team capacity and capability	28, 29	6	12
	Idea-related criteria	31	21	12
	Market-related criteria	32	12	12
	Entrepreneur-related criteria	33	10	13
	New venture-related criteria	34	23	13
Practice/Services	Practice/Services	36	30	15
Objectives (Goals)	Objectives (goals)	37	22	16
Performance	Performance	37A	22	16
Commercialization paths (strategies)	Commercialization paths (strategies)	9	10	6
Uni-stakeholders V.S. Multi-stakeholders	Commercialization phenomena	39	35	18
	Open ended questions	40, 41, 42, 43, 44	10	18, 19, 20, 21
Variables control	Innovation stages	24	30	10
	Variables control	38	11	17
Total		47	485	24

4.2.2.3 Key Informant and Common Method Variance Issues

As indicated in the sample section (Section 4.2.2.4), survey data were collected from key informants of each IIs organization. A key informant is defined as an individual who has sufficient knowledge about her/his organization and who agrees to participate in the survey/interview by answering questions. In this study, and particularly during the confirmatory stage, key informants were mostly comprised of CEOs, presidents, and owners of IIs organizations. However, in certain cases, secondary level management and staff participated as key informants. Overall, the collected data were based on key informants' perceptions and understandings of their respective organizations' operations and characteristics. This in turn leads to a concern of Common Method Variance (CMV) that is discussed next.

CMV is a systematic measure error variance "that is attributable to the measurement method rather than to the constructs the measures represent" (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003, p. 879). CMV and Common Method Bias (CMB) are used interchangeably; however the former (CMV) indicates that some variances is attributable to the 'methods effect', while the latter (CMB) refers to the extent that the 'methods effect' has inflated the associations among variables (Meade, Watson, & Kroustalis, 2007). Scholars have shared concerns in terms of how CMV could alter the relationship among variables in studies that use key informants as respondents (e.g. Podsakoff et al., 2003; Spector, 2006); yet, there has been no consensus about the degree of CMV effects. For instance, Spector (1987) indicated trivial effects for CMV on study validity; Crampton and Wagner (1994) concluded slight effects, while others reported that CMV affected the validity significantly (Cote & Buckley, 1987; Doty & Glick, 1998). Moreover, Spector (2006) concluded that CMV is more arbitrary and vague in nature.

According to Podsakoff et al. (2003), CMV may occur as a result of one or more of the following four sources: common rater, item characteristics, item context, and common measurement context. Studies that extract data by self-report or through key informants could suffer from the effects of one or more of these sources. Accordingly, it is necessary to be aware of these effects and their remedies.

As this study used key informants to collect data, various suggested procedures were employed to reduce or control the effect of CMV as recommended by Podsakoff et al. (2003) and Spector (2006).

As well, this study used statistical tools to test and control the effect of CMV. Each source of CMV and the applicable procedural remedies (whenever necessary) were discussed in the following paragraphs; as well, CMV tests by using statistical tools were discussed in Section 6.7.

The first source of CMV considered is the common source or rater, in which a range of measures for predictors (independent variables IV) and criterion variables (dependent variables DV) are collected from the same respondent. Scholars have listed many types of biases when common source/rater represents a source of CMV, including: social desirability, consistency motif, and leniency biases among others[32] (Podsakoff et al., 2003). However, in order to minimize these potential biases, suggestions by Podsakoff et al. (2003) to "separate measurement of predictor and criterion variables psychologically and guarantee response anonymity" (p. 898) were considered. Thus, before sending the survey, the following preventive steps were performed: 1) the order of questions in the survey were randomized; 2) similar/related questions were separated into different pages in the survey; 3) logic branching was used in the survey; 4) different measurement methods were used in the survey[33]; 5) no detailed knowledge about the ultimate goal of the research nor of its approach to handle the research question were shared with the participants of the survey; 6) participants were informed by the invitation letter that their responses will be anonymous; and 7) survey was sent to a significant proportion of the whole population of IIs in North America but excluding those who participated in the exploratory stage. All of these preventive steps are expected to minimize the CMV that could emerge from individual bias.

On the other hand, the extent of similarities in the findings for both analysis of self-reported IIs types and the types that were identified empirically through the clustering process (See Chapter 6) serve to validate this study's dataset and particularly work to prove the absence of significant CMB coming from common source or rater. In both analyses, dependent variables were the same; however, independent variable in the former was based on self-report from the same rater while in the latter, independent variable was derived empirically by using the clustering technique (See Section 4.2.3).

Item characteristic, a second potential source of CMV, is the way in which items in each question were worded. In other words, using inadequate words in questionnaires could sometimes lead to social desirability bias, incorrect interpretation of the questions, or complex or ambiguous questions,

[32] In Appendix M definitions for each of these types of bias by Podsakoff et al. (2003) are provided, including a list of other types that are not mentioned here.
[33] For example, participants were asked to rate some questions on a scale of 1-5, to select from a list of options, to order items, and to write out some answers.

which could all eventually result in CMB. According to Podsakoff et al. (2003), inadequate words include the usage of "double-barreled questions (Hinkin, 1995), words with multiple meanings (Peterson, 2000), technical jargon or colloquialisms (Spector, 1992), or unfamiliar or infrequently used words (Peterson, 2000)" (p. 883). Special care was paid to the wording of the questionnaires in this study. First, learning that was gained from the exploratory study facilitated the initial wording of the questionnaire, and then researchers and many readers[34] reviewed the questionnaires repeatedly. Changes took place accordingly based on researchers' and readers' feedback, which in turn led to clarification of some parts, replacement of some complex or ambiguous words, and adding of definitions for unusual terms. As a result, less CMV is expected in this study from the source of item characteristics.

Another source of CMV is common item context, which occurs when related items are grouped together in the survey (Hinkin, 1995). Common item context is concerned with the length of scales, the available options, and other situational cues (Podsakoff et al., 2003; Salancik & Pfeffer, 1997; Harrison & McLaughin, 1993). Thus, to minimize CMV that may result from item context, varoius preventive steps took place while designing the survey. For example, 1) contexts of items were checked several times by a number of readers[35] to ensure a neutral context that would not induce positive or negative effects on the respondents; 2) the order of questions' items in the survey was randomized; 3) logic branching was used in the survey; 4) an 'other' option was added for each question that included choices, so that participants were allowed to add related information. These steps in turn minimized the influence of the items' contexts on participants' responses, reduced participants' fatigue from having too many questions on the same page[36], and satisfied participants' capacity of knowledge by allowing them to add additional items. Collectively, these measures were expected to minimize CMV associated with common item context.

Fourth, various researchers have considered the common measurement context as a source of CMV; in other words, CMV may increase during the time of collecting data from key informants based on the factors of location, medium, and time. Thus, location and medium that contribute to minimizing any social desirability are recommended (Richman et al., 1999; Podsakoff et al., 2003); as well, it has been recommended to allow participants to select their own convenient times to respond

[34] Readers are listed as in next Footnote, and include the usage of a professional technical editor.
[35] Initially, 12 faculty and graduate students functioned as readers. Later, during the pilot study, a sample of 26 participants (mostly graduate students) provided additional feedback.
[36] Avoiding too many questions on the same page will reduce the need for readers to frequently scroll through the screen.

(Spector, 2006). Thus, these suggestions were considered in this study. The study invited participants through email to participate in an online survey from any location and allowed them to complete this survey at any time that was convenient for them. Online surveys have an advantage over face-to-face interviews in terms of allowing different locations, flexible times, and multiple sittings to complete the survey.

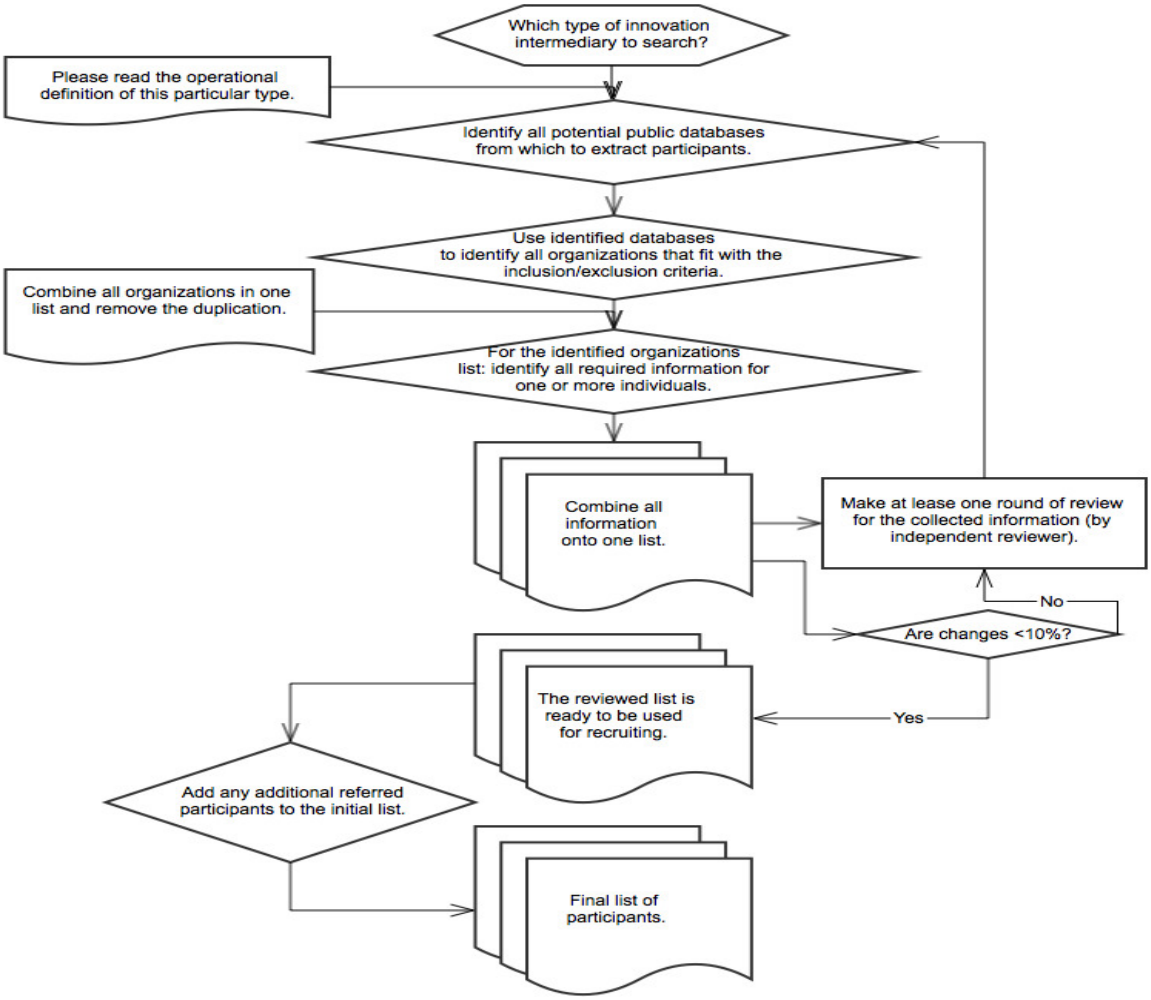
The previous paragraphs discuss several sources and types of CMV, and show the suggestions that were applied as preventive remedies. As well, several other suggestions were not applicable in this research due to various constraints. Scholars have acknowledged that all suggestions to deal with or control CMV are as of yet insufficient (Podsakoff et al., 2003; Spector, 2006), as there is no perfect way to measure the exact effects of CMV or to control its bias. Some objective procedures, such as statistical tools, provide weak evidence to measure and control CMV but are impractical in certain cases based on the context of the dataset and the study questions (Spector, 2006). Statistical tools to control CMV will be discussed further in Chapter Six.

4.2.2.4 Sampling (Confirmatory Stage)

A considerable challenge for this study was finding appropriate participants. Unfortunately, many of the existing associations that could potentially serve our purpose for recruiting participants did not share their members' information due to their privacy policies. In some rare cases they would agree to send emails only once to their members on our behalf, or to sell their mailing addresses (but not email addresses) for the purpose of a paper survey. However, these scenarios did not serve our purpose due to the nature of our study (targeting many types of innovation intermediaries) as well as the fact that individual associations do not include the whole targeted population. Moreover, using more than one association could result in the sending of more than one invitation to the same participant, or in inviting some individuals who are not part of our targeted population. To resolve these issues, a systematic, replicable process was designed to find and build lists of appropriate potential participants.

The flowchart in Figure 4-1 explains the general steps of the systematic process utilized to find and build lists of participants. The process consists of eight major steps including several sub-steps for the various types of innovation intermediaries, as explained in the following paragraphs.

Figure 4-1 Flowchart of Process to Find and Build Lists of Participants



Recall that this study investigated four types of innovation intermediaries: University Technology Transfer Offices (UTTO), Community Business Incubator/Accelerators (CBI), Industry Facilitators of Open Innovation (IFOI), and Independent Innovation Intermediaries (III) (See Appendix I for definitions of each type). Therefore, we specified one of these four types for each iteration when starting the process outlined in the flowchart. After reading the operational definition for the specified type and understanding its respective targeted population, we began to identify all potential public databases/associations in order to extract participants. We used literature, Internet search engines, and peer brainstorming in order to identify the potential public databases/associations for each type.

Appendix I includes the targeted population of each type and the databases/associations that were been identified for use in building our lists of participants.

Next, by using these identified databases/associations, all organizations (offices, firms, institutions) that aligned with the criteria of inclusion and exclusion (see Appendix I for the criteria) were extracted and listed in an Excel file. As well, website references to other organizations (offices, firms, institutions) were used (snowball strategy) to identify additional organization. Each type of innovation intermediary was listed in a separate sheet, and all duplications were removed from all lists. Next, for all of the identified organizations (when available), one or two individuals were identified from each organization as follows: for UTTOs, CBIs, and IIIs, the CEO (Chief Executive Officer), principal, owner, or founder was identified, along with one other manager, director, or officer; for IFOIs, the CTO (Chief Technology Officer) is identified when available, otherwise an individual who played an equivalent role was identified (see Appendix I for a list of these). Then, the following information was extracted (when available) for each identified individual and entered in the Excel file (one row for each organization).

1. Organization's exact name
2. Is this organization part of a University? (YES or NO)
3. Honorific (i.e. Mr., Mrs., Ms., Dr.) for the CEO of the organization
4. First name for the CEO of the organization
5. Last name for the CEO of the organization
6. Title of the position (CEO, president, owner, founder) (a complete title)
7. CEO's email address
8. CEO's telephone number
9. Honorific (i.e. Mr., Mrs., Ms., Dr., …etc.) for one additional manager from the same organization*
10. First name for one additional manager from the same organization*
11. Last name for one additional manager from the same organization*
12. Manager's position (manager, director, VP, officer) (a complete title)*
13. Manager's email address*

14. Manager's telephone number*

15. Mailing address of the organization

*Information 9-14 was available for UTTOs, CBIs, and IIIs but not for IFOIs.

After entering all of the information for each individual and organization into the Excel file, a first round of review was performed with one or more independent reviewer(s) repeating Steps 2-4. If the changes between the initial file and the file that resulted from the first review round varied more than 10%, then a second round of review was done. Finally, the final potential list of participants was ready for recruitment use. After sending the first invitation to the final list of participants, an additional list of referred participants was added to the sample list. Appendix I shows the number of potential participants for each type in both Canada and the United States.

It is important to acknowledge the help provided by professional freelancers through Odesk platform throughout most of the above process after receiving the appropriate training and knowledge of how to do so. These professionals used their skill and knowledge to speed up the process of building the participants' list. For example, they used email verification websites to check the emails found in the above-mentioned databases. This contributed to reducing the number of incorrect and outdated email addresses.

4.2.2.5 Pilot Study and Its Result

Although all scales/items had already been compared and validated by 12 faculty and graduate students, and the according modifications were applied as discussed in Section 4.2.1.2, a pilot study for the designed survey was conducted with the purpose of examining the appearance, design, logical flow, compatibility of choices, level of difficulty, and wording of the survey, as well as to double-validate all developed scales. In addition, this pilot study functioned as a pre-test to ensure that the survey worked smoothly with no errors. Thus, participants were asked to answer the survey questions.

A sample of 40 faculty and graduate students who are knowledgeable about IIs and commercialization fields were invited to provide feedback about the aforementioned aspects. Twenty-six responses were received, none of which articulated any major concerns.

Responses confirmed that all statements on these scales were appropriate for use in the context of all types of innovation intermediaries without exhibiting bias toward any particular type of II. As well, responses reconfirmed the face validity of all constructs' items. The average time for answering the survey was estimated to be 39 minutes. Within these responses, several minor comments, recommendations, and insights were received. For instance, participants recommended removing some similar items, elaborating upon some other items, improving some words, and adding some definitions. As well, participants recommended consistency regarding the Likert scale (to be either a 5-point or a 7-point scale). Therefore, some items were removed, while the wording of some other items was modified, as recommended. Accordingly, the final version of the survey was published (see Supplementary Appendix L for the final version of the survey).

4.2.3 Variables

This section briefly identifies which variables represent the independent variables and which variables represent the dependent variables with reference to the model in Figure 3-4. Nevertheless, due to limited time and resources, it is important to highlight that no control variables were considered for the model in this study. However, as many researchers suggest, introducing control variables is appropriate when other or additional explanatory independent variables[37] are anticipated to influence the dependent variable (Hair et al., 2010). Thus, this study recommends that future research should discuss all potential control variables; particularly those related to stakeholders and innovation intermediaries (e.g. policy, location, and government support, among other issues).

4.2.3.1 Independent Variables

This study perceived types of innovation intermediaries as the only independent variable. This variable has been extracted twice through various methods; accordingly, the analysis was performed twice for all dependent variables[38] (see Section 6.1). The first extraction was based on self-report by the participants themselves; however, the question did not directly ask participants about their IIs type

[37] This refers to any additional explanatory variables which were not included in the theoretical model.
[38] The first analysis used II types based on self-report as IV, and the second analysis used II types based on clustering groups as IV.

(see Section 6.5.1 for details). The other independent extraction was based on the clustering procedure which was performed by using three variables[39] from the collected data to group the participants (IIs). Accordingly, four clusters were resulted from the clustering procedure; they are identifying the various II types (see Section 6.6.1).

4.2.3.2 Dependent Variables

In contrast to the single independent variable, there are many dependent variables in this study. All DVs are classified either as stakeholder-related variables or as operational strategy variables. Stakeholder-related variables include stakeholders' level of importance, stakeholders' level of influence, and IIs level of dependency on and by stakeholders. Furthermore, operational strategy variables contain commercialization paths, objectives, performance, practices, client types, and innovation readiness. More details about each of these variables are presented in Section 6.3.

4.2.4 Data Collection

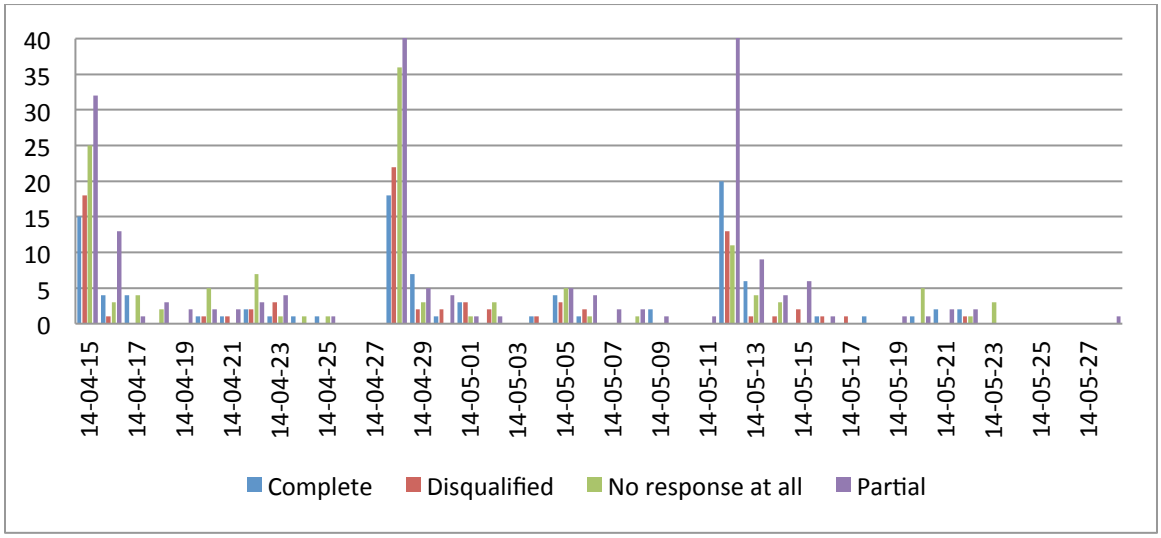
This section reports the response rate for the survey of this study. Among other issues, it provides details about when the survey was commenced and for how long it was open; as well, this section reports the number of usable responses. A discussion of how the issue of non-response bias is provided. Next, Section 4.2.4.3 shows how this study handled the missing data, and illustrates how the imputation procedure was performed. Descriptive statistics tables are provided at the end of this section as a preface for the analysis presented in Chapter 6.

[39] These three variables are stakeholders' level of importance, stakeholders' level of influence, and level of dependency on stakeholders.

4.2.4.1 Response Rate

The two sets of the survey were sent out with the first one sent on Tuesday April 15, 2014 and the second one on Tuesday April 22, 2014; both to invite a total of 9,873 organizations to participate in this confirmatory study. Tuesday was selected because many surveys' best practices indicated that participants tend to ignore the surveys that are sent on Monday and Friday more then the other week days (Shinn, Baker & Briers, 2007). As indicated earlier, the samples include the four types of innovation intermediaries from Canada and United States of America and include the group of international commercialization alliance (ICA). However, after the end of data collecting stage, the IFOIs type from both countries (794 and 1068 firms) was removed from the total sample, as there was no useful response from this particular type[40]. Nevertheless, 296 invitations were not delivered due to wrong/expired emails; 159 targeted participants unsubscribed themselves automatically; while 179 targeted participants sent emails to the researcher requesting to be unsubscribed; and 6 targeted participants indicated some reasons for not participating[41]. Thus, the final total sample is 7,371 organizations.

Figure 4-2 Survey Responses Over Time



[40] There were only 7 clicks on the survey and all of them with no answers.

[41] They are either retired/moved to other organization (2), or do not count their organization as innovation intermediaries (3); as well, emails reached to the wrong persons (1).

Two reminders were sent for each set with a two-week gap between invitations and reminders; these reminders were not sent to wrong or expired emails or to those who were unsubscribed either automatically or manually. Thus, responses rose after each reminder as in Figure 4-2. By the end of May 2014, there was almost zero additional response; hence, the data collecting stage was concluded with 475 responses in total (Figure 4-2).

Therefore, the response rate for the confirmatory study is 6.44%; this response rate is relatively low, yet it is consistent with similar studies in the field of innovation intermediaries (e.g. Sellenthin, 2009)[42]. For this study, the researcher tried many possible efforts to increase the response rate before and during the time the survey was published. First, as indicated previously, the overall number of innovation intermediaries, particularly for the three types: UTTOs, CBIs and IIIs are very limited; thus, this study targeted almost[43] the entire population of these three IIs types. Second, the web-based survey was selected to collect data due to the fact that existing literature suggest that online survey is more likely to have higher response rate than pen-and-paper and mail surveys (e.g. Cook et al., 2000; Dillman & Bowker, 2001; Cobanoglu et al., 2001). Third, tremendous time, effort and expertise were used to develop and design the survey instrument, considering many revisions for wording the questions correctly and dropping unnecessary questions/items to reduce the survey length. Fourth, personalized invitation emails that include each participant's name, position and company were sent, to increase the acceptance for the invitation letter. Fifth, two reminder emails[44] were sent to encourage participation, and also include answers for some questions that were raised by the participants after the first invitation email. Sixth, many emails were exchanged with respondents to answer their concerns and inquiries. Seventh, some respondents suggested redirecting invitations to someone else in their organization which the researcher did. Finally, two incentives were offered to respondents in order to encourage their participations: 1) to receive a copy of the thesis of this study when it is done, 2) to enter in the draw for one of 50 iTunes gift certificates (worth 30$).

[42] Krosnick (1999) found that "surveys with very low response rates can be more accurate than surveys with much higher response rates," and he added that "having a low response rate does not necessarily mean that a survey suffers from a large amount of non response error" (p. 540).
[43] It is to the extent of researcher knowledge.
[44] There was two-week gap between reminders emails.

Table 4-6 Survey Response Overview

Group name	Invites	Drops out	Attempts		Usable response	
Canada						
UTTOs	295	46	64	25.70%	22	8.84%
CBIs	240	42	43	21.72%	17	8.59%
IFOIs	794	86	22	3.11%	0	0.00%
IIIs	2030	192	138	7.51%	29	1.58%
United States						
UTTOs	970	58	96	10.53%	44	4.82%
CBIs	1355	102	79	6.30%	31	2.47%
IFOIs	1068	95	11	1.13%	1	0.10%
IIIs	3069	191	32	1.11%	10	0.35%
ICA	52	9	17	39.53%	8	18.60%
Redirected			6	-	1	-
Total	9873	821	508	5.61%	155	1.71%
Total, after removing IFOIs	8011	640	475	6.44%	163	2.21%

The usable responses[45] were 163 out of the 475 responses, that is 2.21%. However, the response rate for each group from each country varied as indicated in Table 4-6. For example, 295 email invitations were sent to the Canadian UTTOs group, of which 46 respondents were dropped later as indicated above; 25.7% of the participants from this group clicked on the survey link and attempted to answer it; however only 9% of the responses were considered usable in the analysis.

4.2.4.2 Non-Response Bias

All studies that employ a questionnaire[46] to collect data will have some sort of no response; that means either some of the targeted sample did not respond[47] on the questionnaire, or the targeted population was not sampled correctly. Thus, some researchers suggested that this phenomenon of no response – especially with low response rate – might bias the result of the study (e.g. Creswell, 1994). Non-response bias occurs when significant differences appear between the potential answers for those

[45] See Section 4.2.4.3, for how 163 usable responses were calculated.
[46] Any type of questioners (e.g. mail survey or online survey)
[47] They did not respond because they don't have time to response or forget to respond

who did not participate in comparison with those who participate. As a result, researchers suggested wave analysis test to examine the differences between these two groups. Wave test assumes that result of late respondents are similar to the potential result of those who did not participate (Armstrong & Overton, 1977). Some researchers did not appreciate this assumption and the wave analysis test as a technique to assess the non-response bias (Lambert & Harrington, 1990).

In order to perform the wave analysis test for this study, data were divided into two groups: first group that includes all responses before sending the first reminder (N=56), while the second group[48] includes all responses after the second reminders (N=107). Results show that the majority of variables have no significant difference between the two groups in terms of their means and variance; which indicate that there is little or no effect due to non-response bias as assessed in this way.

4.2.4.3 Missing Data and Data Imputation

As indicated above, 475 responses were collected, yet many of them included numerous missing values. Thus, it was necessary to remove all cases that had more than 25% of missing data with a condition that any variable will not have more than 25% of missing values[49] (Hair at el., 2010). As a result, we end up with 163 usable responses. These usable responses still have some missing data; thus, the four steps that were suggested by Hair at el. (2010) were followed to identify the type of missing data among these usable responses; to identify the extent of the missing data, to examine the randomness of missing data, and to propose and apply a remedy to impute the missing data.

First, determine if the missing values are ignorable (Hair at el., 2010). Ignorable missing values may be due to questionnaire design (Hair at el., 2010); in other words, data that are missed due to skip patterns or questionnaire branching are counted as ignorable missing data. Therefore, as indicated in Table 4-4, all missing data for Questions 26 and 27 are considered being ignorable missing values; as it is resulted of a skip pattern after answering 'No governance entity' in Question 25. Hence, it is not necessary to apply any remedy for the missing values in these particular questions. However, all other

[48] This group is the late response group that is assumed to be similar to those who did not respond

[49] Although, Hair at el. (2010) suggested that "variables or cases with 50 percent or more missing data should be deleted but as the level of missing data decrease, the researcher must employ judgment and trial and error," the researcher, after much trail and error, decided to continue with 25% or less of missing data in variables and cases.

questions (variables) are not ignorable and need to be imputed after checking some additional characteristics as in next steps.

Second, determine the extent of missing data (Hair at el., 2010). As indicated above, a threshold of 25% or less of missing values is determined as acceptable; thus, all cases that have more missing values were dropped, as a result, cases were reduced from 475 to 163 cases. It is likely that most missing values may be attributed to the fatigue while answering the long survey and to the fact that some questions were not applicable for some respondents.

Third, examine the randomness of missing data (Hair at el., 2010). Two levels of randomness: MCAR, Missing Completely At Random; and MAR, Missing At Random. The former indicates that missing data do not depend on other data values, while the latter indicate that they do (de Leeuw et al., 2008). SPSS 21 software (Little's MCAR test in particular) was used to examine the randomness for each aspect[50] of the data as indicated in Table 4-7. The result shows no significant level for all tests, which means that essentially all missing data were MCAR. Therefore, the result indicates that, "the cases with missing data are indistinguishable from cases with complete data" (Hair at el., 2010, P. 49). This in turn points out the possibility of using any of the suggested remedies to impute the missing data without having impact or bias by other variables (Hair at el., 2010).

Fourth, apply remedy for the missing data (Hair at el., 2010): Expectation Maximization (EM) is suggested as an appropriate tool to impute missing values that is MCAR (Hair at el., 2010). EM has the advantage of minimizing bias and predicting valuable data while maintaining the original distribution (Hair at el., 2010; PASW, 2007). Thus, EM (SPSS 21) was used to impute all missing data of the metrics[51] variables for this study.

After that, a comparison between the original data and the imputed data was conducted by using a T-test. The result in Appendix J shows that there was no significant difference between the original and imputed data in terms of their means, however there was some significant differences (8% of the variables) in terms of 'Levene's Test for Equality of Variances'. Hence, variables that have

[50] Little's MCAR test and then imputation process was done separately for each aspect, as each aspect's variables will be more homogeneous and that will increase the accuracy to predict the correct values and efficient in terms of reducing time to calculate.
[51] Metrics data are the continuous data while categorical data were not imputed by EM method.

differences in variances will be dropped when possible[52]; otherwise, variables will be treated carefully and compared to the original data when used in any hypothesis testing.

Table 4-7 Little's MCAR Test for Randomness of Missing Data

Survey Sections/Aspects	MCAR Test			Missing
	$\chi 2$	D.F.	P-value	Data (%)
Organization Demographic (a)	55.124	58	0.583	0.20%
Commercialization Paths	146.335	138	0.297	0.23%
The important of stakeholders	7229.201	766	0.826	2.33%
The influence by stakeholders	704.722	731	0.751	1.36%
Dependency on educational institution (university, college)	1937.788	1903	0.284	3.92%
Dependency on industry (and/or parent firm)	442.627	1896	1.000	4.37%
Dependency on government	2975.517	1881	1.000	4.89%
Dependency on financier (funding partner, shareholder)	425.855	2304	1.000	5.04%
Stakeholders dependency on organization	960.928	1001	0.814	3.59%
Clients	125.825	663	1.000	4.28%
Innovation stage (clients perspective)	561.776	581	0.709	4.44%
Innovation stage (organization perspective)	163.234	665	1.000	4.45%
Team Capability to assess a new invention	243.613	261	0.773	1.80%
Assessment team consist of…	41.659	36	0.238	1.29%
Idea-related criteria	596.9606	591	0.428	7.46%
Market-related criteria	133.261	496	1.000	4.76%
Entrepreneur-related criteria	246.491	261	0.732	4.29%
Venture-related criteria	964.41	961	0.463	8.77%
Organizational objectives	122.065	838	1.000	8.93%
Organizational performance	792.415	785	0.419	6.98%
Control Variables	340.408	311	0.121	5.03%
More likely to occur in uni-stakeholder approach	259.139	1191	1.000	8.69%
More likely to occur in multi-stakeholder approach	209.713	993	1.000	8.39%

a) This concept was used as a reference for all other concepts in the imputation process.

[52] Dimension reduction methodology (PCA) will be used later to drop the unnecessary variables, see Section 6.3

After all, a complete data-set of 163 cases was ready for the upcoming analysis. Prior to that, all variables were examined visually and statistically for any extreme abnormality. Visually, histograms and boxplots graphs were assessed, and statistically, Kurtosis and Skewness were checked for any extreme values. Appendix K reflects on the meaning of the above tests and provides a detailed table for the statistical descriptive analysis that includes kurtosis and skewness values. The result shows that no extreme abnormality was exhibited by the imputed data. With the exception of two variables: Q6_3 and Q6_4, the Kurtosis values were always less than 3; as well, the Skewness values were always less than 2. Both indicate no extreme Kurtosis and Skewness and accordingly no extreme abnormality for all variables.

4.2.4.4 Descriptive Statistics

This section provides general descriptive statistics of the demographic information for the collected data. Participants reported that their organizations were founded between 1963 and 2013, with most organizations (73%) founded in the last two decades (Table 4-8). Participants are mainly from Canada and the United States, with an almost equal number of participants from each of these two countries. Table 4-9 lists the provinces/states which have four or more participants. The results indicate that 89% of the Canadian respondents are from six provinces, while 57% of the American participants are from seven states. The rest of the participants for each country are distributed over multiple provinces/states with a frequency ranging between one and three participants. Males comprise almost 80% of the participants while females comprise only 20%; this difference may reflect the actual ratio of males and females in leadership positions at innovation intermediary organizations. Table 4-10 provides additional information relating to participants' positions in their IIs organizations and their education levels.

Table 4-8 Demographic Statistics (Year Founded)

Year Founded	Frequency	Percent
Before 1979	8	5.13%
1979-1983	9	5.77%
1984-1988	13	8.33%
1989-1993	12	7.69%
1994-1998	20	12.82%
1999-2003	28	17.95%
2004-2008	35	22.44%
2009-2013	31	19.87%
	156	100.00%

Table 4-9 Demographic Statistics (Location)

Country	Frequency	Percent	Provinces	Frequency	Percent
Canada	73	46.79%	Alberta	6	8.22%
			British Columbia	8	10.96%
			Ontario	30	41.10%
			Quebec	13	17.81%
			Saskatchewan	4	5.48%
			Nova Scotia	4	5.48%
			Total	65	89.04%
United States	77	49.36%	California	6	7.79%
			Florida	4	5.19%
			Kentucky	4	5.19%
			New York	7	9.09%
			Michigan	4	5.19%
			Maryland	4	5.19%
			Texas	15	19.48%
			Total	44	57.14%
Other Countries	6	3.85%	N/A	N/A	N/A
	156	100.00%			

Table 4-10 Demographic Statistics (Gender, Position and Education Level)

Items	Percent
Gender	
Male	79.55%
Female	20.45%
Total	100%
Position	
Owner	13.19%
Founder	10.99%
C-level Executive - Chairman, CEO, CFO, CTO, or President	24.18%
VP or Director reporting to C-level	28.57%
Other management role	8.79%
Staff	8.79%
Other	5.49%
Total	100%
Education Level	
High school or equivalent	2.17%
Bachelor's degree	19.57%
Master's degree	46.74%
Doctoral degree	23.91%
Professional degree	4.35%
Other	3.26%
Total	100%

4.3 Conclusion Related to Methods

This chapter describes the methods of the two studies that were conducted in this research: exploratory study and confirmatory study. First, an explanation was provided of how two rounds of interviews were conducted for the exploratory stage and what sample was used. Exploratory study aimed to explore innovation intermediaries and investigate various lenses to differentiate between IIs types; simultaneously, insights were provided to help in the process of scale development for many of the independent and dependent variables. As well, this section introduces how the data were analyzed for the exploratory study, concluding with an overview of the learning that was gained from the exploratory study. Overall, Chapter 5 offers broad details of the findings of exploratory study.

The confirmatory section commenced with a detailed description of how scales were developed based on the literature and the exploratory findings. Next, face validity for all scales was examined by consulting expert opinion. These scales were used to build a survey instrument for the purpose of collecting data to validate the research model and to test the various related hypotheses. Many issues related to survey design including the expected effects of common method variance (CMV) were discussed. After that, the sample population that was used in the confirmatory stage was defined. Furthermore, an overview of the collected data including explanation about the response rate and non-response bias issue was reviewed. Missing data and how they were imputed were illustrated next; finally, this section concludes with some descriptive statistics tables as a preface for the analysis presented in Chapter 6.

Chapter 5
Findings of the Exploratory Study

This chapter reports the findings of the exploratory study that consist of two phases (two rounds of interviews): a telephone and an in-person interview. Data from both interviews were analyzed together and conclusions were reported based on the concepts that were investigated. Three sections are included in this chapter to discuss the analysis method (Section 5.1); the findings regard each concept (Section 5.2); and a conclusion for the findings (Section 5.3).

5.1 Analysis Method

It was introduced in Section 4.1.4 that quantitative and qualitative analyses for the exploratory study were performed. As well, Section 4.1.4 provides conceptual illustration of what is content analysis.

Furthermore, to perform the content analysis for the exploratory stage of this study, one of three approaches should be followed: inductive, deductive, or a combination of the two (Elo & Kyngas, 2007). Most questions that were used in the two rounds of interviews are based on three underlying theories: stakeholder influence strategy, absorptive capacity, and business strategy model. These theories, to a great extent, guided us toward a deductive approach in the content analysis process. In other words, the categories in this study tend to be informed by these three theories to the extent that the purpose of this content analysis is to explore whether innovation intermediary types are similar to or different from one another in the context of the three underlying theories.

Prior to analyzing the collected data, we assessed and selected from among various approaches and performed numerous preparatory tasks. First, the data collected were transformed into text form, and all audio recordings were transcribed into text files. Files for each question's responses (by all participants) were then created. Second, determining the criteria of selection (sampling) and the unit of analysis were essential for achieving systematic and objective content analysis. Therefore, the content analysis focused on both manifest and latent content in that explicit and implicit meanings

in the context of the targeted theory were captured and coded. Furthermore, constructs (factors/criteria) from the responses by each participant to each question represented our unit of analysis. For instance, due to the nature of the questions and the methodology that we adopted to collect responses, each participant suggested many constructs (factors/criteria) to compare and contrast his/her organization from others. Accordingly, lists of constructs in the context of particular questions were created.

The content analysis procedure is represented in "three phases: preparation, organizing and reporting" (Elo & Kyngas, 2007, p. 109). The preparation phase was as described in the preceding paragraph. To perform the second phase, organization through multiple steps is essential. Thus, a coder with an engineering and management sciences background applied a written instruction when analyzing the content of the collected data (See Appendix N-1 for the detailed steps).

Furthermore, during the organizing phase and after completing the categorization process, a database was developed and data from the content analysis tables were inserted into the database. As well, other data (collected from other questions) regarding the participants, their innovation intermediary types, their commercialization paths, their ranking of criteria, and their numeric evaluation of the constructs (responses) for themselves and for others from the same regions were inserted in the database. A temporary numerical code that was created in the third step (See Appendix N-1) helped to map the data that resulted from the content analysis and the rest of the information. Building the database in this way helped to harvest particular information in an appropriate format by using the correct SQL command. For example, using SQL allows one to count how many times each type of II is mentioned in a particular category.

This content analysis procedure was applied to the collected data in response to Question 10, Part E of the telephone interviews. Additionally, content analysis was applied to Questions 1, 2, 3, 4, 5, 8, and 9 of the in-person interviews. Partial content analysis was performed on Questions 2, 3, 5, 6, 7B, 8, 9, 15, 16, and 17. These questions consisted of multiple response options, with the last option for each of these questions being 'other'. Accordingly, participants could add options if they were not satisfied with those provided. In this way, all options that were suggested by participants for each particular question were analyzed by applying the partial content analysis as in Appendix N-1.

All other questions, other than the above-referenced questions, were ready for SPSS analysis. In addition, all of the above-referenced questions were ready for SPSS following the above content analysis procedure.

5.2 Findings

This section includes all the findings for the exploratory stage for both interviews; it is organized based on the type and purpose of the collected information and consists of the following sections:

1. Innovation intermediary demographics
2. Innovation intermediary types (IIs Types)
3. Innovation intermediary commercialization paths
4. Innovation intermediary performances and impacts
5. Innovation intermediary selection criteria (Innovation Readiness)
6. Innovation intermediary stakeholders
7. Innovation intermediary practices and services
8. Innovation intermediary absorptive capacity

It is essential to report that questions in the in-person interviews were informed by the new understandings that were gained from the telephone interviews; that was through the initial analysis for the phone interviews' data.

5.2.1 Innovation Intermediary Demographics

Various demographic information were gathered to explore the differences among innovation intermediaries and to examine the viability of the proposed (provided) options, while simultaneously collecting additional viable options directly from the practitioners.

First, participants were asked to identify their organization's (office/department) age. Average ages for the four innovation intermediary types are presented in Table 5-1. The results indicate that IFOI and UTTO were founded long before CBI and that III is a new type of innovation intermediary with an average age of 5.8 years and a mode age of four years.

In terms of their organization's legal status, the question consisted of 10 options and allowed for multiple responses. Most of the innovation intermediaries (participants) selected only one response. The results indicate significant differences among IIs types based on their legal status, see Table 5-1.

Table 5-1 Demographic Information for the Four Innovation Intermediary Types.

Demographic information/II Types	UTTO	CBI	IFOI	III
Age (average)	15	6	28*	5.8
Legal status	Part of a university, college, or hospital**	An incorporated not-for-profit firm**	Part of a larger incorporated private/public for-profit firm**	An incorporated private for-profit firm***
Location	Co-located with a university, college, or hospital $	Co-located with many $$	Co-located with a large incorporated private for-profit firm $	Not co-located $
Full-time employees (average)	12	10	78 #	21
Number of sectors to serve (average)	6 sectors ←→broad scope +	5 sectors ←→broad scope +	2 sectors ←→ narrow scope	3 sectors ←→ narrow scope

* IFOI has a significantly different age mean compared to CBI and III types [F(3, 30)= 5.572, p = 0.003].
** Fisher Exact Test shows significant differences among innovation intermediary types in these legal statuses ($p < 0.05$).
***III one time was described as private not-for-profit.
$ Fisher Exact Test shows significant differences among innovation intermediary types based on their locations (p =000).
$$ Co-located with all levels of government departments, laboratories, or agencies and with startup for-profit and not-for-profit organizations.
IFOI has a significantly different number for full-time employees, compared to types UTTO, CBI and III [F(3, 30)= 13.384, p = 0.000].
+ UTTO and IFOI have significantly different sectors to serve as follows: [F(3, 30)= 8.64, p = 0.000]. IFOI type (M=1.6, SD=1.34) was significantly different from UTTO (M=5.64, SD=1.63) and CBI (M=4.46, SD=1.61). Additionally, UTTO (M=5.64, SD=1.63) was significantly different from III (M=2.8, SD=1.79).

Furthermore, participants were asked about their organization's co-locations. The question consisted of numerous responses and allowed for multiple responses. However, 75% of the IIs marked only one response. Participants responded that almost 29% of the co-locations were near academic institutes, 25% were co-located near private for-profit corporations, and more than 16% were close to a governmental department, laboratory, or agency. These three highest percentages reflect the importance of the three pillars of innovation, namely university, industry, and government.

Nevertheless, the results show some significant differences among II types based on their locations, as in Table 5-1.

The questions about number of employees included various types of employees such as full-time, part-time, contract and volunteer employees. The mean for the whole sample regarding the number of full-time employees was 22, though the sample ranged between 0 and 120 employees. The results of the ANOVA test reveal significant differences in the means of the four types of innovation intermediaries regarding the number of full-time employees, as indicated in Table 5-1. However, no significant differences are shown for the part-time, contract and volunteer employees.

Finally, in terms of the sector(s) that innovation intermediary served. The question included five main sectors as options, including information and communications technology, energy, medical, manufacturing, and environment. In addition, it allowed participants to submit additional options if they were not satisfied with those provided. The results indicate that the five sectors represented more than 87% of the total responses, while the 'other' option accounted for 12.2% of the responses. The ANOVA results indicate significant differences in the means of the four types of innovation intermediaries with respect to the number of served sectors, as indicated in Table 5-1. It is interesting to note that innovation intermediaries from the UTTO and CBI types rarely have only one sector to serve; rather, they tend to serve a broader number of sectors compared to IFOI and III types who tend to serve a narrower field.

5.2.2 Innovation Intermediary Types (IIs Types)

Participants were asked to express their perceptions as to which innovation intermediary definition most appropriately fit their organizations. The question is based on self-reports regarding how each innovation intermediary sees his or her organization matching with one type rather than with another type. At the same time, the question provides an option for participants to add a new innovation intermediary type if they are not satisfied with the four proposed types. Accordingly, this question aids in classifying participants (the innovation intermediaries) into the suggested types, facilitates in investigating how experts perceive these four types, and explores additional suggested types.

A total of 34 responses were received for this question. It shows that participants had accurate perceptions about UTTOs and IFOIs, but not about CBIs and IIIs, as IIIs were sometimes described

as CBIs and CBIs were sometimes described as IIIs. It was noted that most of the participants were satisfied with the four proposed types, as there were few suggestions to add a new type of innovation intermediary. In addition, some innovation intermediaries perceived themselves as being of more than one type simultaneously, while other innovation intermediaries had varying opinions as to which type fit whom.

Thus, these new understandings led researchers to ask a revised question that would capture these opinions during the in-person interviews. The new responses, as a result, offered two types of classification for each participant: self-classification (self-report) and classification by others (one to three).

A total of 29 responses were collected for this in-person question, and again, it was concluded that the participants had a good understanding of UTTOs and IFOIs but were less clear about CBIs and IIIs. Thus, clarification of the definitions of CBIs and IIIs was recommended for the next phase. Moreover, while the same innovation intermediary can share characteristics of more than one single type, the innovation intermediary will have a greater portion of one type (51% or more) than another type. Thus, having participants select one type out of the suggested four types remained valid. In addition, after testing and comparing self-classifications (self-report) with classification by others and with research team's classification, it was concluded that self-reporting is the most appropriate and accurate method for obtaining classification for innovation intermediary types. Therefore, self-classification was recommended for the next phase.

5.2.3 Innovation Intermediary Commercialization Paths

Participants were asked about their organizations' commercialization strategies in the two interviews. The response in phone interviews were based on self-report, while the in-person interviews included both self-report and judgment by neighbors; as well, the phone interviews allowed for several responses, whereas in-person interviews identified the commercialization path preference for each II type (i.e. allowed for one option only).

Although 33 innovation intermediaries (participants) answered the phone interviews, 91 responses were collected. The additional responses were because participants were allowed to provide more than one response and/or were allowed to suggest additional options if they were not satisfied with

the options provided. In fact, participants offered 19 additional suggestions. However, most of the suggested strategies were not perceived as commercialization paths/strategies by the research team, but rather, were perceived as practices and activities toward commercialization (see Appendix N-2). The remaining suggested strategies are similar to those in the provided options. As well, 14 additional practices and activities toward commercialization, but not actual commercialization paths were suggested by participants in the in-person interview (see Appendix N-2). Thus, none of the suggested options were added to the list of provided options. However, this outcome emphasizes a major concern in that there are possible misunderstandings among innovation intermediaries with respect to commercialization paths/strategies.

From the analysis of the responses regarding self-reported commercialization paths, the Fisher Exact Test shows significant differences among innovation intermediary types only for the 'build' (startup) path ($p = 0.003$). With respect to the analysis of the perceptions of others regarding their neighbors' commercialization paths, the Fisher Exact Test shows significant differences among innovation intermediary types for the 'sell' (acquiring) ($p = 0.000$), 'rent' (exclusive licensing) ($p = 0.000$), and 'build' (startup) ($p = 0.000$) paths. These statistics, and combined with the number of times the IIs mentioned each commercialization path option, indicate that IFOI types favor the 'sell' (acquiring) option, as 6 out of 7 IIs in the IFOI category are perceived by others to favor the 'sell' (acquiring) path. Similarly, the analysis indicated that UTTO intermediaries favor the 'rent' (exclusive licensing) path and that CBI and III types favor the 'build' (startup) path. These results, increased our understanding of how IIs perceived commercialization paths, and encouraged our initial prepositions toward confirming the hypothesis.

5.2.4 Innovation Intermediary Performances and Impacts

Questions in this section focus on how innovation intermediaries measured their own success. In addition, participants were asked to compare themselves with peers from the same region/city to extract factors used to measure their peers', and their own impacts and contributions to their communities and regions. Accordingly, the following provided analyses of four questions from the phone interviews and one question from the in-person interviews.

Participants were asked to explain how their organizations measured and reported their own success. The question allowed for multiple responses and permitted participants to suggest additional options if they are not satisfied with the provided list of options. From 34 innovation intermediaries (participants), 185 responses were collected (see Appendix N-3). UTTO has the highest average of number of metrics indicators (8), while the averages for CBI, IFOI, and III are 5, 4, and 5, respectively. All provided options and suggested options (31) are classified into the following three general categories:

1. Direct metrics, (indicators that measure direct activity of innovation intermediaries);
2. Indirect metrics, (indicators that measure success through clients); and
3. Indirect metrics (indicators that measure success through impacts on community and region).

The responses to this question indicated that innovation intermediaries are successful in producing new performance metrics. To our knowledge, some of the suggested metrics have not been previously reported in the literature.

Further, responses to the related question contributed additional factors that innovation intermediaries used to measure their impact on the community, in general, and on the region within which they were located, in particular. Based on the content analysis steps described in Section 5.1, a total of 32 factors were collected from participants. These factors were classified into four main categories: improve commercialization of the ecosystem, help generate jobs, contribute to the economic development of the region/province and nation, and increase revenue and wealth for individuals/firms and the government (Appendix N-4).

In next sections, by using various theoretical lenses, the similarities and differences among the innovation intermediary types were examined. The first lens was that of the stakeholder, the second was the innovation readiness lens, and the third was the absorptive capacity lens. In addition, innovation intermediaries' practices were investigated to assess if there were any significant differences among II types. Accordingly, innovation intermediaries were asked to compare themselves with peers from the same region/city and then, the study extracted the factors that they used to differentiate themselves from their peers.

5.2.5 Innovation Intermediary Stakeholders

This section reports the findings that are related to stakeholders in the context of innovation intermediaries who facilitate research commercialization; in particular it informs the confirmatory study about the main stakeholders and operational funders for IIs; and it lists the various resources that stakeholders provide to IIs; and who are the clients of IIs in general. For this reason, participants were asked many questions about their stakeholders.

The initial two question asked about their partners or stakeholders who help them in their operation as innovation intermediaries; and about the sources of operational funds[53] of the stakeholders.

Participants suggested additional partners/funders and suggested the merging of others. The results indicate that the average response was four main partners or stakeholders per participant (innovation intermediary). The III types reported the highest average, six, as the number of main partners or stakeholders compared with the other types of innovation intermediaries (see Table 5-2 and Appendix N-5 for more details). Similarly, the average response was more than three fund sources per participant (details presented in Table 5-2)

The results shed light on the four main stakeholders and on which stakeholder is most relevant for the various II types. As well, it indicates significant differences in dealing with stakeholders and sheds light on the three main funding stakeholders; the Fisher Exact Test shows significant differences among innovation intermediary types in terms of source from university, college, or hospital ($p = 0.02$); provincial government ($p = 0.007$); and parent firms ($p = 0.00$). The results also show potential differences among other sources, such as private and industry partners ($p = 0.065$) and municipal government ($p = 0.109$).

This observation leads to the following question: How do the differences among innovation intermediary types, with respect to favoring stakeholders and with respect to their dependence on a particular stakeholder or on multiple stakeholders, affect the practices, services, commercialization strategies/paths, and performances of each II type?[54]

[53] The results show that many participants had difficulties distinguishing between operational funding and funding that is pursued by their clients to commercialize inventions. Operational funding is the money that is used for rent, salaries, and day-to-day operational expenses by participants to function as innovation intermediaries.

[54] It was answered by the confirmatory study in Chapter 6 and Chapter 7.

Table 5-2 Stakeholders as Operational Partners/Sources of Funds Corresponding to II Types.

#	Main Stakeholders	As	UTTO	CBI	IFOI	III	Total
How many stakeholders (average)?		Operational partners	4.3	3.45	2.5	6	4
		Funding source	3	3.7	2.8	3	3
1	University and community college	Operational partners	10	8	3	4	25
		Funding source	10	5	0	3	18
2	Government (all levels)	Operational partners	8	9	3	4	26
		Funding source	11	12	3	2	28
3	Private for-profit company (parent firm)	Operational partners	3	7	4	4	19
		Funding source	4	11	5	2	21
4	Financers (ending institution, venture capital, angel investor)	Operational partners	3	5	0	4	12
		Funding source	-	-	-	-	-
Total		Operational partners	11	13	5	5	34
		Funding source	11	13	5	5	34

Furthermore, participants were asked if they received any support from universities, and if so, what type of assistance did they receive?[55]

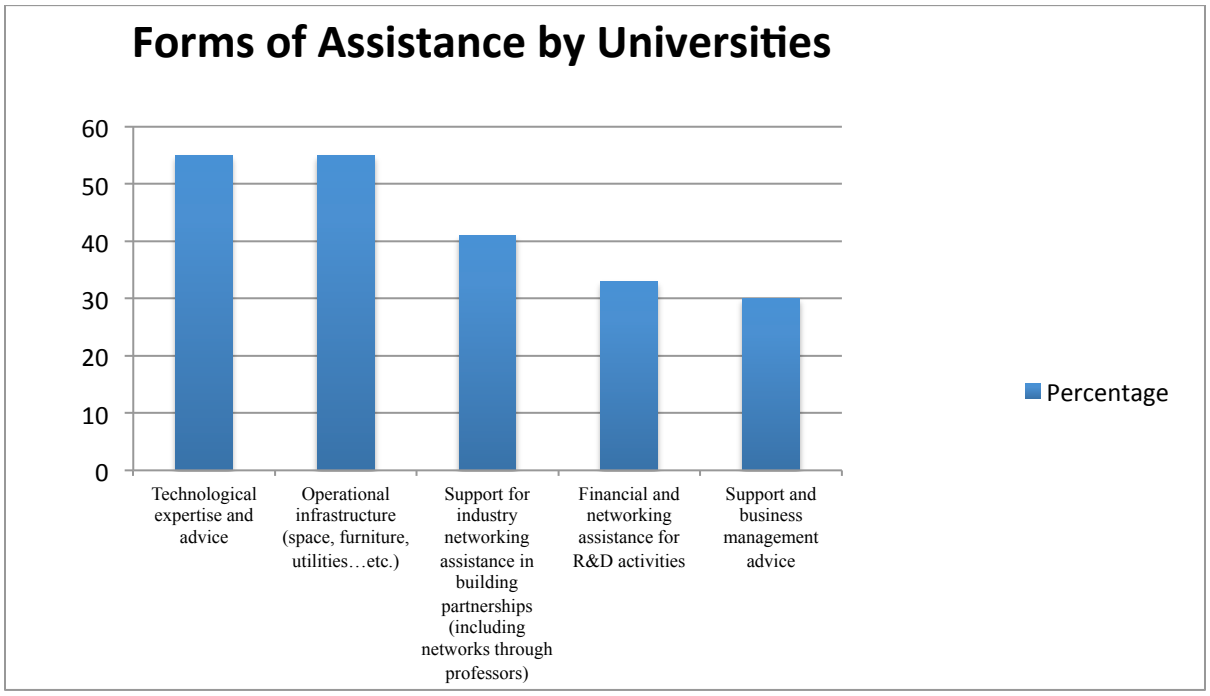
Most of the participants (80%) affirmed that they received assistance from a university, with average of three forms of assistance per participant. The top five forms of assistance that universities provide to innovation intermediaries are presented in Figure 5-1. Fisher Exact Test shows significant differences in means among II types with respect to receiving operational infrastructure (space, furniture, utilities, etc.) ($p = 0.016$), and in terms of receiving financial support for operational costs (including salaries) ($P=0.003$). UTTO type uses both types of assistance more than the other IIs types.

Moreover, in terms of IIs' regular clients, participants suggested additional clients and suggested the merging of others. The average response was approximately four types of clients per participant. The top five clients that were served by various types of innovation intermediaries are: 'Internal and/or external inventors who create new uses for technologies (includes entrepreneur)', 'Internal and/or external researchers who create new technologies from research results', 'Other organizations

[55] Some UTTO participants found it difficult to state that they received assistance from a university as they identify themselves as part of a university, and accordingly, to them assistance expression is only appropriate for external parties.

(who work on technology transfer and commercialization)', and 'enterprises who may be receptors of new technologies or knowledge'. Moreover, the result shows that the IFOI types had strong associations with their parent firms (plant) as their main and sole clients (Fisher Exact Test, p = 0.000), while UTTO types associated with internal researchers who created new technologies from research results (p = 0.041) more so than with any of their other clients. On the contrary, CBI types, in comparison with the other three II types, have the highest association with entrepreneur clients (p = 0.004) and have a similar high association (not significant) with internal and/or external inventors who create new uses for technologies. This result, in turn, highlights the internal and external approaches of clients regarding the various types of II.

Figure 5-1 Forms of Assistance by University Stakeholders



Finally, to capture any other factor that describes stakeholders in the context of innovation intermediary, we asked about how innovation intermediary experts distinguish between innovation intermediary types with respect to the important stakeholders that the IIs are to satisfy. In addition, the evaluations of these factors were captured.

As a result, and by following the content analysis steps as described in Section 5.1, 84 factors were extracted from the participants' responses regarding the above question. These 84 factors were then classified into 24 categories (see Appendix N-6), and the 24 categories were then re-classified into five main category groups: stakeholder names, stakeholder characteristics, stakeholder resources, resource types, and clients as stakeholders.

In addition to the other four stakeholders that were captured in previous questions, participants highlighted community/society and province/region as important stakeholders. However, there were no significant differences among II types in terms of how many times each type mentioned each particular stakeholder. With respect to the four main categories - stakeholder characteristics, stakeholder resources, resource types, and clients as stakeholder - a statistical ANOVA test shows significant differences in means among the IIs. These results indicate that the stakeholder lens is a valid approach for comparing and contrasting II types among each other, and it also indicates that perceived importance of stakeholders and dependency on stakeholders could explain the various types of innovation intermediaries. That in turns supports the frameworking for the confirmatory stage and advocates Stakeholder Influence Strategies Theory (Frooman, 1999) to explain IIs types as discussed in Chapters 3, 6 and 7.

In addition, this section identifies the main stakeholders and those who funded the operation of IIs, and identifies the various sources that stakeholders provide to IIs; as well, it identifies comprehensive list of clients who are potential users of the services of IIs. That in turns assists the scale development/modification for the confirmatory stage as it was discussed in Section 4.2.1.

5.2.6 Innovation Intermediary Selection Criteria (Innovation Readiness)

This section reports the findings that are related to innovation readiness criteria in the context of innovation intermediaries who facilitate research commercialization; in particular it informs the confirmatory study about the main constructs of innovation readiness; and it lists the various criteria that IIs used.

Thus, participants were asked about their selection criteria[56] when choosing technology, startup, or individual/entrepreneur in order to provide help to them to facilitate their commercialization process.

Of the respondents, 94% affirmed that they have a selection process; however, 65% affirmed that they have a referral process for rejected applications. All IFOI types said that they do not have a referral process for rejected applications, while all III types claimed that they do have a referral process for rejected applications ($p = 0.034$).

In addition, each participant was asked to identify the three most important criteria for the selection process. While the participants identified many criteria[57], by following the content analysis steps as described in Section 5.1, 64 factors were extracted and were then classified into five categories: 'Focus on technology/idea/invention', 'Focus on market/commercial/customers', 'Focus on individual/entrepreneurs', 'Focus on company/startups/new venture/parent firms, and 'Focus on funding/money' (see Appendix N-7). An initial analysis indicates that while innovation intermediary types have similar groups of criteria, each type prioritizes the criteria somewhat differently.

Furthermore, to capture any other factor that could explain innovation readiness in the context of the innovation intermediary, we asked how the innovation intermediary experts distinguish between innovation intermediary types in terms of important criteria used in selecting applications. In doing so, we also captured evaluations of these factors.

As a result, and by following the content analysis steps as described in Section 5.1, 92 factors were extracted from the participants' responses to the above question. These 92 factors were re-classified into 13 categories (see Appendix N-8).

The results tend to confirm that while innovation intermediary types identify similar groups of criteria, each type prioritizes the criteria somewhat differently. The results also show that participants emphasize five main constructs, though some of them are significantly different based on II type (see Appendix N-9).

[56] Various comments were received regarding the selection process. For example, some participants, particularly those from the UTTO type, stated, "It is a review process, not a selection process". Others said, "We review all invention disclosure and help all researchers who disclose their inventions", and "We do not reject any, we just return it with suggestions for more information or improvement". Other participants stated, "It is an informal selection process" that is based on individual cases.

[57] Participants were free to articulate what they believed to be criteria, with the condition that their responses are ordered from most important to least important.

These results indicate that the innovation readiness lens is a valid approach for comparing and contrasting II types among each other. Furthermore, it compelled us to consider an investigation regarding the relation of innovation readiness and stakeholders for each type of innovation intermediary. In addition, this section identifies/confirms the main constructs of innovation readiness, and identifies the various criteria under each construct of innovation readiness. That in turns assists the scale development/modification for the confirmatory stage as it was discussed in Section 4.2.1.

5.2.7 Innovation Intermediary Practices and Services

This section reports the practices and services[58] that innovation intermediaries perform in the context of facilitating research commercialization. Participants were asked to provide the three most important practices; they were free to articulate what they believed to be a practice, with the condition that they provide the three that represent the most important ones. In total, participants identified 84 practices that were classified into 12 categories (see Appendices N-11). These 12 categories represent the main practices identified by all IIs. From this, an important question was highlighted: Does each II type have its own set of practices, and if so, what are they?

To answer this question, an analysis of the suggested practices was conducted on the basis of the type of participant who provided the suggestion. The highest three percentages[59] for practices mentioned by type of II represent the three most important practices for that particular type of II (See Table 5-3).

The practices for each type indicate that UTTO and IFOI types focus more on the idea of invention, while CBI and III types focus on entrepreneurships and new ventures (startups) more than on the idea. In addition, by examining each type and its three most important practices, we find congruence with previous findings. For example, the three important practices for UTTO types align with the other findings that UTTO types prefer the commercialization path of ‘rent’. Similar findings hold for the other types.

[58] Services are described in Appendix N-10
[59] Percentage of the number of instances each practice was mentioned by each type of innovation intermediary.

Table 5-3 Top Practices Performed by II Types

#	II Types	The most important practices
1	UTTO	1. Patent management practice 2. Licensing practice 3. Funding practice
2	CBI	1. Coaching, mentoring, training and education practice 2. Business model/plan development practice 3. Funding practice
3	IFOI	1. Invention disclosure/idea generation practice 2. Patent management practice 3. Prototype practice
4	III	1. Coaching, mentoring, training and education practice 2. Networking practice 3. Funding practice

In conclusion, this section highlights that each II type has a largely different focus regarding practices; as well, it identifies comprehensive list of practices that are performed by IIs. That in turns assists the scale development/modification for the confirmatory stage as it was discussed in Section 4.2.1.

5.2.8 Innovation Intermediary Absorptive Capacity

This section helped toward understanding and measuring the four main constructs of absorptive capacity, i.e., acquisition, assimilation, transformation and exploitation, in the context of the innovation intermediary; hence, experts (participants) were asked about the factors they used to distinguish innovation intermediary types when searching for relevant information to facilitate commercialization of ideas or inventions. Additionally, the participants/experts were asked, in a separate question, about the factors they used to distinguish innovation intermediary types in terms of their ability to support the development of prototypes to validate opportunities[60].

[60] The interview process also studied and encapsulated the evaluation of each factor that participants used to distinguish IIs.

By following the content analysis steps as described in Section 1.5, 96 and 89 factors, respectively, were extracted from the participants' responses to the above questions (see Appendix N-12 and N-13 respectively). Both groups of factors were then re-classified into 16 categories, 11 of which comprise the four absorptive capacity constructs.

Investigating these categories has aided us in investigating the four constructs, which ultimately lead to understanding the two main blocks of absorptive capacity: potential and realized absorptive capacity (Zahara & Gorge, 2002). By considring potential and realized absorptive capacity, it is possible to investigate the concept of absorptive capacity in the context of commercialization by IIs. IIs differ significantly with respect to absorptive capacity toward commercialization practices and services. In particular, as IFOI types have higher absorptive capacity than III and CBI types, they are more able/capable of acquiring, digesting and transforming relevant information and then exploiting it for commercial use with the purpose of invention commercialization. Details regarding the differences in absorptive capacity among the various II types are presented in Appendix N-14 and Appendix N-15.

In conclusion, this section highlights that each II type has a different level of absorptive capacity; as well, it identifies how absorptive capacity can be measured for IIs. That in turns indicates that the absorptive capacity lens is a valid approach for comparing and contrasting II types among each other; also, the result assists the scale development/modification for absorptive capacity for the purpose of the confirmatory stage as it was discussed in Section 4.2.1; however, this lens was not used in the confirmatory stage to keep the study traceable and was left for future study.

5.3 Conclusion for the Exploratory Study

This study includes an exploratory stage consisting of two phases (two rounds of interviews): a telephone and an in-person interview. Data from both interviews were analyzed together and conclusions were reported based on the concepts that were investigated. The study aimed to explore and examine the validity of the proposed types of innovation intermediaries. In addition, it investigated many lenses as may help to extract experts' opinions regarding the four types of IIs. Furthermore, commercialization strategies and specific demographic information have been investigated.

The study indicates that while the four proposed types of innovation intermediaries are perceived differently by experts, the experts agree that an innovation intermediary falls into one or more types of the proposed categories, and they suggest that no additional types need be considered. In addition, experts suggested that each type has its own dominant commercialization path (strategy) toward the market.

Moreover, much of the demographic information provides solid ground for comparing and contrasting II types. For example, the various II types have different legal status, locate next to different entities, and serve varying numbers of sectors.

In addition, many factors and items for various concepts are found: stakeholder, innovation readiness criteria, absorptive capacity, impacts and practices/services and were extracted to inform the development of scale (as discussed in Section 4.2.1); though, it helps offer comprehensive list of items for what practitioners meant by each concept in the context of IIs, it also helps to confirm many of the items that were extracted directly from the literature; as well, it helps in wording the items by using vocabulary and expression that were familiar for those who work in the fields of IIs.

Furthermore, the study shows that the following lenses - stakeholder theory, innovation readiness, absorptive capacity theory and practices - are valid as approaches to compare and contrast II types among each other.

Nevertheless, the question of how these lenses interact with each other to explain the types of innovation intermediary requires further study. We must investigate how favoring one particular stakeholder over other stakeholders influences the innovation intermediary's strategy.

Chapter 6
Findings of the Confirmatory Study

The aim of this research was to expand our understanding of various types of innovation intermediaries which facilitate the commercialization of research results. This study uses stakeholder and business orientation lenses to explore which main stakeholders influence which II types, and to determine the impact of that influence on each II's operational strategy. Chapter 3 demonstrates the underlying theories of stakeholder influence strategy and business orientation (technology push and market pull), while Chapter 4 described the methods used in this research to explore and develop the scale items that were used in developing the survey.

This chapter analyzes the collected data twice by using different independent variables as discussed in Section 6.1. First, this section begins by examining several statistical assumptions and employing principal component analysis (PCA) to reduce the variables. Reliability and validity are checked for all multidimensional constructs. Next, two similar sections each comprised of two parts with many subsections are dedicated to test the whole suggested model and hypotheses through the use of different independent variables. Several statistical analyses techniques are employed to analyze the data; finally, CMV is revisited and examined statistically. The chapter ends by presenting conclusions for the findings of all analyses that have been conducted.

6.1 Analytical Method

In this chapter, analyses for collected data are performed using two similar approaches. The first approach uses the independent variable[61] that was extracted from the respondents' answers (i.e. self report) (see Section 6.5.1), while the second approach uses the independent variable that was extracted empirically by following the clustering procedure (see Section 6.6.1). Dependent variables are the same in both approaches. In fact, two sets of hypotheses are investigated in each approach:

[61] The independent variable includes the data of the groups to which each participant belongs.

one assesses the relation between II types and the main stakeholders; while the other examines IIs' operational strategies through four aspects of commercialization paths, clients, objectives, and innovation readiness.

The purpose of conducting the analysis through these two approaches was to expand our understanding of the IIs and their types by being open to various empirical suggestions for classification, in addition to the IIs types that were based on self-report. This understanding allowed us to compare and contrast the two findings, and identify when there was consensus or disagreement. Thus, this process helped to validate the findings and reduce the effect of potential bias that is generally associated with self-report research. Finally, the clustering analysis made it possible to detect possible new groups that were not perceived through the self-reported identified II types.

6.2 Tests of Statistical Assumptions

In this study, multiple tests for the data were run to check certain assumptions that were required to perform particular analysis. These tests were performed with results reported in each required section. For instance, in Sections 6.3, 6.5, and 6.6, the assumptions for PCA, regression, multi-regression, MANOVA, ANOVA and one-way repeat measure ANOVA tests were checked for each construct. All results for these tests are reported in a particular Supplementary Appendix corresponding to each section.

6.3 Preparing the Data for Analysis

The nature of this study, the method of data collection, and the number of variables for each concept made it necessary to employ this special preparation step. Many issues needed to be resolved: 1) unrelated variables needed to be removed from the concepts where they did not belong, 2) one or more highly correlated variables needed to be reduced into a single variable, and 3) multicollinearity needed to be removed or reduced to a minimum to make it possible to run ANOVA and similar tests. Therefore, Principal Component Analysis (PCA) was suggested to handle these issues and to produce component scores that can be used in any follow-on analysis[62] (Hair et al., 2010). Indeed, PCA is a technique that uses mathematical principles to transform many correlated variables into a lesser number of linearly uncorrelated variables that are called principal components (Jolliffe, 2002). Although, in practice, some researchers tend to use principal components analysis interchangeably with factor analysis, there are conceptual differences between them; one of the main conceptual differences is that the retained PCA components account for the maximum variance that includes common and unique variance in the data; while Factors that result from factor analysis account only for the common variance. Furthermore, PCA is suitable for this study as it helps to combine many items and produce a score to represent them. General requirements, assumptions and procedures to perform PCA were discussed in detail in Appendix O; as well, steps to assess the suitability of conducting PCA for each concept and indicators to decide the number of components to be retained in a PCA procedure were listed in Appendix O; finally, discussion about the usefulness of rotation in a PCA procedure, what rotation methods are available, and how to choose among them is explained in Appendix O.

Generally, after meeting and satisfying the requirements and assumptions (see Supplementary Appendix O for an example), a lot of the time and effort was spent in determining how many components to extract; as a result, for all concepts in this study, components were retained after considering the visual inspection of the scree plot, the eigenvalue and the proportion variance cutoff value, and after meeting the interpretability criterion that exhibited 'simple structure' (Thurstone, 1947).

[62] Many studies use the approach of using either PCA's scores or the average of all items of the construct in a follow-on study (e.g. Carlson & Perrewe, 1999).

Moreover, PCA procedure includes the step of selecting rotation to be employed. Researchers tend to use Varimax and Oblimin method for orthogonal and oblique rotations respectively; Vogt (1993, p. 91) suggested that selection of the rotation "is done differently depending upon whether the factors are believed to be correlated (oblique) or uncorrelated (orthogonal)." In this analysis, based on Vogt (1993) recommendation, some PCA were performed using Oblimin method (oblique); while other PCA were performed by using Varimax method (orthogonal).

6.3.1 Principal Component Analysis PCA for All Constructs

PCA was performed for many constructs using 159 samples.[63] This section presents components' names and explains variances for each concept, while component loadings and communalities of the rotated solution are listed in a table for each concept in Supplementary Appendix O.

For the purpose of making this section informative and simple, all constructs are reported under two groups of constructs: stakeholder related constructs and operational strategy constructs. Accordingly, three tables (Table 6-1, Table 6-2 and Table 6-3) include information about number of items and components for each construct. As well, components' names and the variances that are explained by each component and by the whole construct are presented. Rotation method and interpretation of each construct are provided at the bottom of each table and in the footnotes, respectively. Finally, components' scores for all constructs are used in Sections 6.5 and 6.6 to compare and contrast II types and clusters, respectively among themselves.

[63] The sample size was 159 after removing the four outliers that were identified in the clustering procedure (see Section 6.6) to make both analyses comprisable.

Table 6-1 Rotated Components for Stakeholders Related Constructs

Constructs	Components Name*	# Of Items	Variance Explained
Stakeholders' Salience Level[64]	Community Salience Level	4	22.74%
	Financier[65] Salience Level	4	17.14%
	Industry[66] Salience Level	4	11.99%
	Government Level of Importance	4	9.42%
	Educational Institution[67] Salience Level	4	8.81%
	Overall	**20**	**70.10%**
Stakeholders' Level of Influence[68]	Educational Institution Level of Influence	3	24.88%
	Financier Level of Influence	3	16.45%
	Government Level of Influence	3	11.44%
	Industry Level of Influence	3	10.49%
	Community Level of Influence	3	8.41%
	Overall	**15**	**71.66%**
Dependency on Stakeholders[69]	Dependency on Educational Institution	11	22.07%
	Dependency on Industry	10	17.75%
	Dependency on Government	11	7.43%
	Dependency on Financier	10	7.08%
	Overall	**44**	**53.34%**
Stakeholders Dependency on IIs[70]	Educational Institution Dependency on IIs	8	21.32%
	Government Dependency on IIs	8	16.87%
	Financier Dependency on IIs	8	10.40%
	Industry Dependency on IIs	8	7.64%
	Overall	**32**	**56.22%**

* All constructs used Oblimin rotation as components are expected to have some correlation among each other, as there is no single stakeholder can work with isolation of other stakeholders' interaction.

[64] PCA indicates that measuring the importance, power, legitimacy and urgency for each stakeholder is in fact measuring the salience of stakeholder.
[65] For simplicity, "Financier" will be used instead of "Financier (funding partner, shareholder)" after this point.
[66] For simplicity, "Industry" will be used instead of "Industry (and/or parent firm)" after this point.
[67] For simplicity, "Educational Institution" will be used instead of "Educational Institution (university, college)" after this point
[68] PCA indicate that measuring the stakeholders' contribution to organization's (IIs) strategy, ability to withhold support to organization (IIs) and request of performance metrics reports from organization (IIs) is in fact measuring the level of influence of each stakeholder.
[69] PCA indicates that measuring the dependency of stakeholders on IIs are in fact measuring the level of the dependency of each stakeholder on IIs.
[70] PCA indicates that measuring the dependency of IIs on stakeholders are in fact measuring the level of the dependency of IIs on each stakeholder.

Table 6-2 Rotated Components for Operational Strategy Constructs (Part One)

Constructs	Components Name*	# Of Items	Variance Explained
Clients[71]	External clients (Individual, Entrepreneurs, New Venture, Establish Firms, Partners and Other IIs)	7	33.20%
	University Clients (Internal Clients, Professors, Students)	3	22.98%
	Clients from Hospitals and Research Center	2	13.4%
	Overall	**12**	**69.58%**
IIs Objectives[72]	Improve the Economic Performance of the Local Community	6	32.35%
	Increase the Financial Success for Companies	3	13.71%
	Support Entrepreneurs/Start-ups Activity	4	8.16%
	Generate Benefits to Self and other Partners	2	6.05%
	Promote Local Industry by Commercializing Technologies	4	5.49%
	Increase the Sustainability of Success for Companies	3	5.03%
	Overall	**22**	**70.80%**
Commercialization Paths[73]	Sell	4	61.36%**
	Rent	4	61.78%**
	Rent_nv	3	65.39%**
	Build[74]	1	N/A***
	Overall	**10**	**N/A****

* All constructs used Oblimin rotation as components are expected to have some correlation among each other.
** Each of these components' explained variance was calculated separately; thus no overall explained variance.
*** No PCA was run for this path, as it has only one item to measure it, see Footnote (73 & 74).

[71] PCA indicates that measuring the extent to which IIs provide commercialization services to the 12 types of clients in fact measures the extent to which IIs provide commercialization services to three groups of clients as in components column.
[72] PCA indicates that there are six main objectives for IIs.
[73] According to Pries (2006), knowing the basis of commercializing an invention (exclusive or non-exclusive rights), the purpose of using an invention (product development or manufacturing and distribution), the rights to further develop the technology (to inventors or to commercializing firms), and the returns from technology (fixed license, royalties, and/or equities) will work as a proxy to calculate the commercialization paths; 'BUILD' is the only path that can be measured directly; thus, the three combinations of variables is based on Pries (2006) suggestions.
[74] Z-score was calculated for 'BUILD' in order to be consistent when comparing all new scores for commercialization paths, as the results of the other three paths that were calculated by using PCA were standardized.

Table 6-3 Rotated Components for Operational Strategy Constructs (Part Two)

Constructs[75]	Components Name*	# Of Items	Variance Explained
Idea/Technology Construct of Innovation Readiness	Synergy between capability of IIs and the proposed idea	7	16.84%
	Potential societal and environmental benefits from the idea	3	12.97%
	Originality of the idea	4	12.31%
	Innovation level of the idea (radical vs. incremental)	3	9.64%
	Financial aspects related to the idea	2	7.87%
	Uniqueness of the idea	2	7.44%
	Overall	**21**	**67.08%**
Market Construct of Innovation Readiness	Expected fit between market need and the proposed solution	6	30.48%
	Path to market	3	20.66%
	Potential opportunities in the targeted market	3	19.71%
	Overall	**12**	**70.84%**
Entrepreneur Construct of Innovation Readiness	Entrepreneur engagement	4	33.53%
	Entrepreneur capabilities	6	32.70%
	Overall	**10**	**66.23%**
New Business Venture Construct of Innovation Readiness	Viability of the new business venture	6	16.70%
	Potential successful growth of the new business venture	5	15.57%
	Potential contribution to local societal and environment	4	13.75%
	Scope of the new business venture	3	9.59%
	Scientific and technology foundation of the new business venture	3	7.85%
	Payback potential of the new business venture	2	7.80%
	Overall	**23**	**71.25%**

* Varimax rotation was used because all components/factors for each construct were assumed to be uncorrelated (orthogonal).

[75] The result of PCA procedure helped in identifying the main factors/components for each of the four constructs of Innovation Readiness, as well as in calculating their scores; accordingly, the resulting components were expected to be superior criteria for each of these four constructs.

6.4 Reliability and Validity

Reliability and validity of the constructs that comprise the model were tested. Particularly, two groups of the constructs indicated in Chapter 3 were examined. The first group is called stakeholder related constructs, and includes four main constructs; the second group is called operational strategy constructs, and includes seven constructs.[76] The following subsections further illustrate what tests were done and what constructs were assessed.

6.4.1 Reliability Test

A reliability test provides evidence for the extent that a variable or a set of variables have minimum level of measurement errors; in other words, high reliability indicates low measurement error (Hair et al., 2010). Many researchers define reliability as the extent to which stable and consistent results are produced for what is intended to be measured (Nunnally, 1978; Hair et al., 2010). Although many tests are available to assess reliability, numerous researchers have used Cronbach's alpha[77] to evaluate reliability (Nunnally, 1978; Bagozzi & Yi, 1988; Hair et al., 2010). Cronbach's alpha with values of 0.7 and above represent good reliability; however 0.6 is acceptable, especially for research of an exploratory nature (Hair et al., 1998). Table 6-4 shows the values of Cronbach's alpha for all main constructs of this research. All values are greater than 0.7, which indicate high internal consistency and reliability for all items and constructs.

Only four constructs have alpha values between 0.7 and 0.6, which are still acceptable (Hair et al., 1998). Two components/factors from the construct 'Idea/Technology Construct of Innovation Readiness' and one component/factor from the construct 'IIs Objectives' were removed from the model due to their low alpha values (see Appendix P for details). As well, six items from various constructs were removed. Such removal has been recommended by scholars particularly in cases when alpha value improves after eliminating these item(s) (e.g. Hair et al., 2010). Tables in Appendix P show the items that were removed.

[76] Four out of these seven constructs comprise Innovation Readiness.
[77] Cronbach's alpha is a coefficient to assess how a set of items are closely related as a group.

Table 6-4 Reliability Coefficient for Main Constructs

Constructs	# Items	Cronbach's Alpha
Stakeholders' Salience Level	20	0.817
Stakeholders' Level of Influence	15	0.755
Dependency on Stakeholders	44	0.907
Stakeholders Dependency on IIs	32	0.867
Clients	12	0.774
IIs Objectives	22	0.900
Commercialization Paths	10	0.860
Idea/Technology Construct of Innovation Readiness	21	0.823
Market Construct of Innovation Readiness	12	0.916
Entrepreneur Construct of Innovation Readiness	10	0.876
New Business Venture Construct of Innovation Readiness	23	0.901

6.4.2 Convergent and Discriminate Validity

Face validity, convergent validity, and discriminate validity are three components of the research validity (Malhotra, 1996; Hair et al., 2010). Face validity was examined and established, as presented in Section 4.2.1.2 and Section 4.2.2.5. Convergent validity and discriminate validity, both of which are part of the construct validity, are discussed next.

Convergent validity is the degree to which items of a particular construct have high variance in common (Malhotra, 1996; Hair et al., 2010); while discriminate validity is the extent to which different constructs are indeed distinct and uncorrelated (Churchill, 1979; Hair et al., 2010). The results of PCA in this chapter provide good evidence of both convergent and discriminate validity. All items have a load of 0.5 or higher of their corresponding constructs; [78] as well, they show explained variances of 50% or higher (Segars, 1996; Hair et al., 2010). Further, the same items show a low load of other constructs that are not their corresponding constructs confirm their discriminate validity. See Table 6-1, Table 6-2, Table 6-3, and Supplementary Appendix O for all tables representing PCA for all constructs of this research.

[78] Corresponding constructs are based on the design of the survey as established through the face validity in Section 4.2.1.2 and Section 4.2.2.5.

6.5 Findings Based on II Types Suggested by Literature and Exploratory Study

In this section, analyses of all hypotheses were performed by using IIs types that were extracted from respondents' answers as the independent variable. Four types of IIs were used: UTTO, IFOI, CBI, and III. Section 6.5.1 explains how respondents' answers were mapped to these four types of IIs. Next, the investigated model was divided into two parts. The first part examined hypotheses one to six (Section 6.5.2). These hypotheses checked the relation between II types and their stakeholders. In particular, four stakeholder-related concepts were analyzed: stakeholders' salience level, level of stakeholder dependency on IIs, level of IIs' dependency on stakeholder, and level of stakeholder influence. In addition, relationships among these concepts were investigated, particularly in terms of how stakeholders' salience level and the level of IIs' dependency on stakeholders explain the stakeholders' influence level. The second part examined IIs' operational strategy in terms of four aspects of commercialization paths, clients, objectives, and innovation readiness. This corresponds to hypotheses seven through ten; and is described in Sections 6.5.3 through 6.5.6. This section concludes with a summary that includes tables that identify which hypotheses were supported and which were not (see Table 6-25 and Table 6-42).

6.5.1 Self Identified II Types

Respondents' answers for Question two were used to identify the group to which each participant belongs. This represents the groups based on self-report. In Question two, participants were asked to 'select the one statement that best describes themselves;' thirteen statements were provided include the 'other' option (as in Table 6-5). The responses were mapped into four groups (as in Table 6-5). These four groups were introduced and defined in Section 2.3 based on the Stakeholders Strategy Influence Theory. Accordingly, the 159 samples[79] for this study were mapped (based on their self-report) into 83, 14, 2, and 55 for the group/type UTTO, CBI, IFOI and III respectively. Five responses answered 'other'; hence they have been mapped to 'other' rather than any of the four types. As indicated in Chapter 4, the third type 'IFOI' was removed from the study, because there were almost

[79] Out of the 163 total samples, only 4 outliers were detected in the clustering procedures and removed to make both findings (self-grouping vs. clustering grouping) comparable and based on the same observations.

no responses from IFOI. Thus all analysis in this section investigated three groups/types of IIs: UTTO, CBI and III.

Table 6-5 Mapping of Question Two into the Four Groups of IIs

	Question 2 Statements Option	Groups	Samples
1	I am from a technology transfer office (or equivalent) that is associated with an Educational Institution (university, college).	UTTO	84
2	I am from a business incubator that is associated with an Educational Institution (university, college).		
5	I am from a business accelerator that is associated with an Educational Institution (university, college).		
3	I am from a business incubator that is supported by the government.	CBI	14
6	I am from a business accelerator that is supported by the government.		
9	I am from a unit or a department that is part of a firm.	IFOI	2
4	I am from a private business incubator.	III	55
7	I am from a private business accelerator.		
8	I am from a consulting company.		
10	I am from an angel investor group.		
11	I am from a venture capital investor firm.		
12	I am from another lending organization.		
13	Other (please specify)	Others	4

6.5.2 The Relationship Between II Types and Their Stakeholders

To investigate the relationship between self-report groups and their stakeholders, the following stakeholders-related variables were used: 1) the level of stakeholders' salience; 2) the level of stakeholders' influence; 3) the level of stakeholders' dependency by IIs; and 4) the level of stakeholders' dependency on IIs. Scores for each stakeholder by each participant (IIs) for the above constructs were calculated through the PCA[80] procedures; and were used in the following subsection to compare and contrast II types in terms of the above 4 constructs. It is important to highlight that scores (values) for all variables are standardize; thus, reader will notice positive and negative mean's values where signals have no meaning and indicate no direction; signals only show that positive values are higher than negative values.

In the following sections, comparisons between groups (MANOVA and ANOVA) and within-groups (one-way repeated measures ANOVA) were performed for each construct. These tests help in examining the Hypotheses H1 through H6. MANOVA and ANOVA were used to examine the

[80] See Section 6.3 For more details about how PCA was performed for each concept.

differences among the three groups in terms of which stakeholder was perceived as more salient; while one-way repeated measures[81] ANOVA was used to investigate which stakeholder was perceived as more salient for each group.

In order to run statistical tests to perform the above comparisons, it was required to identify and remove significant outliers to eliminate their possible negative impact on the ANOVA, MANOVA and one-way repeated measures ANOVA in particular[82]. Thus, for the above four constructs that were discussed in Sub-sections 6.5.2.1 through 6.5.2.4, SPSS 'explore analysis' was used and a box plot test for both between-subject and within-subject were generated. As a result, 11 observations were identified as outliers and then removed (See Supplementary Appendix Q for more details). Consequently, in the following sub-sections, we safely state that there were no significant outliers. Nevertheless, although ANOVA in general is a robust test for deviations from normality (see Peres-Neto & Olden 2001, Kirk, 1995); distribution (normality) for all variables[83] was assessed by Kurtosis and Skewness test and Shapiro-Wilk test ($p > 0.05$) (See Supplementary Appendix Q); as well, all other required assumptions were checked and met (See Supplementary Appendix Q).

Section 6.5.2.1 shows detailed example of how analyses and conclusions were performed for the construct of stakeholders' salience level; however, because the same approach was followed for the next three sections, and to avoid repetitiveness, main results were reported, and many tables were removed to Appendix Q.

6.5.2.1 Salient Levels of Stakeholders

A one-way multivariate analysis of variance (MANOVA) was run[84] to examine the differences among the three groups in terms of which stakeholder was perceived as more salient. A statistically significant difference was found between the groups in the combined dependent variables (stakeholders level of importance), $F(15, 373.077) = 7.360$, $p < 0.0001$; Wilks' $\Lambda = 0.489$; Partial $\eta 2 =$

[81] Because the participants are the same individuals who are asked about various stakeholders on the same dependent variable, this test is also referred to as within-subjects ANOVA or ANOVA with repeated measures.
[82] Outliers may distort the differences between the levels of the within-subjects factor and may cause problems when generalizing the results (of the sample) to the population (Ghosh & Vogt, 2012).
[83] Although Kurtosis and Skewness values were in the acceptable range to be determined as normally distributed, some variables were assessed as not normally distributed based on Shapiro-Wilk test ($p < 0.05$); thus Kurtosis and Skewness test were used.
[84] Assumptions were checked and met (Supplementary Appendix Q)

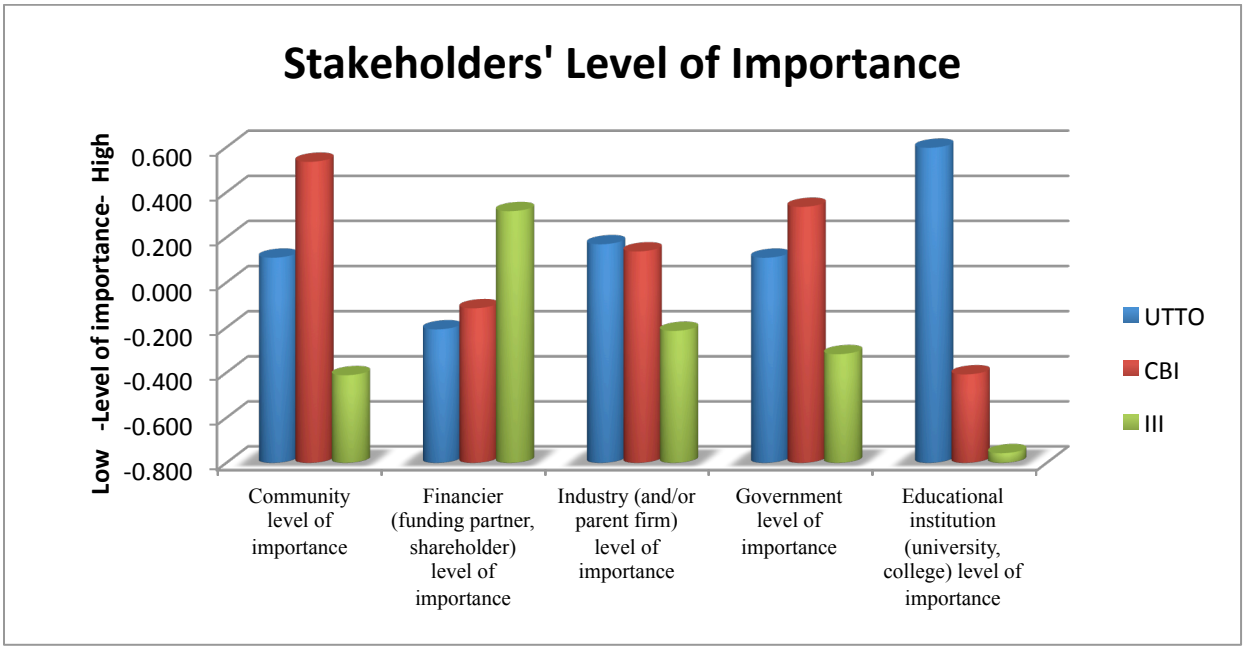
0.212. This in turn implies that level of importance for stakeholders can be predicted by knowing to which group the innovation intermediary belongs.

Table 6-6 Result of MANOVA for the Level of Stakeholders Importance

Dependent Variables	II Types	Mean	Multivariate F*	Univariate F*	P-value	Partial Eta Squared
			7.360		0.000	0.212
Community Level of Importance	UTTO CBI III	0.110 0.535 -0.411		4.840	0.003	0.095
Financier Level of Importance	UTTO CBI III	-0.208 -0.114 0.316		3.192	0.026	0.064
Industry Level of Importance	UTTO CBI III	0.170 0.138 -0.215		1.799	0.150	0.037
Government Level of Importance	UTTO CBI III	0.110 0.336 -0.318		3.071	0.030	0.062
Educational Institution Level of Importance	UTTO CBI III	0.598 -0.408 -0.757		29.159*	0.002*	0.437

Error df=139, and df=3 for all variables; * This is based on Welch ANOVA as the homogeneity of variances was violated.

Figure 6-1 Means for the Stakeholders Level of Importance



Follow-up univariate ANOVAs indicated that the stakeholders 'Community' ($F(3, 139) = 4.84$, $p = .003$; Partial $\eta 2 = 0.095$); 'Financier' ($F(3, 139) = 3.192$, $p = .026$; Partial $\eta 2 = 0.064$); 'Government' ($F(3, 139) = 3.071$, $p = 0.030$; Partial $\eta 2 = 0.062$); and 'Educational Institution' ($F(3, 4.834) = 29.159$, $p = 0.002$; Partial $\eta 2 = 0.437$); were statistically significantly different between the II types. Tukey post-hoc tests showed that for 'Community' and 'Government', innovation intermediaries from UTTO and CBI types had statistically significantly higher mean scores than innovation intermediaries from III type (all $p < 0.05$); as well, in terms of 'Financier' stakeholders, III was statistically significant with higher mean scores than innovation intermediaries from UTTO ($p = 0.014$). Furthermore, for the 'Educational Institution' stakeholders, results showed that innovation intermediaries from UTTO type had statistically significantly higher mean scores than innovation intermediaries from III type (all $p < 0.001$).

Table 6-7 Post-hoc Result for the Level of Stakeholders Importance

Dependent Variable	(I) II Type	(J) II Type	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
Community Level of Importance	UTTO	CBI	-0.425	0.293	0.470	-1.188	0.337
		III	.521*	0.170	0.014	0.078	0.964
	CBI	UTTO	0.425	0.293	0.470	-0.337	1.188
		III	.947*	0.303	0.012	0.157	1.736
Financier Level of Importance	III	UTTO	.524*	0.171	0.014	0.080	0.968
		CBI	0.431	0.304	0.492	-0.361	1.222
Government Level of Importance	UTTO	CBI	-0.226	0.304	0.459	-0.827	0.376
		III	.428*	0.177	0.017	0.078	0.777
	CBI	UTTO	0.226	0.304	0.459	-0.376	0.827
		III	.653*	0.315	0.040	0.031	1.276
Educational Institution Level of Importance ¥	UTTO	CBI	1.005*	0.184	0.000	0.478	1.532
		III	1.355*	0.150	0.000	0.962	1.748

* The mean difference is significant at the 0.05 level; ¥ Based on Games-Howell post-hoc as the homogeneity of variances was violated

In addition, a one-way repeated measures ANOVA was conducted[85] for UTTO to determine whether there were statistically significant differences in perceiving stakeholders' salience over the five main stakeholders: Community, Financier, Industry, Government and Educational Institution. The level of importance showed statistically significant changes in salience level of stakeholders, $F(4, 308) = 8.780$, $p < 0.0001$, Partial $\eta 2 = 0.102$, with highest level of salience for Educational Institution stakeholder ($M = 0.598$, $SD = 0.667$), then Industry ($M = 0.17$, $SD = 0.949$), then Community ($M =$

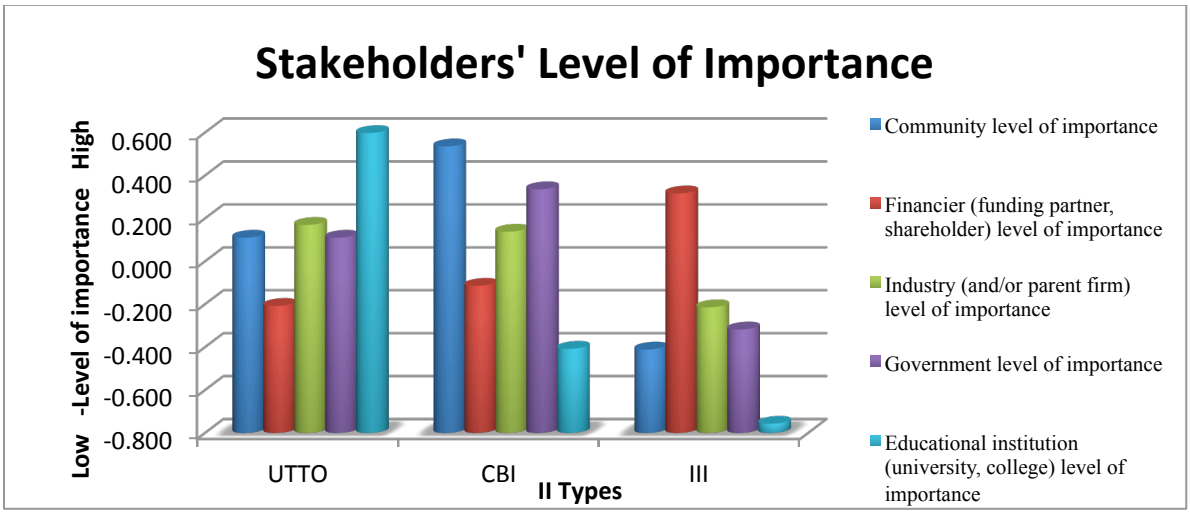
[85] There were no significant outliers as assessed by box plot (Section 6.5) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix Q). Nevertheless, the assumption of Sphericity was not violated, as assessed by Mauchly's test of sphericity, $\chi 2(9) = 10.857$, $p = 0.286$ (Supplementary Appendix Q).

0.11, SD = 0.951), then Government (M = 0.11, SD = 0.941), and then Financier (M = -0.208, SD = 0.994). Pairwise comparisons analysis with a Bonferroni adjustment showed that level of salience for Educational Institution stakeholder was significantly higher than Industry (M = 0.428, 95% CI [0.040, 0.816], p = 0.021), higher than Community (M = 0.488, 95% CI [0.095, 0.881], p = 0.006), higher than Government (M = 0.488, 95% CI [0.137, 0.839], p = 0.001), higher than Financier (M = 0.805, 95% CI [0.412, 1.199], p < 0.001). There was a statistically significant difference among means, therefore, we can reject the null hypothesis and accept the alternative hypothesis that UTTO perceives Educational Institution stakeholder as the most salient stakeholder.

Table 6-8 Result of One-Way Repeated Measure ANOVA for Stakeholders' Level of Importance

II Types	Source	Sphericity	Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
UTTO	Stakeholders	Sphericity Assumed	25.884	4.000	6.471	8.780	0.000	0.102	H1a (√)
	Error(Stakeholders)		226.992	308.000	0.737				
CBI	Stakeholders	Sphericity Assumed	6.599	4.000	1.650	2.654	0.045[86]	0.194	H1c (√)
	Error(Stakeholders)		27.348	44.000	0.622				
III	Stakeholders	Sphericity Assumed	30.909	4.000	7.727	9.179	0.000	0.155	H1d (√)
	Error(Stakeholders)		168.367	200.000	0.842				

Figure 6-2 The Means of Stakeholders' Level of Importance for Each II Type



[86] Although it is significant <0.05, Pairwise comparisons did not show any significant differences among stakeholders, thus, LSD was used as in next footnote.

Table 6-9 Pairwise Comparisons Result for Stakeholders' Level of Importance

II Types	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Educational Institution Level of Importance	Community	.488*	0.136	0.006	0.095	0.881
		Financier	.805*	0.136	0.000	0.412	1.199
		Industry	.428*	0.134	0.021	0.040	0.816
		Government	.488*	0.121	0.001	0.137	0.839
	Industry Level of Importance	Community	0.060	0.141	1.000	-0.347	0.467
		Financier	.378*	0.127	0.040	0.010	0.745
		Educational Institution	-.428*	0.134	0.021	-0.816	-0.040
		Government	0.060	0.137	1.000	-0.336	0.455
CBI[87]	Community Level of Importance	Financier	.650*	0.195	0.007	0.221	1.079
		Educational Institution	.943*	0.324	0.014	0.230	1.656
		Government	0.200	0.296	0.514	-0.452	0.852
		Industry	0.398	0.272	0.172	-0.201	0.996
	Government Level of Importance	Community	-0.200	0.296	0.514	-0.852	0.452
		Financier	0.450	0.397	0.281	-0.424	1.323
		Educational Institution	.743*	0.304	0.033	0.074	1.412
		Industry	0.198	0.345	0.578	-0.561	0.957
III	Financier Level of Importance	Community	.728*	0.194	0.005	0.157	1.298
		Educational Institution	1.073*	0.175	0.000	0.560	1.586
		Industry	.531*	0.175	0.037	0.018	1.044
		Government	.634*	0.187	0.014	0.084	1.184
	Industry Level of Importance	Community	0.197	0.178	1.000	-0.327	0.720
		Financier	-.531*	0.175	0.037	-1.044	-0.018
		Educational Institution	.542*	0.158	0.012	0.077	1.007
		Government	0.103	0.206	1.000	-0.501	0.708

The same approach was followed for the other two groups; the results of one-way repeated measures ANOVA are listed in Table 6-8 and Table 6-9. The conclusions drawn from the analysis of one-way repeated measures ANOVA for CBI and III were as follows:

1. The difference among the means for CBI was statistically significant. Therefore, we can reject the null hypothesis and conclude that CBI perceives Community and then Government as their most salient stakeholder.

[87] LSD adjustment was used for this comparison

2. The difference among the means for III was statistically significant. Therefore, we can reject the null hypothesis and conclude that III perceives Financier as their most salient stakeholder.

For the next three sections same approach of previous section was followed; thus, only the main results were reported and many illustration tables and figures are in Appendix Q.

6.5.2.2 Dependency Levels on Stakeholders

This section examined the level of dependency on stakeholders for each IIs type/group. A one-way MANOVA was run[88] to examine the differences among the three groups in terms of dependency on the four main stakeholders i.e. Financier, Industry, Government and Educational Institution. A statistically significant difference was found between the groups in the combined dependent variables (level of dependency on stakeholders), $F(12, 360.114) = 13.461$, $p < 0.0001$; Wilks' $\Lambda = 0.375$; Partial $\eta 2 = 0.279$ (Table 6-10). This in turn implies that the level of dependency on stakeholders can be predicted by knowing to which type the innovation intermediary belongs.

Table 6-10 Result of MANOVA for the Level of Dependency on Stakeholders

Dependent Variables	II Types	Mean	Multivariate F*	Univariate F*	P-value	Partial Eta Squared
			13.461		0.000	0.279
Dependency on Educational Institution	UTTO	0.668		49.191	0.000	0.515
	CBI	-0.383				
	III	-0.831				
Dependency on Industry	UTTO	-0.177		0.559*	0.666*	0.017
	CBI	0.146				
	III	0.041				
Dependency on Government	UTTO	-0.105		2.178*	0.218*	0.099
	CBI	0.840				
	III	-0.277				
Dependency on Financier	UTTO	-0.218		2.709	0.048	0.055
	CBI	-0.222				
	III	0.240				

Error df=139, and df=3 for all variables; * Based on Welch ANOVA as the homogeneity of variances was violated

Follow-up univariate ANOVAs indicated that the dependency on the stakeholders 'Educational Institution' ($F(3, 139) = 49.191$, $p < 0.001$; Partial $\eta 2 = 0.515$) ; and 'Financier' ($F(3, 139) = 2.709$, p

[88] Assumptions were checked and met (Supplementary Appendix Q).

=.048; Partial η2 = 0.055) showed a significant difference between the II types. In terms of 'level of dependency on Educational institution' stakeholder, Tukey post-hoc tests showed that innovation intermediaries from UTTO type had statistically significantly higher mean scores than innovation intermediaries from CBI and III type (all $p < 0.001$); as well, in terms of 'level of dependency on Financier' stakeholders, III was statistically significant with higher mean scores than innovation intermediaries from UTTO ($p = 0.037$) (Appendix Q).

In addition, a one-way repeated measures ANOVA was conducted[89] for each IIs type to determine whether there were statistically significant differences in dependency on stakeholders over the four main stakeholders. A similar approach as in Section 6.5.2.1 was followed; the results of one-way repeated measures ANOVA are listed in Table 6-11 and Table 6-12. The conclusions of the analysis of one-way repeated measures ANOVA for UTTO, CBI, and III were as follows:

Table 6-11 Result of One-Way Repeated Measure ANOVA for the Level of Dependency on Stakeholders

II Types	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
UTTO	Stakeholders	Sphericity Assumed	41.255	3	13.752	25.914	0.00	0.252	H2a (√)
	Error(Stakeholders)		122.587	231	0.531				
CBI	Stakeholders	Sphericity Assumed	10.649	3	3.55	3.653	0.022	0.249	H2c (√)
	Error(Stakeholders)		32.071	33	0.972				
III	Stakeholders	Greenhouse-Geisser	33.463	2.562	13.06	15.883	0.000	0.241	H2d (√)
	Error(Stakeholders)		105.345	128.112	0.822				

1. There was a statistically significant difference among means, therefore, we can reject the null hypothesis and accept the alternative hypothesis that UTTO is more dependent on the Educational Institution stakeholder as compared to the other stakeholders
2. The difference among the means for CBI was statistically significant. Therefore, we can reject the null hypothesis and conclude that CBI is more dependent on Government than they are on the other stakeholders.

[89] There were no significant outliers as assessed by box plot (Section 6.5) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix Q). Nevertheless, the assumption of sphericity was not violated, as assessed by Mauchly's test of Sphericity, $\chi2(5) = 7.692$, $p = 0.174$ (Supplementary Appendix Q).

3. The difference among the means for III was statistically significant. Therefore, we can reject the null hypothesis and conclude that III is more dependent on Financier than on the other stakeholders but not Industry stakeholders.

Table 6-12 Pairwise Comparisons Result for the Level of Dependency on Stakeholders

II Types	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Dependency on Educational Institution	Industry	.845*	0.106	0.000	0.559	1.131
		Government	.773*	0.110	0.000	0.473	1.072
		Financier	.886*	0.131	0.000	0.531	1.240
CBI[90]	Dependency on Government	Educational Institution	1.223*	0.382	0.008	0.382	2.065
		Industry	0.694	0.558	0.239	-0.534	1.922
		Financier	1.063*	0.405	0.024	0.171	1.954
III	Dependency on Educational Institution	Industry	-.873*	0.142	0.000	-1.264	-0.481
		Government	-.554*	0.126	0.000	-0.901	-0.207
		Financier	-1.071*	0.175	0.000	-1.552	-0.590
	Dependency on Financier	Educational Institution	1.071*	0.175	0.000	0.590	1.552
		Industry	0.199	0.188	1.000	-0.317	0.714
		Government	.517*	0.169	0.021	0.054	0.981

6.5.2.3 Dependency Levels by Stakeholders on IIs

To examine the level of dependency on IIs, a one-way MANOVA was run[91] to examine the differences among the three groups in terms of dependency on IIs by these four main stakeholders: Financier, Industry, Government and Educational Institution. A statistically significant difference was found between the groups in the combined dependent variables (level of dependency by stakeholders), $F(12, 360.114) = 6.601$, $p < 0.0001$; Wilks' $\Lambda = 0.591$; Partial $\eta 2 = 0.161$. This in turn implies that the level of dependency by stakeholders may be predicted by knowing to which type the innovation intermediary belongs.

[90] LSD adjustment was used for this comparison.
[91] Assumptions were checked and met (Supplementary Appendix Q).

Table 6-13 Result of MANOVA for the Level of Dependency by Stakeholders

Dependent Variables	Cluster Number of Case	Mean	Multivariate F*	Univariate F*	P-value	Partial Eta Squared
			6.601		0.000	0.161
Educational Institution dependency on our organization	UTTO	0.472		14.297	0.000	0.236
	CBI	-0.617				
	III	-0.482				
Government dependency on our organization	UTTO	-0.264		2.522*	0.179*	0.081
	CBI	0.568				
	III	0.066				
Financier dependency on our organization	UTTO	-0.319		4.463*	0.076*	0.122
	CBI	-0.300				
	III	0.327				
Industry dependency on our organization	UTTO	0.029		0.212	0.888	0.005
	CBI	0.098				
	III	-0.091				

Error df=139, and df=3 for all variables; * Based on Welch ANOVA as the homogeneity of variances was violate

Follow-up univariate ANOVAs indicated that the dependency on IIs by the stakeholders 'Educational Institution' ($F(3, 139) = 14.297$, $p < .001$; Partial $\eta 2 = 0.236$) was statistically significantly different between the II types. Tukey post-hoc tests showed that innovation intermediaries from UTTO type had statistically significantly higher mean scores than innovation intermediaries from CBI and III type (all $p < 0.001$).

In addition, a one-way repeated measure ANOVA was conducted[92] for each IIs type to determine whether there were statistically significant differences in dependency on IIs by stakeholders over the four main stakeholders. A similar approach as in Section 6.5.2.1 was followed; the results of one-way repeated measures ANOVA are listed in Table 6-14 and Table 6-15. The conclusions of the analysis of one-way repeated measures ANOVA for UTTO, CBI, and III were as follows:

[92] There were no significant outliers as assessed by box plot (Section 6.5) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix Q). Nevertheless, the assumption of sphericity was not violated, as assessed by Mauchly's test of Sphericity, $\chi 2(5) = 6.999$, $p < 0.221$ (Supplementary Appendix Q).

Table 6-14 Result of One-Way Repeated Measure ANOVA for the Level of Dependency by Stakeholders

II Types	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
UTTO	Stakeholders	Sphericity Assumed	30.666	3.000	10.222	18.069	0.000	0.190	H3a (√)
	Error(Stakeholders)		130.681	231.000	0.566				
CBI	Stakeholders	Sphericity Assumed	9.448	3.000	3.149	3.485	0.027	0.241	H3c (√)
	Error(Stakeholders)		29.821	33.000	0.904				
III	Stakeholders	Sphericity Assumed	17.529	3.000	5.843	7.513	0.000	0.131	H3d (√)
	Error(Stakeholders)		116.653	150.000	0.778				

Table 6-15 Pairwise Comparisons Result for the Level of Dependency by Stakeholders

II Types	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Educational Institution dependency on our organization	Government	.736*	0.115	0.000	0.425	1.046
		Financier	.791*	0.130	0.000	0.439	1.143
		Industry	.443*	0.134	0.008	0.081	0.804
	Industry dependency on our organization	Educational Institution	-.443*	0.134	0.008	-0.804	-0.081
		Government	0.293	0.110	0.057	-0.005	0.591
		Financier	.348*	0.125	0.040	0.010	0.686
CBI	Government dependency on our organization	Educational Institution	1.185*	0.401	0.049	-0.102	2.472
		Financier	0.868	0.458	0.507	-0.601	2.336
		Industry	0.470	0.369	1.000	-0.713	1.652
III	Educational Institution dependency on our organization	Government	-.547*	0.163	0.009	-0.996	-0.099
		Financier	-.809*	0.181	0.000	-1.307	-0.311
		Industry	-.390*	0.141	0.048	-0.779	-0.002
	Financier dependency on our organization	Educational Institution	.809*	0.181	0.000	0.311	1.307
		Government	0.262	0.198	1.000	-0.283	0.806
		Industry	0.419	0.191	0.201	-0.107	0.945

1. There was a statistically significant difference among means, thus, we can reject the null hypothesis and accept the alternative hypothesis that in UTTO the Educational Institution stakeholder was highly dependent on IIs as compared to other stakeholders.
2. The difference among the means for CBI was statistically significant based on which we can reject the null hypothesis and conclude that for CBI the Government stakeholder was more dependent on IIs as compared to other stakeholders; it was high but not significantly different than Educational Institution compare to Financier stakeholders.

3. The difference among the means for III was statistically significant. Therefore, we can reject the null hypothesis and conclude that III was more dependent on Financier than on the other stakeholders but not Government and Industry stakeholders. As well, Educational Institution scored significantly the lowest dependency on IIs for the type III.

For the sake of knowing who is depending more on others (IIs versus salient stakeholder), the initial glance at the means show that salient stakeholders always had lower dependency on IIs compared to the IIs dependency on that particular salient stakeholder; yet this was not the case for the type III. Nevertheless, a statistical comparison between the level of the dependency by the salient stakeholder on IIs types and the level of IIs dependency on the same salient stakeholders for the three types of IIs was performed. The result showed that only Educational Institution stakeholder for the type UTTO had significant lower dependency on UTTO compared to UTTO dependency on it; other comparisons showed no significant differences. These findings help in identifying type of influence by each salient stakeholders based on the stakeholders influence strategies theory by Frooman (1999).

6.5.2.4 Influence on IIs Strategy by Stakeholders

Influence on IIs strategy by stakeholders was analyzed in this section; one-way multivariate analysis of variance (MANOVA) was run[93] to detect differences among the three groups in terms of which stakeholder was perceived to influence IIs more than other stakeholders. A statistically significant difference was found between the groups in the combined dependent variables (stakeholders level of influence), $F(15, 373.077) = 9.759$, $p < 0.0001$; Wilks' $\Lambda = 0.401$; Partial $\eta 2 = 0.263$. This in turn implies that level of influence by stakeholders can be predicted by knowing to which group the innovation intermediary belongs.

Follow-up univariate ANOVAs indicated that the stakeholders 'Community' ($F(3, 139) = 6.478$, $p < .001$; Partial $\eta 2 = 0.123$); 'Financier' ($F(3, 139) = 3.653$, $p = .014$; Partial $\eta 2 = 0.073$); 'Government' ($F(3, 139) = 3.648$, $p = 0.014$ 0.; Partial $\eta 2 = 0.073$); and 'Educational Institution' ($F(3, 5.549) = 47.525$, $p < 0.001$; Partial $\eta 2 = 0.439$); were statistically significantly different between the II Types.

[93] Assumptions were checked and met (Supplementary Appendix Q).

Tukey post-hoc tests showed that for 'Community' and 'Government', innovation intermediaries from UTTO and CBI types had statistically significantly higher mean scores than innovation intermediaries from III type (all $p < 0.05$); as well, in terms of 'Financier' stakeholders, III was statistically significant with higher mean scores than innovation intermediaries from UTTO ($p = 0.006$). Furthermore, for the 'Educational Institution' stakeholders, results showed that innovation intermediaries from UTTO type had statistically significantly higher mean scores than innovation intermediaries from III and CBI types (all $p < 0.001$). Finally, for the 'Industry' stakeholders, results showed that innovation intermediaries from UTTO type had statistically significantly higher mean scores than innovation intermediaries from III type (all $p = 0.011$).

Table 6-16 Result of MANOVA for the Level of Stakeholders Influence

Dependent Variables	Cluster Number of Case	Mean	Multivariate F*	Univariate F*	P-value	Partial Eta Squared
			9.759		0.000	0.263
Educational Institution Level of Influence	UTTO	0.624		47.525*	0.003*	0.439
	CBI	-0.548				
	III	-0.710				
Financier Level of Influence	UTTO	-0.194		3.653	0.014	0.073
	CBI	-0.357				
	III	0.335				
Government Level of Influence	UTTO	0.125		3.648	0.014	0.073
	CBI	0.353				
	III	-0.350				
Industry Level of Influence	UTTO	0.225		4.081	0.008	0.081
	CBI	-0.366				
	III	-0.325				
Community Level of Influence	UTTO	0.203		6.478	0.000	0.123
	CBI	0.292				
	III	-0.482				

Error df=139, and df=3 for all variables; * Based on Welch ANOVA as the homogeneity of variances was violated

In addition, a one-way repeated measures ANOVA was conducted[94] for each IIs type to determine whether there were statistically significant differences in stakeholders' influence level over the five main stakeholders: Community, Financier, Industry, Government and Educational Institution. A similar approach as in Section 6.5.2.1 was followed; the results of one-way repeated measures

[94] There were no significant outliers as assessed by box plot (Section 6.5) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix Q). Nevertheless, the assumption of sphericity was not violated, as assessed by Mauchly's test of Sphericity, $\chi2(9) = 7.903$, $p = 0.544$ (Supplementary Appendix Q).

ANOVA are listed in Table 6-17 and Table 6-18. The conclusions of the analysis of one-way repeated measures ANOVA for UTTO, CBI, and III were as follow:

Table 6-17 Result of One-Way Repeated Measure ANOVA for Stakeholders' Level of Influence

II Types	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
UTTO	Stakeholders	Sphericity Assumed	26.676	4	6.669	8.631	0.000	0.101	H5'a (√)
	Error(Stakeholders)		237.973	308	0.773				
CBI	Stakeholders	Sphericity Assumed	8.308	4	2.077	2.685	0.044	0.196	H5'c (√)
	Error(Stakeholders)		34.036	44	0.774				
III	Stakeholders	Sphericity Assumed	30.978	4	7.744	8.892	0.000	0.151	H5'd (√)
	Error(Stakeholders)		174.193	200	0.871				

Table 6-18 Pairwise Comparisons Result for Stakeholders' Level of Influence

II Types	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Educational Institution Level of Influence	Financier	.819*	0.138	0	0.42	1.218
		Government	.500*	0.128	0.002	0.131	0.868
		Industry	0.4	0.145	0.071	-0.018	0.818
		Community	.422*	0.137	0.029	0.026	0.817
	Industry Level of Influence	Educational Institution	-0.4	0.145	0.071	-0.818	0.018
		Financier	.419*	0.143	0.045	0.005	0.833
		Government	0.1	0.133	1	-0.285	0.485
		Community	0.022	0.141	1	-0.385	0.428
CBI[95]	Government Level of Influence	Educational Institution	.901*	0.311	0.014	0.217	1.584
		Financier	0.709	0.380	0.089	-0.127	1.545
		Industry	0.718	0.383	0.088	-0.126	1.562
		Community	0.061	0.371	0.873	-0.756	0.878
III	Financier Level of Influence	Educational Institution	1.045*	0.15	0	0.604	1.486
		Government	.685*	0.182	0.004	0.151	1.218
		Industry	.660*	0.179	0.006	0.134	1.186
		Community	.817*	0.172	0	0.313	1.322

1. There was a statistically significant difference among means, therefore, we can reject the null hypothesis and accept the alternative hypothesis that Educational Institution stakeholder more than other stakeholders influences UTTO.

[95] LSD adjustment was used for this comparison.

2. The difference among the means for CBI was statistically significant. Therefore, we can reject the null hypothesis and conclude that Government stakeholders influences CBI more than other stakeholders.

3. The difference among the means for III was statistically significant. Therefore, we can reject the null hypothesis and conclude that Financier influences III more than other stakeholders.

6.5.2.5 Relationship Between Influence Level and the Level of Salience and Dependency on Stakeholders

To investigate the relationship between a particular stakeholder's influence level on one hand with the level of salience, and dependency on all main stakeholders on the other hand, a correlation between all variables[96] was investigated initially (Table 6-19). In addition, a multiple regression analysis was run between the level of influence by each stakeholder and all variables for the other concepts (one concept per time as independent variable). The purpose of this test was to confirm the above relationships that were suggested by correlation, to measure the effect size for all independent variables together and to eliminate those variables that have no significant coefficients. As well, these tests helped us examine the Hypotheses H3 through H6.

Prior to discussing test results, it was important to emphasize that neither of the above tests imply any causation in the relation between variables. The selection of a particular direction in the following analysis was to investigate differences and effect size of that particular direction, for the sake of this study.

First, a Pearson's product-moment correlation was run[97] to assess the relationship between each stakeholder's influence level and the level of salience, dependency by and dependency on all main stakeholders. There was a moderate to high significant positive correlation between each stakeholder's influence level and its level of salience, dependency by stakeholders, and dependency on stakeholders (Table 6-19). For instance, the level of influence of Educational Institution had a high

[96] Three concepts include 14 variables after reduction by using PCA (Section 6.3). Concepts are: stakeholder's influence level (5 variables), stakeholder's salience level (5 variables), and level of dependency on stakeholders (4 variables).

[97] Preliminary analyses showed the relationship to be linear with all variables normally distributed, as assessed by Shaprio-Wilk test ($p > 0.05$) and Kurtosis and Skewness tests, and there were no outliers.

positive correlation with the level of importance of Educational Institution, r(148) = 0.775, p < 0.01, a high positive correlation with dependency on Educational Institution, r(148) = 0.67, p < 0.01 and a high positive correlation with dependency of Educational Institution on IIs, r(148) = 0.446, p < 0.01. Nevertheless, Educational Institution level of salience, dependency by stakeholders, and dependency on stakeholders respectively explained 60%[98], 45% and 20% of the variability of the influence level of Educational Institution in a one to one relation.

Table 6-19 Correlation Between Stakeholders Influence Level and the Level of Salience, Dependency by, and Dependency on All Main Stakeholders

Correlations	Educational Institution Level of Influence	Financier Level of Influence	Government Level of Influence	Industry Level of Influence	Community Level of Influence
Community level of importance	.204*	-0.079	.232**	-0.092	**.582****
Educational Institution level of importance	**.775****	-0.143	.182*	0.102	0.146
Dependency on Educational Institution	**.670****	-.200*	.203*	.202*	0.16
Educational Institution dependency on IIs	**.446****	-0.076	0.054	0.138	0.066
Financier level of importance	-0.122	**.703****	-0.099	0.026	-0.133
Dependency on Financier	-0.125	0.153	-.254**	-0.1	-0.06
Financier dependency on IIs	-.293**	**.313****	-.206*	-0.112	-.176*
Government level of importance	0.056	-0.034	**.699****	0.107	0.149
Dependency on Government	0.098	0.051	**.403****	-0.044	0.148
Government dependency on IIs	-0.122	-0.025	**.315****	-0.077	-0.099
Industry level of importance	.281**	0.158	.265**	**.512****	-0.05
Dependency on Industry	-0.099	0.111	-0.046	**.238****	-0.114
Industry dependency on IIs	0.097	0.066	.197*	**.262****	0.01

- Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).
- **Bold** is only applied to highlight the relation for various concepts of the same stakeholder

Second, four multiple regression analysis were run next; three of them were between the level of influence by each stakeholder in one hand and stakeholder's salience level, level of dependency on stakeholders, and combination of both, on the other hand. The other multiple regression analysis was between stakeholder's salience level and level of dependency on stakeholders.

The first multiple regression was run[99] to predict Educational Institution level of influence from the five variables of stakeholders' salience level. Some of these variables were statistically significant for predicting Educational Institution level of influence, F(5, 142) = 49.767, p < 0.0001, adj. R^2=0.637.

[98] $R^2 = r^2$ (i.e. using correlation table (0.775* 0.775)= 0.600 that means it explain 60% of the variability of the other variable.

[99] The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were met (Appendix Q).

Three of the five variables were statistically significant to the prediction, $p < 0.05$. Regression coefficients and standard errors can be found in Table 6-20. It is observed that Educational Institution level of importance has the highest coefficient 0.769; that means for each one unit increase in level of importance for Educational Institution, there was an increase of 0.769 in the level of influence by Educational Institution; however the other two variables: Industry and Government level of importance had significant coefficients of 0.156 and -0.136[100] respectively to predict the Educational Institution level of influence. In terms of the effect, it was clear that Educational Institution level of importance explained 60% of the variability of Educational Institution influence level.

Table 6-20 Summary of Multiple Regression Analysis Between the Level of Influence by Educational Institution Stakeholder and the Five Variables of Stakeholders Salience Level

DV	Coefficients	Unstandardized Coefficients		Standardized Coefficients	t	P-value	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
Educational Institution Level of Influence	(Constant)	0.001	0.051		0.010	0.992	-0.100	0.101
	Community Level of Importance	0.042	0.055	0.041	0.766	0.445	-0.067	0.151
	Financier Level of Importance	-0.031	0.054	-0.030	-0.578	0.564	-0.137	0.075
	Industry Level of Importance	**0.156**	**0.056**	**0.148**	**2.766**	**0.006**	**0.045**	**0.268**
	Government Level of Importance	**-0.136**	**0.053**	**-0.135**	**-2.563**	**0.011**	**-0.241**	**-0.031**
	Educational Institution Level of Importance	**0.769**	**0.054**	**0.762**	**14.122**	**0.000**	**0.661**	**0.877**
$F(5, 142) = 49.767$, $p < 0.0001$, adj. $R^2 = 0.637$.								

By combining the findings of this section which indicated that, any increase in the level of importance of Educational Institution was associated with the increase in influence level by Educational Institution, with the findings of H1a and H5'a which indicated that UTTO perceived Educational Institution stakeholder as the most salient stakeholder, and it was influenced by the Educational Institution stakeholder more than other stakeholders. Based on this the H5 null hypothesis was rejected and the alternative hypothesis was accepted (H5a). Alternative hypothesis

[100] Negative coefficient in regression model means that the variables are negatively associated. In other words, any increase in the independent variable leads to a decrease in the dependent variable. For instance, in this particular coefficient, one unit increase in the level of salience for Government leads to a decrease in the level of influence by Educational Institution by 0.136.

(H5a) indicated that the salient stakeholder (Educational Institution) influenced UTTO strategy more than all the other stakeholders.

Following the same approach, multiple regression was ran[101] for the other three main stakeholders (see Supplementary Appendix Q). Table 6-21 shows the main conclusions that H5b, H5c and H5d were accepted. That indicated that the salient stakeholder (e.g. Industry[102], Government and Financiers for H5b, H5c and H5d respectively) influenced IIs (e.g. IFOI, CBI and III respectively) strategy more than all the other stakeholders.

Table 6-21 Summary of Multiple Regression Analysis Between the Level of Influence by Each Stakeholder and the Five Variables of Stakeholders Salience Level

Dependent Variables	Coefficients	B*	S. E_B	Beta*	Hypothesis
Educational institution Level of Influence	Industry Level of Importance	0.156	0.056	0.148	H5a (√)
	Government Level of Importance	-0.136	0.053	-0.135	
	Educational institution Level of Importance	**0.769**	**0.054**	**0.762**	
	F(5, 142) = 49.767, p < .0001, adj. R2 = .637.				
Financers Level of Influence	**Financier Level of Importance**	**0.702**	**0.060**	**0.707**	H5d (√)
	F(5, 138) = 30.899, p < .0001, adj. R2 = .528.				
Government Level of Influence	Financier Level of Importance	-0.130	0.058	-0.124	H5c (√)
	Industry Level of Importance	0.225	0.059	0.213	
	Government Level of Importance	**0.699**	**0.056**	**0.698**	
	F(5, 138) = 42.578, p < .0001, adj. R2 = .607.				
Industry Level of Influence	Community Level of Importance	-0.248	0.075	-0.242	H5b (√)
	Industry Level of Importance	**0.592**	**0.076**	**0.572**	
	F(5, 138) = 13.941, p < .0001, adj. R2 = .336.				

* $p < 0.05$; B= unstandardized regression coefficients; S. E_B= standard error of the coefficients Beta=standardized coefficients

The second group of multiple regression procedures was run[103] between the level of influence by each stakeholder and the four variables of stakeholders' dependency level. By following the same approach as above and running multiple regressions to predict Educational Institution influence level (see Supplementary Appendix Q). It was concluded that Educational Institution level of dependency had significant and highest coefficient 0.693 to predict Educational Institution influence level. However

[101] All assumptions have been checked and met for the three procedures of the multiple regressions; (Initially, four observations (19, 30, 34 and 140) were detected as outliers and were accordingly removed. After removing the outliers, all assumptions were met.)

[102] Despite that, none of the 3 types in this study perceived Industry as the most salient stakeholder, the finding of this test was sufficient to reject the null hypothesis and accept the alternative H5b for Industry stakeholder.

[103] The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were met (Supplementary Appendix Q). (Initially, three observations (25, 30, and 86) were detected as outliers and were removed accordingly. After removing the outliers, all assumptions were met.).

the other variable, Industry level of dependency had a coefficient of -0.237. In terms of the effect, it was clear that Educational Institution level of dependency explained 45% of the variability of Educational Institution influence level. Therefore, by combining this finding with the findings of H2a and H5'a which indicated that, UTTO was highly dependent on the Educational Institution stakeholder more than on other stakeholders, and was influenced by Educational Institution more than other stakeholder respectively, then the H6 null hypothesis was rejected and the alternative hypothesis (H6a) was accepted. Alternative hypothesis (H6a) indicated that the dependency on stakeholder Educational Institution influenced UTTO strategy more than the other stakeholders (See Table 6-22).

Table 6-22 Summary of Multiple Regression Analysis Between the Level of Influence by Each Stakeholder and the Five Variables of Stakeholders Dependent Level

Dependent Variables	Coefficients	B*	S. E_B	Beta*	Hypothesis
Educational institution Level of Influence	**Dependency on Educational Institution**	**0.693**	**0.059**	**0.704**	H6a (√)
	Dependency on Industry	-0.237	0.064	-0.227	
	F(4, 140) = 40.121, p < .001, adj. R2 = .534.				
Financers Level of Influence	Dependency on Educational Institution	-0.244	0.079	-0.258	H6d (X)
	F(4, 142) = 3.440, p = .010, adj. R2 = .089.				
Government Level of Influence	**Dependency on Government**	**0.548**	**0.080**	**0.510**	H6c (√)
	Dependency on Financier	-0.328	0.077	-0.309	
	F(4, 140) = 16.583, p < .001, adj. R2 = .321.				
Industry Level of Influence	Dependency on Educational institution	0.179	0.081	0.184	H6b (√)
	Dependency on Industry	**0.295**	**0.087**	**0.284**	
	F(4, 140) = 4.948, p < .001, adj. R2 = .124.				

* $p < 0.05$; B= unstandardized regression coefficients; S. E_B= standard error of the coefficients Beta=standardized coefficients

Following the same approach, multiple regression was ran for the other three main stakeholders (see Supplementary Appendix Q). Table 6-22 shows the main conclusions that H6b, and H6c were accepted. That indicated that the dependency on stakeholder (e.g. Industry[104] and Government for H6b and H6c respectively) influenced IIs (e.g. IFOI and CBI respectively) strategy more than the other stakeholders. Nevertheless, the H6 null hypothesis could not be rejected for Financers stakeholder; it indicated that the dependency on stakeholder (Financiers) had no relation with the influence level by the same stakeholder (i.e. Financiers).

Next to the above investigation of the relationship between each stakeholder's influence level on one hand with each of the level of salience, and dependency on all main stakeholders on the other

[104] Despite that, none of the 3 types in this study perceived Industry as the most salient stakeholder, the finding of this test is sufficient to reject the null hypothesis and accept the alternative H5b for Industry stakeholder.

hand, and prior to investigate the relationship between each stakeholder's influence level and the combination of both (stakeholders level of salience, and stakeholders dependency level on IIs); investigations for the relation between the concepts of level of salience and level of dependency were performed.

First, a correlation between all variables from the concepts of level of salience and level of dependency was investigated (Table 6-23). Thus, a Pearson's product-moment correlation was run[105] to assess the relationship between each stakeholder's importance level and the level of dependency on all main stakeholders. There was a moderate to high significant positive correlation between each stakeholder's importance level and its level of dependency on stakeholders (Table 6-23). For instance, the level of importance of Educational Institution has a high positive correlation with the level of dependency on Educational Institution, $r(148) = 0.704$, $p < 0.01$. This in turn indicated that each of these variables was explaining a major portion of the level for the same stakeholders. This finding was true for all the four main stakeholders: Education Institution, Financier, Industry and Government; yet there was a variation in the level of correlations. Thus, the H4 null hypothesis was rejected and the alternative hypothesis (H4) was accepted. Alternative hypothesis (H4) indicated that dependency and level of importance of the same stakeholder had a positive correlation (association).

Table 6-23 Correlation Between Stakeholders Level of Importance with Dependency Level on All Main Stakeholders

Correlation	Community Level of Importance	Financier Level of Importance	Industry Level of Importance	Government Level of Importance	Educational Institution Level of Importance
Dependency on Educational Institution	0.109	-0.159	.249**	0.177*	**0.704****
Dependency on Industry	-0.137	0.199*	**0.165***	-0.100	-0.170*
Dependency on Government	0.183*	0.054	0.016	**0.402****	0.129
Dependency on Financier	-0.022	**0.173***	-0.167*	-0.441**	-.244**

- Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).
- **Bold** is only applied to highlight the relation for various concepts of the same stakeholder

[105] Preliminary analyses showed the relationship to be linear with all variables normally distributed, as assessed by Shaprio-Wilk test ($p > 0.05$) and Kurtosis and Skewness test, and there were no outliers.

Second, a multiple regression procedure was run[106] between the level of importance for each stakeholder and the four variables of stakeholders' dependency level. By following the same approach as above and running multiple regressions for all the five main stakeholders (see Supplementary Appendix Q and Table 6-24). It was concluded that Educational Institution and Government level of dependency have significant and highest coefficient 0.692 and 0.498 to predict Educational Institution and Government importance level respectively; nevertheless, Industry level of dependency has significant and low coefficient 0.189 to predict Industry importance level; However, Community's importance level and Financier importance level are not predicted by the same stakeholders level of dependency.

Table 6-24 Summary of Multiple Regression Analysis Between the Level of Importance for Each Stakeholder and the Four Variables of Stakeholders' Dependency Level

Dependent Variables	Coefficients	B*	S. E_B	Beta*
Educational institution Level of Importance	**Dependency on Educational institution**	**0.692**	**0.057**	**0.700**
	Dependency on Industry	-0.235	0.060	-0.226
	F(4, 143) = 46.204, p < .001, adj. R2 = .564.			
Financers Level of Importance	Dependency on Educational Institution	-0.163	0.081	-0.168
	Dependency on Industry	0.189	0.085	0.185
	F(4, 143) = 3.253, p = .014, adj. R2 = .083.			
Government Level of Importance	**Dependency on Government**	**0.498**	**0.069**	**0.482**
	Dependency on Financier	-0.504	0.070	-0.479
	F(4, 143) = 25.856, p < .001, adj. R2 = .420.			
Industry Level of Importance	Dependency on Educational Institution	0.224	0.075	0.243
	Dependency on Industry	**0.189**	**0.079**	**0.196**
	Dependency on Financier	-0.171	0.080	-0.176
	F(4, 142) = 5.339, p < .001, adj. R2 = .131			
Community Level of Importance	Dependency on Industry	-0.193	0.085	-0.191
	Dependency on Government	0.207	0.085	0.206
	F(4, 143) = 2.829, p = .027, adj. R2 = .073.			

* $p < 0.05$; B= unstandardized regression coefficients; S. E_B= standard error of the coefficients Beta=standardized coefficients

In sum, despite the relationship between Educational Institution level of dependency and Educational Institution importance level, all other stakeholders did not show high correlation nor explanation of stakeholder's importance level by the level of dependency on the same stakeholder. Although, at the first glance both concepts seemed to be similar, these findings indicated that they are

[106] The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were checked and met. (Initially, one observation (24) was detected as an outlier (when DV= industry level of importance) and was accordingly removed. After removing the outliers, all assumptions were met.)

mostly explaining small portion of each other and cannot claim to be identical or similar to each other. Hence the next tests will use both concepts (9 variables) to examine their prediction and explanation of stakeholder's level of influence.

The fourth and last group of multiple regression procedures was run[107] between the level of influence by each stakeholder and the nine variables of both constructs of stakeholders' dependency level and level of importance. By following the same approach as above and running multiple regressions for all the five main stakeholders, the results are shown in the Supplementary Appendix Q and was concluded as following:

In general, the results of the last test confirm the previous tests' findings that were found for the relation between stakeholder's level of influence and each concept separately; however, this test offered a better explanation for the concept of stakeholder's level of influence by some of the nine variables of stakeholders' dependency level and level of importance. This in turn indicated three important findings: 1) although there were some common explanations for some of the variability of the stakeholder's level of influence by the two concepts[108], each concept accounted for some explanations of variability that were not common with the other concept; 2) the largest portion of the variability explanation of the stakeholder's level of influence for a particular stakeholder was explained by the same stakeholder's level of importance and its dependency level or at least one of them[109]; 3) some variables from the dependency level concept were not significant in this test, even though they were significant when this concept was examined separately. The following example will clarify the above three findings. For instance, the variability explanation for Educational Institution level of influence by both concepts was raised to 71.1%; while the coefficient of Educational Institution level of importance was decreased from 0.769 to 0.576 and for Educational Institution dependency level from 0.693 to 0.247. As well, it was noticeable that all previous variables within the concept 'stakeholders level of importance' continued to contribute to the variability explanation of Educational Institution level of influence in the separate and combined model; while for the concept of 'stakeholders dependency level', some of the variables were not significant even though it was

[107] The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were checked and met. (Initially, seven observations (19, 20, 30, 34, 86, 89 and 140) were detected as outliers and were accordingly removed. After removing the outliers, all assumptions were met.)
[108] They were: level of importance and dependency level.
[109] Sometimes, stakeholder's level of importance is accounted for the largest portion of the variability explanation of the stakeholder's level of influence, more than the stakeholder's dependency level variables.

significant when this concept was examine separately. Supplementary Appendix Q shows all the comparisons between the tests that were between stakeholder's level of influence and each concept separately in one hand and the test between stakeholder's level of influence and both concept combined on the other hand. After all, it was concluded that for any IIs type that perceives a particular stakeholder as important more then other stakeholders, the variables for the level of that stakeholder's salience and its level of the dependency explained the level of influence by that particular stakeholder better than any of these variables separately; this findings confirmed Frooman's theory of stakeholders influence strategy (1999) and at the same time suggested additional predictor (stakeholders salience level) for the influence by stakeholders (See more details in discussion of Chapter 7).

In conclusion, most hypotheses were accepted (Table 6-25) for Section 6.5.2 and all of its subsections, which in turns support the first part of the model (Figure 6-3) in the context of innovation intermediaries who facilitate research commercialization. The overall conclusion was that each II type perceived one of the main stakeholders as the most salient stakeholder compared to other stakeholders, and depended on it; accordingly, IIs were influenced the most by their particular salient stakeholder. Consequently, the results showed that stakeholder's salience level (five variables) and level of dependency on stakeholders (four variables) explained a large portion of the level of influence that each particular salient stakeholder applied on the IIs (see Figure 6-3). Types of influences are discussed in Chapter 7.

Figure 6-3 First Part of the Research Model (Stakeholders Related Constructs)

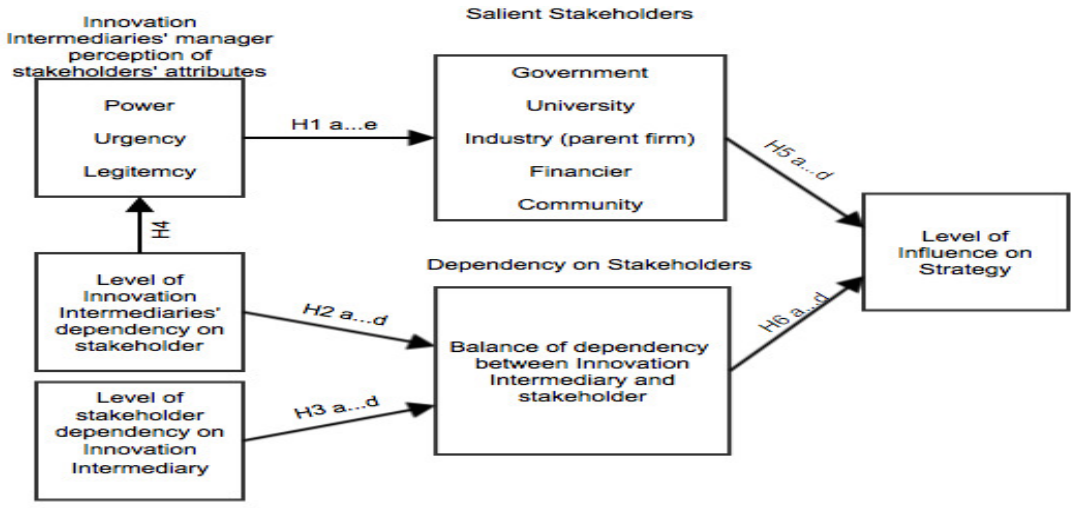


Table 6-25 Summary for All Hypothesis for IIs Types Relation with Stakeholders

Hypotheses (Stakeholder's Importance Level)	State
H1a: UTTO perceives Educational Institution as a salient stakeholder.	Supported
H1b: IFOI perceives Industry as a salient stakeholder.	N/A
H1c: CBI perceives Government as a salient stakeholder.	Supported
H1d: III perceives Financiers as a salient stakeholder.	Supported
H1e: No II type perceives Community as a salient stakeholder.	Not Supported
Hypotheses (Dependency Level on Stakeholder)	**State**
H2a: UTTO is highly dependent on the Educational Institution more so than on other stakeholders.	Supported
H2b: IFOI is highly dependent on the Industry more so than on other stakeholders.	N/A
H2c: CBI is highly dependent on the Government more so than on other stakeholders.	Supported
H2d: III is highly dependent on the Financiers more so than on other stakeholders.	Supported
Hypotheses (Stakeholder's Dependency Level)	**State**
H3a: Educational Institution is highly dependent on UTTO compared to other stakeholders.	Supported
H3b: Industry is highly dependent on IFOI compared to other stakeholders.	N/A
H3c: Government is highly dependent on CBI compared to other stakeholders.	Supported
H3d: Financiers is highly dependent on III compared to other stakeholders.	Supported
Hypotheses (Stakeholder's Influence Level)	**State**
H5'a: UTTO is influenced by Educational Institution more than by other stakeholders	Supported
H5'b: IFOI is influenced by Industry more than by other stakeholders	N/A
H5'c: CBI is influenced by Government more than by other stakeholders	Supported
H5'd: III is influenced by Financier more than by other stakeholders	Supported
Hypotheses (Relationships Between Stakeholder's Importance Level and Dependency Level)	**State**
H4: Level of II dependency on salient stakeholder is positively associated with managers' perception regarding stakeholders' saliency.	Supported
Hypotheses (Relationships Between Stakeholder's Influence Level and Importance Level)	**State**
H5a: Salient stakeholder (Educational Institution) influences UTTO strategy more so than other stakeholders.	Supported
H5b: Salient stakeholder (Industry) influences IFOI strategy more so than other stakeholders.	Supported
H5c: Salient stakeholder (Government) influences CBI strategy more so than other stakeholders.	Supported
H5d: Salient stakeholder (Financiers) influences III strategy more so than other stakeholders.	Supported
Hypotheses (Relationships Between Stakeholder's Influence Level and Dependency Level)	**State**
H6a: High dependency of UTTO on Educational Institution stakeholder influences UTTO's strategy toward purposes of Educational Institution more so than other stakeholders.	Supported
H6b: High dependency of IFOI on Industry stakeholder influences IFOI's strategy toward purposes of Industry more so than other stakeholders.	Supported
H6c: High dependency of CBI on Government stakeholder influences CBI's strategy toward purposes of Government more so than other stakeholders.	Supported
H6d: High dependency of III on Financiers stakeholder influences III's strategy toward purposes of Financiers more so than other stakeholders.	Not Supported
Hypotheses (Relationships Between Stakeholder's Influence Level and Both Importance and Dependency Level)	**State**
For any IIs type that perceives a particular stakeholder as important more then other stakeholders, the variables for the level of that stakeholder's salience and its level of the dependency explain the level of influence by that particular stakeholder better than any of these variables separately.	Supported

Furthermore, in next sections, the second part of the model is discussed, which focus on how II types are differentiated in terms of their operational strategy; thus, various dependent variables are discussed and compered among IIs type; that leads to articulate the impact of stakeholders influence on each type of IIs in terms of their operational strategy.

6.5.3 The Relationship Between II Types and Their Clients

This section investigates the relationship among IIs types in terms of their clients (stakeholders). A one-way multivariate analysis of variance (MANOVA) was run[110] to examine the differences among the three IIs types in terms of their clients. A statistically significant difference was found between the clusters in the combined dependent variables (clients), $F(6, 294) = 13.836$, $p < 0.001$; Wilks' $\Lambda = 0.608$; Partial $\eta 2 = 0.22$. This in turn supports the initial idea that clients can be predicted by knowing to which II type the innovation intermediary belongs.

Table 6-26 Result of Multivariate Analysis of Variance for Clients

Dependent Variables	II Types	Mean	Multivariate F*	Univariate F*	P-value	Partial Eta Squared
			13.836		0.000	0.220
External Clients (individual, entrepreneurs, new venture, establish firms, partners and other IIs)	UTTO	-0.388		16.386	0.000	0.180
	CBI	0.719				
	III	0.379				
University Clients (internal clients, professors, students)	UTTO	0.413		18.562	0.000	0.199
	CBI	0.044				
	III	-0.535				
Clients from hospitals and research center	UTTO	0.106		1.668	0.192	0.022
	CBI	-0.323				
	III	-0.132				

Follow-up univariate ANOVAs indicated that 'external clients' ($F(2, 149) = 16.386$, $p < 0.001$; Partial $\eta 2 = 0.18$) and 'university clients' ($F(2, 149) = 18.562$, $p < 0.001$; Partial $\eta 2 = 0.199$); were statistically significantly different between the II types. Tukey post-hoc tests showed that for 'external clients', innovation intermediaries from CBI and III had statistically significantly higher mean scores

[110] Assumptions were checked and met (Supplementary Appendix R)

than innovation intermediaries from UTTO (all $p < 0.001$); However, in terms of 'university clients', UTTO was statistically significant with higher mean scores than innovation intermediaries from III ($p < 0.01$). Furthermore, there was no statistically significant a difference among II types for the 'clients from hospitals and research centres'.

Figure 6-4 Means for the Three Main Clients

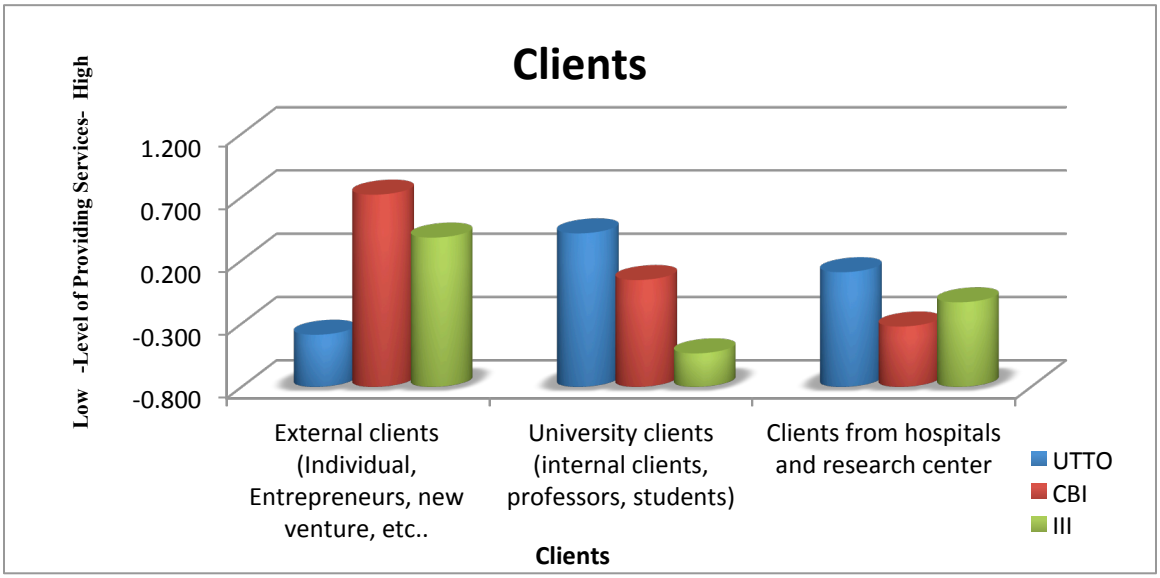


Table 6-27 Post-hoc Result for Clients Differences Between IIs Types

Dependent Variable	(I) II Types	(J) II Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
External Clients (individual, entrepreneurs, new venture, establish firms, partners and other IIs)	CBI	UTTO	1.107*	0.265	0.000	0.479	1.735
		III	0.339	0.275	0.435	-0.311	0.990
	III	UTTO	.768*	0.160	0.000	0.390	1.146
		CBI	-0.339	0.275	0.435	-0.990	0.311
University Clients (internal clients, professors, students)	UTTO	CBI	0.369	0.259	0.331	-0.244	0.981
		III	.948*	0.156	0.000	0.580	1.317

In addition, comparisons within groups (IIs types) were investigated in terms of their clients. In other words, all three clients were compared within each IIs type. This test helped examine the Hypotheses H9, and determine which clients were served more by each IIs type. Thus, a one-way

repeated measures ANOVA was conducted[111] for UTTO to determine whether there were statistically significant differences in the providing of services to any of the three main clients. The level of service provision for clients showed statistically significant differences, $F(2, 164) = 13.558$, $p < 0.001$, Partial $\eta 2 = 0.181$, with highest scores for 'university clients' ($M = 0.413$, $SD = 0.846$). Post-hoc analysis with a Bonferroni adjustment showed that service provision to 'university clients' was significantly higher than 'external clients' ($M = 0.801$, 95% CI [0.480, 1.122], $p < 0.001$); as well, service provision to 'clients from hospitals and research centres' was significantly higher than service provision to 'external clients' ($M = 0.494$, 95% CI [0.177, 0.811], $p = 0.001$). There was a statistically significant difference among means of some clients; therefore, we could reject the null hypothesis and accept the alternative hypothesis that UTTO focuses more on providing services to 'university clients' and than on providing services to 'clients from hospitals and research centres', as compared to other clients.

The same approach was followed for the other two IIs types. Results of one-way repeated measures ANOVA are listed in Table 6-28 and Table 6-29. Conclusions drawn from the analysis of one-way repeated measures ANOVA for CBI and III are as follows:

Table 6-28 Result of One-Way Repeated Measure ANOVA for All Clients

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
UTTO	Clients	Sphericity Assumed	27.116	2	13.558	18.168	0.000	0.181	H9a (√)
	Error(Clients)		122.390	164	0.746				
CBI	Clients	Sphericity Assumed	7.822	2	3.911	3.633	0.041	0.218	H9c (√)
	Error(Clients)		27.988	26	1.076				
III	Clients	Sphericity Assumed	23.120	2	11.560	17.843	0.000	0.248	H9d (√)
	Error(Clients)		69.968	108	0.648				

1. The difference among the means for CBI was statistically significant. Thus, we could reject the null hypothesis and conclude that CBI provides more services to some clients compared to others. 'External clients' was significantly higher than 'clients from hospitals and research centres', while 'external clients' consistently scored the higher means.

[111] There were no significant outliers as assessed by box plot and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix R). Nevertheless, the assumption of Sphericity was assessed by Mauchly's test of sphericity (Supplementary Appendix R).

2. The difference among the means for III was statistically significant. 'External clients' was significantly higher than 'university clients' and 'clients from hospitals and research centres'. As a result, we could reject the null hypothesis and accept the alternative hypothesis that III focuses more on 'external clients' compared to other clients.

Figure 6-5 Means for Clients for Each Cluster

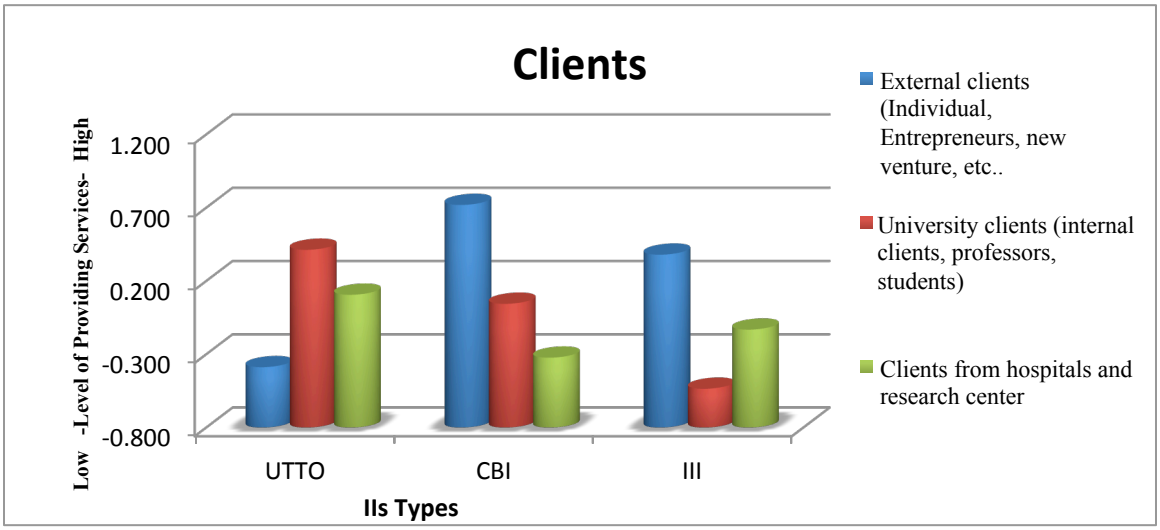


Table 6-29 Post-hoc Result for Providing Services to Clients Within Each IIs type

II Types	(I) Clients	(J) Clients	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	University Clients (internal clients, professors, students)	External clients	.801*	0.131	0.000	0.480	1.122
		Clients from hospitals and research center	0.307	0.141	0.097	-0.038	0.652
	Clients from hospitals and research center	External clients	.494*	0.130	0.001	0.177	0.811
		University clients	-0.307	0.141	0.097	-0.652	0.038
CBI	External Clients (individual, entrepreneurs, new venture, establish firms, partners and other IIs)	University clients	0.674	0.347	0.222	-0.279	1.628
		Clients from hospitals and research center	1.042*	0.329	0.022	0.138	1.947
III	External Clients (individual, entrepreneurs, new venture, establish firms, partners and other IIs)	University clients	.915*	0.150	0.000	0.544	1.285
		Clients from hospitals and research center	.511*	0.152	0.004	0.136	0.886
	Clients from hospitals and research center	External clients	-.511*	0.152	0.004	-0.886	-0.136
		University clients	.404*	0.159	0.041	0.012	0.795

6.5.4 The Relationship Between II Types and Performance and Objectives

This section investigates the relationship among IIs types in terms of their objectives and performance. This investigation was done by using the scores of each factor/component of objectives[112] and the cumulative performance score. The cumulative performance was calculated by drawing upon two responses: 1) the measure of the importance of each objective for IIs (Scale 1 to 5); and 2) the measure of how IIs performed in each particular objective for the past year (out of 100%). Accordingly, 22 objectives were summed up using the following equation:

(Sum of (Objective's importance level (i) * Objective's performance level (i)/100))*0.9091 (Where i= from 1 to 22)[113]

Using the cumulative performance scores helped develop a performance indicator that takes into account the various perceptions of each IIs regarding the importance level of goals.

In the following paragraphs, one-way MANOVA tests were performed to compare IIs types in terms of their objective's importance level. Thus, a one-way multivariate analysis of variance (MANOVA) was run to examine the differences among the three IIs types in terms of their objective's importance level. Assumptions[114] were checked[115] and were met[116] (Supplementary Appendix R). A statistically significant difference was found among the clusters in the combined dependent variables (objectives), $F(12, 286) = 5.772$, $p < 0.0001$; Pillai's Trace = 0.39; Partial $\eta 2 = 0.195$. This in turn supports the initial idea that objectives can be predicted by knowing to which IIs types the innovation intermediary belongs.

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[112] See Section 6.3.
[113] The result of this equation is normalized to be out of 100 by multiplying it to (100/110= 0.9091)
[114] Box's *M* test of equality is of significance with unequal sample sizes; thus, the test is not robust (Tabachnick & Fidell, 2001). Accordingly, Pillai's Trace result is recommended to correct for this violation of equality assumption for MANOVA.
[115] Although Levene's F test suggested that the variances associated with 'Increase the financial success for companies' was not homogenous, an examination of the standard deviations (see Supplementary Appendix R) revealed that none of the largest standard deviations were more than four times the size of the corresponding smallest standard deviation, thus suggesting that the ANOVA would be robust in this case (Howell, 2009). As well, using Welch's ANOVA control for this violation.
[116] Only two observations (8 and 148) were removed as extreme outliers.

Table 6-30 Result of Multivariate Analysis of Variance for Objectives

	Variables (Objectives)	II Types	Mean	Multivariate F*	Univariate F*	P-value	Partial Eta Squared
	All			5.772		0.000	0.195
1	Improve the economic of the local community	UTTO	0.089		3.960	0.021	0.051
		CBI	0.422				
		III	-0.281				
2	Increase the financial success for companies	UTTO	-0.447		29.727*	0.000	0.251
		CBI	0.270				
		III	0.602				
3	Support entrepreneurs/start-ups activity	UTTO	0.053		1.847	0.161	0.025
		CBI	0.503				
		III	-0.023				
4	Promote local industry by commercializing technologies	UTTO	-0.003		0.522	0.594	0.007
		CBI	0.229				
		III	-0.084				
5	Increase the sustainability of success for companies	UTTO	-0.165		2.432	0.091	0.032
		CBI	0.257				
		III	0.170				

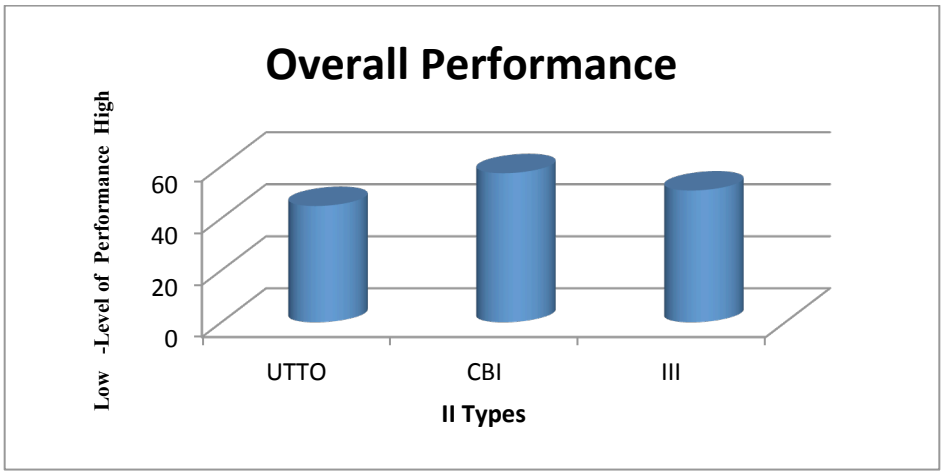
Error df=147, and df=2 for all variables; * Based on Welch ANOVA as the homogeneity of variances was violated F(2, 31.988)

Follow-up univariate ANOVAs indicated that 'improve the economic performance of the local community' ($F(2, 147) = 3.96$, $p = 0.021$; Partial $\eta 2 = 0.051$); and 'increase the financial success for companies' ($F(2, 31.988) = 29.727$, $p < 0.001$; Partial $\eta 2 = 0.251$); were statistically significantly different between the IIs types, while other three objectives were not significant (see Table 6-30). Tukey post-hoc tests showed that for 'improve the economic performance of the local community', innovation intermediaries from CBI and UTTO types have statistically significantly higher mean scores than innovation intermediaries from III (all $p < 0.05$). Moreover, in terms of 'increase the financial success of companies,' III was statistically significant with higher mean scores than innovation intermediaries from UTTO ($p < 0.001$) (See Appendix R).

Before comparing objectives within each IIs types, a cumulative performance was compared between the three IIs types. One-way ANOVA was performed to determine if the cumulative performance was different among IIs types. Assumptions were checked and met for ANOVA. Cumulative performance was statistically significantly different between IIs types, $F(2, 147) = 5.987$, $p = 0.003$, $\omega 2 = 0.06$. Cumulative performance mean was higher in CBI ($M = 57.362$, $SD = 13.77$) compared to III ($M = 50.709$, $SD = 15.584$) and UTTO ($M = 44.736$, $SD = 13.326$). Tukey post-hoc analysis revealed that the mean for CBI was statistically significantly higher than the mean for UTTO

(12.626, 95% CI [2.586, 22.666]); as well, the mean for III was statistically significantly higher than the mean for UTTO (5.973, 95% CI [.088, 11.858]). However, no other differences were statistically significant.

Figure 6-6 Overall Performance Means for Clusters



Moreover, comparisons within IIs types in terms of their objectives were investigated. In other words, all five objectives were compared within each IIs type. These tests helped examine the Hypothesis H10, and determine which objective was most important for each IIs types. Thus, a one-way repeated measures ANOVA was conducted[117] for each type to determine whether there were statistically significant differences in objectives. A similar approach as in Section 6.5.3 was followed; the results of one-way repeated measures ANOVA are listed in Table 6-31 and Table 6-32. Conclusions drawn from the analysis of one-way repeated measures ANOVA for CBI and III are as follows:

[117] There were no significant outliers as assessed by box plot (Section 6.5) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix R). Nevertheless, the assumption of sphericity was not violated, as assessed by Mauchly's test of Sphericity, $\chi 2(5) = 7.692$, $p = 0.174$ (Supplementary Appendix R).

Table 6-31 Result of One-Way Repeated Measure ANOVA for All Objectives

II Types	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
UTTO	Objectives	Sphericity Assumed	19.007	5.000	3.801	5.721	0.000	0.065	H10a (√)
	Error(Objectives)		272.438	410.000	0.664				
CBI	Objectives	Greenhouse-Geisser	6.827	2.800	2.439	1.706	0.187	0.124	H10c (X)
	Error(Objectives)		48.031	33.596	1.430				
III	Objectives	Greenhouse-Geisser	24.869	4.088	6.083	5.957	0.000	0.101	H10d (√)
	Error(Objectives)		221.245	216.663	1.021				

Table 6-32 Post-hoc Result for Objectives Within Each Cluster

II Types	(I) Objectives	(J) Objectives	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Increase the financial success for companies	Improve the economic performance of the local community	-.536*	0.114	0.000	-0.880	-0.193
		Support entrepreneurs/start-ups activity	-.500*	0.123	0.002	-0.873	-0.126
		Promote local industry by commercializing technologies	-.445*	0.140	0.031	-0.867	-0.022
		Increase the sustainability of success for companies	-0.282	0.121	0.332	-0.648	0.084
III	Increase the financial success for companies	Improve the economic performance of the local community	.883*	0.174	0.000	0.347	1.418
		Support entrepreneurs/start-ups activity	.625*	0.152	0.002	0.158	1.091
		Promote local industry by commercializing technologies	.686*	0.180	0.005	0.133	1.239
		Increase the sustainability of success for companies	0.432	0.158	0.130	-0.055	0.919

1. There was a statistically significant difference among means of some objectives (i.e. the objectives 'Improve the economic performance of the local community,' 'Support entrepreneurs/start-ups activity,' and 'Promote local industry by commercializing technologies' were significantly higher than 'increase the financial success of companies' (all $p > 0.05$)). Therefore, we could reject the null hypothesis and accept the alternative hypothesis that UTTO focuses less on 'increase the financial success of companies' compared to other objectives.

2. For CBI, there was no statistically significant difference between the means; accordingly, we could not reject the null hypothesis for it. In other words, CBI tended to have indifferent priority for all objectives.
3. The difference among the means for III was statistically significant. The objective 'Increase the financial success for companies' was significantly higher than all other objectives, but not the objective of 'increase the sustainability of success for companies'. As a result, we can reject the null hypothesis and accept the alternative hypothesis that III focuses more on 'increase the financial success of companies' compared to other objectives.

6.5.5 The Relationship Between II Types and Commercialization Paths

Commercialization paths were introduced and discussed in Section 2.2 and Section 6.3. Four paths were identified from the ten variables (Q9_1 –to- Q9_10): BUILD, RENT, SELL, and RENT through newly created venture (RENT_nv) (Pries, 2006)[118]. This section examines the relationship between IIs types in terms of their commercialization paths both between and within clusters. These tests examined the Hypotheses H7.

First, one-way MANOVA tests were performed[119] to compare IIs types in terms of their commercialization paths. These tests investigated the differences between commercialization paths based on innovation intermediaries in the three IIs types. UTTO scored higher in RENT, SELL, and RENT_nv in comparison to III which scored higher in BUILD. There was a statistically significant difference between the IIs types in the combined dependent variables (commercialization paths), $F(8, 292) = 5.877$, $p < 0.0001$; Wilks' $\Lambda = 0.742$; and Partial $\eta 2 = 0.139$. Follow-up univariate ANOVAs indicated that SELL ($F(2, 149) = 9.159$, $p < 0.001$; Partial $\eta 2 = 0.109$), RENT ($F(2, 149) = 12.383$, $p < 0.001$; Partial $\eta 2 = 0.143$), RENT_nv ($F(2, 149) = 15.003$, $p < 0.001$; Partial $\eta 2 = 0.168$), and BUILD ($F(2, 149) = 5.386$, $p = 0.006$; Partial $\eta 2 = 0.067$) were statistically significantly different among the IIs types using a Bonferroni adjusted α level of 0.025. Tukey post-hoc tests showed that for BUILD scores, innovation intermediaries from III and CBI had statistically significantly higher scores than innovation intermediaries from UTTO ($p < 0.05$). Moreover, for SELL, RENT and

[118] Based on Pries (2006), PCA was conducted for three combinations of variables that resulted in three paths: SELL, RENT, and RENT through new created venture. Next, the scores were used (see Section 6.4.1 for more details).
[119] Assumptions were checked and were met; Initially, one observation (103) was detected as outlier and was accordingly removed. After removing it, all assumptions were met. (Supplementary Appendix R)

RENT_nv scores, Tukey post-hoc tests showed that innovation intermediaries from UTTO had a statistically significantly higher mean than IIs from III and CBI (all $p < 0.5$). This in turn supports the initial idea that commercialization paths can be predicted by knowing to which IIs types the innovation intermediary belongs.

Table 6-33 Result of Multivariate Analysis of Variance for Commercialization Paths

Dependent Variables	Cluster Number of Case	Mean	Multivariate F*	Univariate F*	P-value	Partial Eta Squared
			5.877		0.000	0.139
SELL	UTTO	0.343		9.159	0.000	0.109
	CBI	-0.433				
	III	-0.262				
RENT	UTTO	0.360		12.383	0.000	0.143
	CBI	-0.461				
	III	-0.362				
RENT_nv	UTTO	0.417		15.003	0.000	0.168
	CBI	-0.483				
	III	-0.359				
BUILD	UTTO	-0.192		5.386	0.006	0.067
	CBI	0.408				
	III	0.282				

Error df=149, and df=2 for all variables

Table 6-34 Post-hoc Result for Commercialization Paths' Level of Importance Between IIs Types

Dependent Variable	(I) IIs Types	(J) IIs Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
SELL	UTTO	CBI	.776*	0.268	0.012	0.142	1.411
		III	.605*	0.161	0.001	0.224	0.987
RENT	UTTO	CBI	.821*	0.265	0.007	0.194	1.449
		III	.722*	0.160	0.000	0.344	1.100
RENT_nv	UTTO	CBI	.900*	0.260	0.002	0.284	1.516
		III	.776*	0.157	0.000	0.405	1.147
BUILD	CBI	UTTO	.600*	0.273	0.029	0.062	1.139
		III	0.126	0.282	0.656	-0.432	0.684
	III	UTTO	.474*	0.164	0.004	0.150	0.798
		CBI	-0.126	0.282	0.656	-0.684	0.432

Second, comparisons within IIs types in terms of their commercialization paths were investigated to examine which commercialization path was perceived as preferable for each IIs types. A one-way

repeated measures ANOVA was conducted[120] for each type to determine whether there were statistically significant preference differences between any of the four commercialization paths. A similar approach as in Section 6.5.3 was followed; the results of one-way repeated measures ANOVA are listed in Table 6-35 and Table 6-36. The conclusions drawn from the analysis of one-way repeated measures ANOVA for UTTO, CBI and III are as follows:

Table 6-35 Result of One-Way Repeated Measure ANOVA for All Commercialization Paths' Level of Importance

IIs Types	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
UTTO	CP	Greenhouse-Geisser	20.136	1.787	11.267	13.905	0.000	0.145	H7a (√)
	Error(CP)		118.747	146.556	0.810				
CBI	CP	Greenhouse-Geisser	7.921	1.305	6.068	4.991	0.031	0.277	H7c (√)
	Error(CP)		20.632	16.970	1.216				
III	CP	Greenhouse-Geisser	15.705	2.019	7.778	16.063	0.000	0.229	H7d (√)
	Error(CP)		52.796	109.038	0.484				

1. The differences among the means for UTTO were statistically significant. Thus, we could reject the null hypothesis and accept the alternative hypothesis that UTTO prefers RENT, RENT_nv and SELL to BUILD path; nevertheless.
2. The differences among the means for CBI were statistically significant. Thus, we can reject the null hypothesis and conclude that CBI preferred certain commercialization paths over others. BUILD was significantly higher than RENT_nv, and SELL. As a result, we can accept the alternative hypothesis that CBI preferred BUILD compared to other commercialization paths.
3. Almost similar to CBI, the differences among the means for III were statistically significant. BUILD was significantly higher than RENT and RENT_nv, and SELL. As a result, we can reject the null hypothesis and accept the alternative hypothesis that III preferred BUILD over other commercialization paths.

[120] There were no significant outliers as assessed by box plot (only one extreme outlier (observation 103) was removed) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix R). Nevertheless, the assumption of sphericity was not violated, as assessed by Mauchly's test of Sphericity Supplementary Appendix R).

Table 6-36 Post-hoc Result for Commercialization Paths' Level of Importance Within Each IIs Types

IIs Types	(I) CP	(J) CP	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	SELL	RENT	-0.017	0.077	1.000	-0.224	0.190
		RENT_nv	-0.074	0.079	1.000	-0.287	0.139
		BUILD	.535*	0.132	0.001	0.177	0.893
	RENT	SELL	0.017	0.077	1.000	-0.190	0.224
		RENT_nv	-0.057	0.055	1.000	-0.207	0.093
		BUILD	.552*	0.132	0.000	0.195	0.909
	RENT_nv	SELL	0.074	0.079	1.000	-0.139	0.287
		RENT	0.057	0.055	1.000	-0.093	0.207
		BUILD	.609*	0.140	0.000	0.229	0.989
CBI[121]	BUILD	SELL	.842*	0.345	0.03	0.097	1.586
		RENT	0.87	0.408	0.053	-0.012	1.752
		RENT_nv	.891*	0.331	0.018	0.176	1.606
III	BUILD	SELL	.545*	0.119	0.000	0.218	0.871
		RENT	.644*	0.136	0.000	0.272	1.017
		RENT_nv	.641*	0.137	0.000	0.265	1.018

6.5.6 The Relationship Between II Types and Innovation Readiness Criteria

This section investigated the relationship among IIs types in terms of their innovation readiness criteria. This investigation was done by using the scores of each factor/criteria within each of the four constructs of innovation readiness.

Table 6-37 MANOVA for Innovation Readiness and its Four Constructs

	Value (Wilks' Lambda)	F	Hypothesis df	Error df	P-value	Partial Eta Squared
Innovation readiness	0.395	2.846	51	396.768	0.000	0.266
Idea/technology	0.584	4.739	18	407.779	0.000	0.164
Market	0.919	1.397	9	357.910	0.188	0.028
Entrepreneurs	0.912	2.338	6	296.000	0.032	0.045
New business venture	0.703	3.000	18	407.779	0.000	0.111

In the following paragraphs, five one-way MANOVA tests were performed (Table 6-37) to compare IIs types in terms of innovation readiness and its four constructs[122]: idea (technology) (four main factors/criteria), market (3), entrepreneur (2), and new business venture (6). Assumptions were

[121] LSD adjustment was used instead of Bonferroni adjustment; as the later does not detect the differences.
[122] These four constructs comprise the innovation readiness as it was introduced in Section 2.4.

checked and met[123]. A statistically significant difference was found among the IIs types in the combined dependent variables (innovation readiness), $F(51, 396.768) = 2.846$, $p < 0.0001$; Wilks' $\Lambda = 0.395$; Partial $\eta 2 = 0.266$ (Table 6-37). That supports the initial idea that innovation readiness can be predicted by knowing to which IIs types the innovation intermediary belong. Furthermore, the MANOVA models for three of the four constructs of innovation readiness were significant: idea/technology construct ($F=4.739$, $p < 0.001$), entrepreneurs construct ($F=2.338$, $p = 0.032$), and new business venture construct ($F=3.000$, $p < 0.001$). Nevertheless, individual univariate F-statistics for seven criteria out of 12 factor/criteria in relation to the three significant constructs were also significant (Table 6-38); this in turn further supports the idea that innovation readiness can be predicted by knowing to which IIs types the innovation intermediary belongs.

Table 6-38 One-Way ANOVA for All Criteria

Constructs	#	Dependent Variable (Criteria)	Type III Sum of Squares	Mean Square	F	P-value	Partial Eta Squared
Idea/technology	1	Synergy between capability of IIs and the proposed idea.	8.263	2.754	2.811	0.042	0.054
	2	Potential societal and environmental benefits from the idea	6.431	2.144	2.371	0.073	0.046
	3	Originality of the idea	32.966	10.989	13.821	0	0.218
	4	Innovation level of the idea (radical vs. incremental)	4.632	1.544	1.506	0.215	0.029
Market	7	Expected fit between market need and the proposed solution	5.917	1.972	2.173	0.094	0.042
	8	Path to market	5.403	1.801	1.834	0.143	0.036
	9	Potential opportunities in the targeted market	0.673	0.224	0.25	0.861	0.005
Entrepreneurs	10	Entrepreneur engagement	0.803	0.268	0.27	0.847	0.005
	11	Entrepreneur capabilities	12.767	4.256	4.556	0.004	0.084
New business venture	12	Viability of the new business venture	6.549	2.183	2.286	0.081	0.044
	13	Potential successful growth of the new business venture	12.137	4.046	4.221	0.007	0.078
	14	Potential contribution to local societal and environment	15.858	5.286	5.598	0.001	0.101
	15	Scope of the new business venture	2.244	0.748	0.759	0.519	0.015
	16	Scientific and technology foundation of the new business venture	7.615	2.538	2.77	0.044	0.053
	17	Payback potential of the new business venture	2.171	0.724	0.783	0.505	0.016

Errorr dF=149, and df=3 for all variables

[123] Assumptions were checked and were met; Initially, one observation (77) was detected as outlier and was accordingly removed. After removing it, all assumptions were met. (Supplementary Appendix R)

Table 6-39 Post-hoc Result for Criteria Level of Importance Between IIs Types

Dependent Variable	(I) II Types	(J) II Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
Synergy between capability of IIs and the proposed idea	III	UTTO	.468*	0.173	0.037	0.020	0.917
		CBI	0.539	0.296	0.269	-0.231	1.309
Originality of the idea	UTTO	CBI	.958*	0.258	0.002	0.288	1.628
		III	.880*	0.155	0.000	0.476	1.284
Entrepreneur capabilities	III	UTTO	.614*	0.168	0.002	0.177	1.052
		CBI	0.506	0.289	0.303	-0.246	1.258
Potential successful growth of the new business venture	III	UTTO	.554*	0.171	0.008	0.110	0.997
		CBI	0.045	0.293	0.999	-0.716	0.807
Potential contribution to local societal and environment	UTTO	CBI	-0.064	0.281	0.996	-0.794	0.667
		III	.642*	0.169	0.001	0.202	1.082
Scientific and technology foundation of the new business venture	UTTO	CBI	0.420	0.277	0.131	-0.127	0.967
		III	.414*	0.167	0.014	0.084	0.744

Tukey post-hoc tests showed that for 'synergy between capability of IIs and the proposed idea' criterion, innovation intermediaries from III had statistically significantly higher mean scores than innovation intermediaries from UTTO ($p = 0.037$); similar results were found for the criteria 'Entrepreneur capabilities,' and 'Potential successful growth of the new business venture' where III were statistically significantly higher mean scores than innovation intermediaries from UTTO (all $p < 0.05$). On the other hand, for the criterion of 'Originality of the idea', Tukey post-hoc tests showed that innovation intermediaries from UTTO had statistically significantly higher mean scores than innovation intermediaries from CBI ($p = 0.002$) and from III ($p < 0.001$). Furthermore, for the criteria of 'potential contribution to local society and environment', and 'scientific and technology foundation of the new business venture,' Tukey post-hoc tests showed that innovation intermediaries from UTTO had statistically significantly higher mean scores than innovation intermediaries from III ($p < 0.05$).

In addition, comparisons within IIs types in terms of their innovation readiness criteria were investigated. In other words, all criteria were compared within each IIs type. These tests helped examine the Hypotheses H8, and determine which criteria were perceived as more important for each IIs type/group. One-way repeated measures ANOVA was conducted[124] for each type to determine

[124] There were no significant outliers as assessed by box plot (Only two extreme outliers (observations 88 and 89) were removed.) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix R). Nevertheless, the assumption of sphericity was not violated, as assessed by Mauchly's test of Sphericity Supplementary Appendix R).

whether there were statistically significant differences in perceiving any of the 17 criteria as more important than others. A similar approach as in Section 6.5.3 was followed; the results of one-way repeated measures ANOVA are listed in Table 6-40 and Table 6-41.The conclusions drawn from the analysis of one-way repeated measures ANOVA for UTTO, CBI and III are as follows:

Table 6-40 Result of One-Way Repeated Measure ANOVA for All Criteria's Level of Importance

II Types	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
UTTO	All Criteria	Greenhouse -Geisser	43.95	11.502	3.821	3.397	0.000	0.04	H8a (√)
	Error(Criteria)		1047.832	931.691	1.125				
CBI	All Criteria	Greenhouse -Geisser	12.179	5.388	2.26	1.047	0.401	0.087	H8c (X)
	Error(Criteria)		127.92	59.264	2.158				
III	All Criteria	Greenhouse -Geisser	59.36	9.716	6.109	4.064	0.000	0.07	H8d (√)
	Error(Criteria)		788.757	524.683	1.503				

1. The level of importance for some criteria showed statistically significant differences for UTTO, with highest scores for 'originality of the idea'; therefore, we could reject the null hypothesis and accept the alternative hypothesis that UTTO focused more on idea/technology construct compared to other constructs of innovation readiness.
2. There was no statistically significant difference among the means of criteria for CBI. Thus, we could not reject the null hypothesis that there was no relation between CBI and the innovation readiness' focus (idea/technology, market, entrepreneur, and new business venture).
3. The difference among the means for III was statistically significant. Thus, we could reject the null hypothesis and conclude that III perceives some criteria as more important than others. Some of the new business venture' criteria (e.g. 'potential successful growth of the new business venture', and 'payback potential of the new business venture') were significantly higher than 'originality of the idea'. As well, the criteria 'expected fit between market need and the proposed solution', 'entrepreneur capabilities', and 'potential successful growth of the new business venture'' scored significantly higher than 'potential contribution to local societal and environment'. Moreover, the criterion 'entrepreneur capabilities' was significantly higher than 'originality of the idea' and 'potential societal and environmental benefits from the idea'.

As a result, we can reject the null hypothesis and accept the alternative hypothesis that III focused more on new business venture and entrepreneur constructs compared to other constructs of innovation readiness; in addition, III perceived that having some societal and environmental benefits and contributions was not as much of a priority as the potential financial success and growth of new venture and entrepreneur capabilities.

Table 6-41 Post-hoc Result for Criteria Level of Importance Within Each IIs Types

II Types	(I) Criteria	(J) Criteria	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	3	1	.584*	0.148	0.024	0.032	1.136
		11	.656*	0.138	0.001	0.142	1.169
		12	.585*	0.145	0.018	0.044	1.126
		13	.668*	0.126	0.000	0.201	1.135
		17	.470*	0.125	0.045	0.004	0.936
	14	11	.457*	0.121	0.040	0.008	0.907
III	3	1	-.764*	0.147	0.000	-1.324	-0.205
		7	-.687*	0.180	0.047	-1.370	-0.004
		8	-.652*	0.166	0.032	-1.282	-0.023
		11	-.839*	0.172	0.001	-1.491	-0.186
		17	-.605*	0.129	0.003	-1.095	-0.115
	11	2	.575*	0.137	0.014	0.054	1.096
		3	.839*	0.172	0.001	0.186	1.491
		14	.799*	0.165	0.002	0.172	1.427
	14	7	-.648*	0.169	0.046	-1.291	-0.004
		11	-.799*	0.165	0.002	-1.427	-0.172
		13	-.727*	0.173	0.014	-1.386	-0.068

6.5.7 Summary

In conclusion, most hypotheses in Section 6.5.4 through Section 6.5.7 were accepted (see Table 6-42). This in turn supports the second part of the model (Figure 6-7) in the context of innovation intermediaries who facilitate research commercialization. The overall conclusion is that each II type translates the various influences that it receives from its salient stakeholders (as discussed in Section 6.5.2) into diverse operational strategies. This study investigated the four important aspects of IIs' operational strategies: clients to be served by IIs (3), objectives of IIs (6), commercialization paths (4), and innovation readiness (17). In other words, it is evident that various II types focus on serving particular clients, give more priority to some objectives, use a particular dominant commercialization path, and focus on specific criteria when selecting which innovation to commercialize. Interestingly, most of the statistical findings align with the observed behaviour of the various II types. This increases the validity of the proposed typology of II types and simultaneously provides theoretical explanation for their behaviour. That in turns result in many implications and open new venues for future research, as discussed in Chapter 7.

Figure 6-7 Second Part of the Research Model (Operational Strategies Constructs)

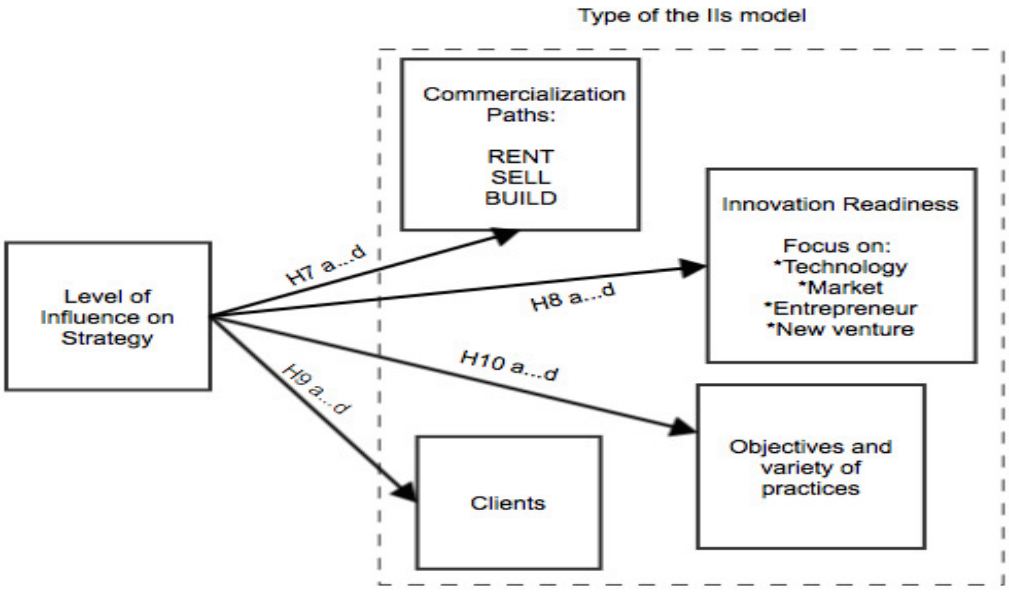


Table 6-42 Summary for All Hypothesis for IIs Types Operational Strategies

Hypotheses (Commercialization Paths)	State
H7a: UTTO is more likely to use 'RENT' as their dominant commercialization path in comparison to the other commercialization paths.	Supported
H7b: IFOI is more likely to use 'SELL' as their dominant commercialization path in comparison to the other commercialization paths.	N/A
H7c: CBI is more likely to use 'BUILD' as their dominant commercialization path in comparison to the other commercialization paths.	Supported
H7d: III is more likely to use 'BUILD' as their dominant commercialization path in comparison to the other commercialization paths.	Supported
Hypotheses (Innovation Readiness)	**State**
H8a: UTTO is likely to focus more on 'TECHNOLOGY' compared to other constructs of innovation readiness.	Supported
H8b: IFOI is likely to focus more on 'MARKET' compared to other constructs of innovation readiness.	N/A
H8c: CBI is likely to focus more on 'ENTREPRENEUR' compared to other constructs of innovation readiness.	Not Supported
H8d: III is likely to focus more on 'NEW BUSINESS VENTURE' compared to other constructs of innovation readiness.	Supported
Hypotheses (Clients)	**State**
H9a: UTTO is likely to serve internal clients (i.e. affiliated clients, students, faculty, and university staff) more than other clients.	Supported
H9b: IFOI is likely to serve internal clients (i.e. affiliated clients, parent firm's employees) more than other clients.	N/A
H9c: CBI is more likely to serve external clients (i.e. not necessarily affiliated clients).	Supported
H9d: III is more likely to serve external clients (i.e. not necessarily affiliated clients).	Supported
Hypotheses (Objectives)	**State**
H10a: UTTO is more likely to have focused objectives and practices that may be related to patenting and licensing.	Supported
H10b: IFOI is more likely to have focused objectives and practices that may be related to patenting, licensing, and acquiring.	N/A
H10c: CBI is more likely to have broad objectives and practices that may be related to creating a new business venture.	Not Supported
H10d: III is more likely to have broad objectives and practices that may be related to creating a new business venture.	Supported

The next section discusses similar hypotheses; however, the independent variable is II types based on the emerged clusters.

6.6 Findings Based on II Types Suggested by Clustering Analysis

This section conducted analyses similar to what has been conducted in Section 6.5; however, in this section, analyses for all hypotheses were performed by using clusters that were extracted from clustering analysis as the independent variable. In total, four clusters emerged. Section 6.6.1 explains how clustering procedure was performed and identifies what clustering variables were used. Similar to Section 6.5, the investigated model was divided into two parts. The first part examined hypotheses one to six (Section 6.6.3), while the second part examined IIs operational strategy including hypotheses seven through ten, which are described in Sections 6.6.4 through 6.6.8. This section concludes with a summary that includes tables outlining which hypotheses were supported and which were not (see Table 6-56 and Table 6-70).

6.6.1 Clusters of IIs

Clustering analysis is defined as the grouping of "individuals or objects into clusters so that objects in the same cluster are more similar to one another than they are to objects in other clusters" (Hair, Tatham, Anderson, & Black, 2010). As indicated in the methodology chapter and at the beginning of this chapter, the other approach for this study to grouping innovation intermediaries who facilitate research commercialization was by clustering them based on their data. The resulted clusters denote organizational configurations, which were groups of IIs that share common characteristics (Ketchen Jr et al., 1997; Meyer, Tsui, & Hinings, 1993). Thus, the resulted clusters were used in this section as the types of IIs instead of the self reported ones (that were used in Section 6.5.1).

In general, the clustering procedure will depend on the particular research question that is to be answered; it can be either three basic research questions or a combination of these: 1) to explore an empirical natural taxonomy description for the data which might be compared to the theoretical typology that already exist through other studies; 2) to simplify data by grouping observations and then profiling each cluster characteristics which in turn may generate hypothesis related to the structure; 3) to identify relationship among individual observations through the groups i.e. clusters. In

this study, a combination of all the above goals will be explored to some extent to gain insights from the clustering analysis procedure. However, the primary objective is to develop taxonomy for innovation intermediaries based on their perception of their stakeholders. After identifying the taxonomy, we profiled the clusters for innovation intermediaries' stakeholders, demographics, commercialization paths, selection criteria, practices and goals. Finally, a comparison among all the clusters, in this case the innovation intermediaries types, was performed.

6.6.1.1 Cluster Techniques

Several statistical techniques are available to cluster data. The most popular and common techniques are hierarchical and nonhierarchical cluster analysis methods (Hair, et al, 2010). Both techniques have been used by social science scholars and have advantages, disadvantages and use different algorithms (See Supplementary Appendix S for more details about theses techniques and their advantages and disadvantages).

In this study, in order to minimize the drawbacks and maximize the advantage of both hierarchical and nonhierarchical methods, a combination of hierarchical and then nonhierarchical methods was applied; the hierarchical method was used to determine the appropriate number of clusters while the nonhierarchical method was used to fine-tune the result of the hierarchical clustering. Thus, in this study, seed points were selected based on the empirical results of the hierarchical clustering with a cluster number equal to four as it was suggested by the hierarchical method.

6.6.1.2 Cluster Methodology

In order to perform the procedure of clustering analysis[125], a number of decisions and assumptions were considered (See Supplementary Appendix S for full details of theses decisions and assumptions for the clustering procedure).

However, it is necessary to highlight that the sample size was 163 observations with no missing data[126]; where 14 variables[127] that were measuring the constructs of stakeholders' salience,

[125] Cluster analysis does not required data to have normality, linearity and homoscedasticity (Hair et al., 2010).
[126] Only four observation 52, 113, 137 and 133 were removed as outliers based on information from agglomeration schedule and observations that were among the 10% which have largest dissimilar distance).
[127] See section 6.3 for PCA procedure on how these 14 variables were calculated from PCA of 79 variables.

stakeholders' influence and the dependency of IIs on their stakeholders were used[128]; theses variables were standardized with metric value, thus squared Euclidean distance was used to measure the similarity distance between objects. Moreover, the result indicates no multicollinearity[129] among the clustering variables; where the maximum value of variance inflation factor (VIF) was < 3.743. Furthermore, Ward's method was used as a clustering algorithm to run the hierarchical procedure. Results of the hierarchical clustering show that four clusters were the most appropriate for this set of data, where each of theses four clusters has distinctive characteristics. Then, nonhierarchical procedure was run based on the empirical result of the hierarchical clustering with a cluster number equal to four, and seed points for each cluster. Results from the nonhierarchical cluster are shown in Table 6-43. It showed a cluster size of 49, 36, 47 and 27 for the four suggested clusters respectively. As well, ANOVA test for each of the clustering variables showed significant differences among clusters in terms of these variables (Table 6-43). Next paragraphs are profiling the nonhierarchical clusters in terms of clustering variables the and provide some interpretation to each cluster:

Table 6-43 Profile of the Four Clusters from Nonhierarchical Cluster Analysis

Variable	Variables Name	Mean Values Cluster Number: #1	#2	#3	#4	F	P-value
LOI_C2	Community Level of Importance	0.037	-0.020	0.512	-0.931	15.147	0.000
LOI_F2	Financier Level of Importance	-0.880	0.208	0.494	0.461	28.919	0.000
LOI_I2	Industry Level of Importance	0.043	-0.721	0.548	-0.071	13.691	0.000
LOI_G2	Government Level of Importance	-0.043	0.053	0.554	-0.957	17.149	0.000
LOI_EI2	Educational Institution Level of Importance	0.523	-0.451	0.482	-1.187	40.742	0.000
LOIn_EI2	Educational Institution Level of Influence	0.606	-0.665	0.469	-1.028	44.160	0.000
LOIn_F2	Financier Level of Influence	-0.958	0.152	0.627	0.445	40.770	0.000
LOIn_G2	Government Level of Influence	0.063	-0.188	0.589	-0.888	16.971	0.000
LOIn_I2	Industry Level of Influence	-0.070	-0.804	0.503	0.322	16.475	0.000
LOIn_C2	Community Level of Influence	-0.044	-0.078	0.547	-0.768	12.263	0.000
DL_EI2	Dependency on Educational Institution	0.617	-0.716	0.458	-0.962	43.184	0.000
DL_I2	Dependency on Industry	-0.281	-0.610	0.378	0.667	15.251	0.000
DL_G2	Dependency on Government	-0.223	-0.017	0.628	-0.664	13.577	0.000
DL_F2	Dependency on Financier	-0.406	0.209	0.018	0.427	5.261	0.002
	Cluster Sample Sizes	**49**	**36**	**47**	**27**	**159**	

• Cluster #1 contained 49 observations and was characterized by having relatively high scores for dependency on Educational Institution, their level of importance and level of influence. As well it had

[128] Innovation intermediaries' perception of their stakeholders, stakeholder theory, and stakeholders influence strategy theory were used as a foundation to select these variables for clustering procedure.
[129] That may be attributed to the fact that variables values were results of PCA.

relatively low scores for dependency on Financier, on their level of importance and on level of influence. Moreover, community and industry level of importance were above the average; otherwise, all other variables means were below the average. Thus, this cluster represents innovation intermediaries who were characterized by depending on Educational Institution (i.e. university, college) and perceived it as a very important stakeholder; hence, they were more likely to accept Educational Institution influence on their strategy. Therefore, this cluster's members were more likely to use the single stakeholders approach.

- Cluster #2 contained 36 observations and had relatively low scores for dependency on Industry, on their level of importance and on level of influence. Nevertheless, dependency on Financier, their level of importance and level of influence were above the average; as well, Government level of importance was above the average. Otherwise, all other variables' means were below the average. Thus, this cluster represents innovation intermediaries who were characterized by depending on Financier and perceived it as an important stakeholder compared to other stakeholders; hence, they were more likely to accept financier influence on their strategy. Nevertheless, Cluster #2 perceived Government as a salient stakeholder. Therefore, this cluster was more likely to depart from the single stakeholders approach but was not yet half the way to multistakeholders approach.

- Cluster #3 contained 47 observations and had a relatively high score in most of the clustering variables; it scored above the average for all variables, and scored the highest for all variables except for dependency on Educational Institution, their level of importance and level of influence; as well as dependencies on Industry and on Financier. Although, Cluster #3 had the highest scores for the level of importance for all stakeholders except Educational Institutions stakeholder, yet this was still above the average. It was important to highlight that the highest dependency was scored for the Government stakeholders and the highest level of importance was scored for the Government as well. Despite this some stakeholders received scores a bit higher which represented higher priority, this cluster represented innovation intermediaries who depended on multistakeholders and perceive them as very important stakeholders; hence, they are more likely to accept the influence of all stakeholders on their strategy; therefore, this cluster was more likely to follow the multistakeholders approach.

- Cluster #4 contained 27 observations and had a relatively higher score for dependency on Industry and Financier and high scores for their level of importance and level of influence. Furthermore, Cluster #4 scored below the average for all other variables that were not mentioned above. There were some similarities between Cluster #4 and Cluster #2 in terms of financer stakeholder, and clear differences in terms of Industry stakeholder and government stakeholders. Thus, this cluster represented innovation intermediaries who depended on Financier and Industry; they also perceived Financier as a very important stakeholder compared to other stakeholders; hence, they were more likely to accept financier influences on their strategy. Therefore, this cluster's members were more likely to follow the single stakeholders approach.

These results show that each of the four clusters had distinctive characteristics; these characteristics for each cluster depicted that groupings are ranged from giving high priority to a single stakeholder at one end to the extent of dealing almost equally with all stakeholders (i.e. the multistakeholders approach) at the other end. Reliability of the clusters' finding was examined in next section.

6.6.1.3 Reliability and Validity of the Clusters

The last stage of clustering analysis procedure is to test reliability and validity of the final cluster solution; it is an important step toward ensuring the practical significance of the solution.

This study[130] used the approach of analyzing same data twice by using different methods or algorithms (Hair et al., 2010; Ketchen Jr & Shook, 1996); it compared clusters based on 14 variables (PCA scores)[131] with others based on 14 variables (original variables)[132]. Then a cross tabulation of cluster's membership for both solutions showed no major differences between the two solutions. As well, comparison of many cluster solutions (e.g., 2, 3, 5 Clusters) showed no major differences with the four clusters solution that emerged in this study.

[130] Due to the limited number for the sample of this study, and because large sample is required for many reliability tests, this study did not use the popular approach of splitting the data into two separate sets and then compare them or predict the remaining half from the half that have been clustered (e.g. Hair et al., 2010; Miller & Friesen, 1984).
[131] Please see Section 6.3 for how PCA scores were calculated for these 14 variables.
[132] Fourteen original variables were selected based on the highest load variable on each component of the 14 clustering variables; see Section 6.3.

Furthermore, to examine solution's stability[133], comparisons[134] of hierarchical clustering solution with nonhierarchical solution were run, and show no major differences and accordingly stable solution.

In terms of external validity, samples were divided based on their countries and then were compared to each other; Canadian samples were compared to USA samples and show no major differences (in terms of number of clusters and the membership of each observation). However, generalizability will be limited to the North American context.

On the other hand, criterion (predictive) validity could be done through the analysis of the other variables that were not part of the clustering variables. According to Arthur (1994), significant result of validity test indicates that the clusters are useful to predict the analyzed variables. To assess criterion validity, dependent variables were considered. As there are many groups of dependent variables, commercialization paths variables were assessed first, four paths: BUILD, RENT, SELL and RENT through new created venture (RENT_nv here and after). **Table 6-44** shows the MANOVA test for the four paths for the four clusters. The overall MANOVA model was significant ($F=4.012$, $p < 0.001$), which supports the initial idea that theses commercialization paths may be predicted by knowing to which clusters the innovation intermediary belongs. Nevertheless, the individual univariate F-statistics were also significant, further verifying this understanding. Hence, it is significant to say that cluster solution may predict other key outcomes like commercialization paths, which provided evidence of criterion validity. Further analysis for MANOVA and ANOVA of commercialization paths are detailed in Section 6.6.6. Other dependent variables were tested as well in Section 6.6.3 through Section 6.6.8.

[133] Normally, cluster stability assessment is necessary to be done in case that the seed points for the nonhierarchical clustering (K-means) were selected randomly by the software, where order of the cases in the data file can affect cluster membership. In that case, nonhierarchical cluster procedure will be repeated many times with different order for the observations every time.

[134] Because the seed points were selected based on the centroids value for each clustering variables for each cluster after the procedure of the hierarchical clustering.

Table 6-44 MANOVA Results Assessing Solution Criterion Validity

Variables (Paths)	Cluster Number of Case	Mean	Multivariate F*	Univariate F*	P-value
			4.012		0.000
SELL	1	0.330		3.661	0.014
	2	-0.326			
	3	0.030			
	4	-0.217			
RENT	1	0.507		8.298	0.000
	2	-0.292			
	3	-0.031			
	4	-0.477			
RENT_nv	1	0.428		6.181	0.001
	2	-0.280			
	3	0.016			
	4	-0.433			
BUILD	1	-0.247		4.477	0.005
	2	0.350			
	3	-0.207			
	4	0.342			

6.6.1.4 Profiling the Final Cluster Solution

The clustering procedure required profiling clusters based on additional variables rather than just the clustering variables and the predictive variables; thus, it was useful to use some demographic variables to describe each cluster effectively. Some of these demographic variables are listed in Table 6-45; one example of them will be described in in detail in the following paragraphs; additional explanations for other characteristics are in Supplementary Appendix S.

The first characteristic was that IIs 'provide clients with free commercialization-related services,' where a chi-square test for association was conducted between clusters and their answers for the above statement (Q1_2). There was a statistically significant association between clusters and the characteristic of providing free commercialization-related services, $\chi 2(3) = 22.451$, $p < 0.001$. All expected cell frequencies were greater than five. There was a moderately strong association between clusters and providing free commercialization-related services, $\varphi = 0.376$, $p < 0.001$. Additional analysis showed that the odds ratio that members in Cluster #1 have 2.48 times the likelihood of providing free commercialization-related services than those who were not members in Cluster #1 (see Table 6-46); also, the odds ratio that members in Cluster #3 have 2.67 times the likelihood of providing free commercialization-related services than those who were not members in Cluster #3,

and the odds ratio that members in Cluster #4 have 4.77 times the likelihood of NOT providing free commercialization-related services than those who were not members in Cluster #4. On the other hand, there was a statistically significant association between clusters and the members who were open to facilitating the commercialization of ideas of multiple sectors and/or disciplines, Fisher's Exact Test = 10.135, p = 0.013. Two expected cell frequencies were less than five. There was a moderately strong association between clusters and being 'open to facilitating the commercialization of ideas of multiple sectors and/or disciplines', Cramer's V = 0.24, p = 0.026. Additional analysis shows that the odds ratio that members in Cluster #1 have 10 times the likelihood of facilitating the commercialization of ideas of multiple sectors and/or disciplines than those who were not members in Cluster #1.

Table 6-45 Chi-square and Fisher's Exact Test for Demographic Characteristics

Variables	The statement	Ans	Cluster Number				Total	Chi-Square Tests			
			#1	#2	#3	#4			Value	df	Exact Sig. (2-sided)
Q1_2	Our organization provide clients with free commercialization-related services	No	11	18	10	18	57	Pearson Chi-Square	22.451	3	0.000
		Yes	38	18	37	9	102				
		Total	49	36	47	27	159				
Q1_4	Our organization is open to facilitating the commercialization of ideas of multiple sectors and/or disciplines	No	1	4	9	6	20	Fisher's Exact Test	10.135	-	0.013
		Yes	48	32	38	21	139				
		Total	49	36	47	27	159				
Q5_5	Our organization serves the Environment sectors	No	15	13	15	18	61	Fisher's Exact Test	11.89	3	0.026
		Yes	33	23	31	9	96				
		Total	49	36	47	27	159				
Q7_1	We are co-located with a university, college or hospital	No	10	28	17	24	79	Pearson Chi-Square	49.651	3	0.000
		Yes	38	8	30	2	78				
		Total	48	36	47	26	157				
Q7_10	We are co-located with a startup	No	42	34	47	26	149	Fisher's Exact Test	7.858	-	0.019
		Yes	6	2	0	0	8				
		Total	48	36	47	26	157				
Q7_12	We are not co-located.	No	43	21	45	5	114	Pearson Chi-Square	60.543	3	0.000
		Yes	5	15	2	21	43				
		Total	48	36	47	26	157				
Q8_1	We are legally a public organization	No	32	32	34	27	125	Pearson Chi-Square	15.015	3	0.002
		Yes	16	4	13	0	33				
		Total	48	36	47	27	158				
Q8_2	We are legally an incorporated private for-profit firm	No	45	23	42	10	120	Pearson Chi-Square	38.203	3	0.000
		Yes	3	13	5	17	38				
		Total	48	36	47	27	158				
Q8_6	We are legally part of a university, college or hospital	No	21	34	29	26	110	Pearson Chi-Square	36.155	3	0.000
		Yes	27	2	18	1	48				
		Total	48	36	47	27	158				
Q8_9	We are legally a single-owner organization	No	48	32	47	23	150	Fisher's Exact Test	11.973	-	0.001
		Yes	0	4	0	4	8				
		Total	48	36	47	27	158				

Table 6-46 Risk Estimate for Q1_2 for Cluster #1 After Combining Cluster #2, 3 and 4 into Cluster #5.

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for Q1_2 (No / Yes)	0.403	0.186	0.87
For cohort 4 Clusters (group 1 and others) = 1	0.518	0.288	0.932
For cohort 4 Clusters (group 1 and others) = 2	1.286	1.057	1.565
N of Valid Cases	159		

By following the same approach, all other variables in Table 6-45 showed statistical differences among clusters (See Appendix S); these results showed the validity of the clustering procedure and simultaneously provide a foundation to differentiate among clusters (i.e. innovation intermediaries).

6.6.2 Relationship Between Clusters and Self Reported II Types

Clustering procedure empirically identified groups to which each participant belongs. In other words, rather than the self-reported II types (Section 6.5.2), clustering was another method to identify innovation intermediary types. The four emerged clusters were mapped into the four self reported II types (Table 6-47) to clarify which cluster was similar to which II type, and consequently reveal which hypothesis was expected from which cluster. For instance, 81.6% of Cluster #1 members were from those who classified themselves as UTTOs; thus, it was expected that all hypotheses listed in Chapter 3 for UTTO would be applicable for Cluster #1. Similarly, hypothesis for UTTO was expected to be applicable for Cluster #3. On the other hand, 81.5% and 63.9% of Cluster #4 and Cluster #2 members respectively were from those who classified themselves as IIIs; thus, both clusters were expected to behave similarly to III. Nevertheless, although the above mapping of hypothesis was justified, the clustering analysis in Section 6.6.1 indicates that there were differences among clusters. In other words, the clustering analysis suggested that there were differences between Cluster #1 and Cluster #3 which contradicted our expectation of using similar hypotheses for both. Accordingly, analyses in this section and the following sections investigated which of these clusters behaved as expected and illuminate those who behaved unexpectedly.

Table 6-47 Mapping Clusters to IIs Types

	UTTO	CBI	IFOI	III	Others	Total
Cluster #1	**40**	4	0	3	2	49
	81.63%	8.16%	0.00%	6.12%	4.08%	
Cluster #2	7	5	1	**23**	0	36
	19.44%	13.89%	2.78%	**63.89%**	0.00%	
Cluster #3	**34**	4	0	7	2	47
	72.34%	8.51%	0.00%	14.89%	4.26%	
Cluster #4	3	1	1	**22**	0	27
	11.11%	3.70%	3.70%	**81.48%**	0.00%	
Total	84	14	2	55	4	159

6.6.3 The Relationship Between Clusters and Their Stakeholders

Emergent clusters were differentiated based on the clustering variables as it was examined in Section 6.6.1. In the following sub-sections, the relationship between clusters and their stakeholders was investigated by using the same clustering variables in addition to the variables of the level of stakeholders' dependency on IIs; yet, this time was to compare within-subjects for each cluster. In other words, it compared stakeholders within each cluster[135]. These tests helped us examine the Hypotheses H1 through H6, similar to what was done in Section 6.5.3; however, in this section, clusters represent our IV, comparing to II types in Section 6.5.3.

By following the same approach as in Section 6.5.3; 11 observations were identified as outliers and accordingly have been removed (See Supplementary Appendix T (Part1) for details); Consequently, in the following sub-sections, we safely state that there were no significant outliers. Nevertheless, in the following subsections one-way repeat ANOVA was run to perform the above comparisons; similar approach of previous sections was followed (See Section 6.5.2.1 for example); thus, only the main results were reported and many illustration tables and figures are in Appendix T.

[135] Comparisons between clusters were done through the clustering procedure (See Section 6.6.1.3).

6.6.3.1 Salient Levels of Stakeholders

The first hypothesis was to examine which stakeholder was perceived as more salient for each cluster. Thus, a one-way repeated measures ANOVA was conducted[136] for every cluster to determine whether there were statistically significant differences in perceiving stakeholders' salience over the five main stakeholders: Community, Financier, Industry, Government, and Educational Institution. A similar approach as in Section 6.5.2.1 was followed; **Table 6-48** shows the results for the one-way repeated measures ANOVA for all clusters; and **Table 6-49** shows the significant post-hoc comparisons for all clusters. The conclusions of the analysis of every clusters was as follow:

Table 6-48 Result of One-Way Repeated Measure ANOVA for Stakeholders Level of Importance

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
#1	Stakeholders	Greenhouse -Geisser[137]	46.955	2.935	16.000	16.813	0.000	0.276	H1a (√)
	Error(Stakeholders)		122.881	129.124	0.952				
#2	Stakeholders	Sphericity Assumed	19.080	4.000	4.770	6.984	0.000	0.175	H1d (√)
	Error(Stakeholders)		90.150	132.000	0.683				
#3	Stakeholders	Greenhouse -Geisser	1.662	2.950	0.563	0.865	0.460	0.020	H1a (X)
	Error(Stakeholders)		80.688	123.907	0.651				
#4	Stakeholders	Sphericity Assumed	50.343	4.000	12.586	15.581	0.000	0.384	H1d (√)
	Error(Stakeholders)		80.777	100.000	0.808				

1. There was a statistically significant difference among means for Cluster #1, therefore, we can reject the null hypothesis and accept the alternative hypothesis that Cluster #1 perceives Educational Institution stakeholder as the most salient stakeholder.

2. The difference among the means for Cluster #2 was statistically significant. Therefore, we can reject the null hypothesis and conclude that Cluster #2 perceives Financier as the most salient stakeholder. Nevertheless, although Financier show a significantly higher mean than

[136] There were no significant outliers as assessed by box plot (Section 6.6.3) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix T (Part1)). Nevertheless, the assumption of sphericity was assessed by Mauchly's test of Sphericity, (See Supplementary Appendix T (Part1)).

[137] Greenhouse-Geisser correction was used when the assumption of Sphericity was violated.

Educational Institution and Industry, it was not significantly different than the means for Community and Government.

3. For Cluster #3, there was no statistically significant difference between the means, therefore, we cannot reject the null hypothesis and accordingly may conclude that Cluster #3 associates a similar level of salience to its all stakeholders. Although the Government scores a little higher but does not differ significantly from others.

Table 6-49 Post-hoc Result for Stakeholders' Level of Importance

Clusters	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	Educational Institution	Community	.457*	0.150	0.038	0.015	0.899
		Financier	1.409*	0.174	0.000	0.894	1.923
		Industry	.504*	0.164	0.036	0.020	0.989
		Government	.612*	0.159	0.004	0.141	1.084
#2	Financier	Community	0.227	0.203	1.000	-0.386	0.839
		Industry	.877*	0.215	0.003	0.229	1.526
		Government	0.209	0.193	1.000	-0.372	0.791
		Educational Institution	.727*	0.180	0.003	0.185	1.269
#4	Financier	Community	1.377*	0.206	0.000	0.744	2.010
		Industry	0.530	0.241	0.374	-0.212	1.272
		Government	1.359*	0.241	0.000	0.617	2.100
		Educational Institution	1.667*	0.218	0.000	0.995	2.340
	Industry	Community	.847*	0.225	0.009	0.156	1.539
		Financier	-0.530	0.241	0.374	-1.272	0.212
		Government	0.829	0.314	0.141	-0.137	1.794
		Educational Institution	1.137*	0.232	0.000	0.425	1.850

4. The difference among the means for Cluster #4 was statistically significant and due to which we can reject the null hypothesis and conclude that Cluster #4 perceives Financier as the most salient stakeholder. Nevertheless, although Financier showed a significantly higher mean than Educational Institution, Community and Government, it was not significantly higher than the mean for Industry. Furthermore, Cluster #4 differed from Cluster #2 in terms of the stakeholder Industry that score as the second highest salient stakeholder with a significant difference with Community and Educational Institution but not with the Government.

6.6.3.2 Dependency Levels on Stakeholders

The next hypothesis was to examine the level of dependency on stakeholders for each cluster/group. Thus, a one-way repeated measures ANOVA was conducted[138] for each cluster to determine whether there were statistically significant differences in dependency on stakeholders over the four main stakeholders i.e., Financier, Industry, Government and Educational Institution. A similar approach as in Section 6.5.2.1 was followed; Table 6-50 shows the results for the one-way repeated measures ANOVA for all clusters; and Table 6-51 shows the significant post-hoc comparisons for all clusters. The conclusions of the analysis of every clusters were as follow:

Table 6-50 Result of One-Way Repeated Measure ANOVA for the Level of Dependency on Stakeholders

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
#1	Stakeholders	Sphericity	28.804	3.000	9.601	20.415	0.000	0.317	H2a (√)
	Error(Stakeholders)	Assumed	62.080	132.000	0.470				
#2	Stakeholders	Sphericity	22.275	3.000	7.425	17.112	0.000	0.341	H2d (√)
	Error(Stakeholders)	Assumed	42.958	99.000	0.434				
#3	Stakeholders	Sphericity	13.501	3.000	4.500	6.728	0.000	0.138	H2a (√)
	Error(Stakeholders)	Assumed	84.283	126.000	0.669				
#4	Stakeholders	Sphericity	47.865	3.000	15.955	21.904	0.000	0.467	H2d (√)
	Error(Stakeholders)	Assumed	54.630	75.000	0.728				

1. The difference among the means for Cluster #1 was statistically significant due to which we can reject the null hypothesis and conclude that Cluster #1 is more dependent on Educational Institution more than on other stakeholders;

2. The difference among the means for Cluster #2 was statistically significant. Therefore, we can reject the null hypothesis and conclude that Cluster #2 was more dependent on Financier than on the other stakeholders; yet, although Financier showed significantly higher mean than Educational Institution and Industry, it was not significantly different than that of the Government. Nevertheless, dependency on the Government stakeholders scored the second

[138] There were no significant outliers as assessed by box plot (Section 6.6.3) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix T (Part1)) Nevertheless, the assumption of sphericity was assessed by Mauchly's test of Sphericity, (See Supplementary Appendix T (Part1)).

highest dependency level with significant differences higher than Educational Institution and Industry stakeholders.

Table 6-51 Post-hoc Result for the Level of Dependency on Stakeholders

Clusters	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	Educational Institution	Industry	.894*	0.158	0.000	0.457	1.331
		Government	.885*	0.159	0.000	0.446	1.323
		Financier	.981*	0.149	0.000	0.570	1.391
#2	Government	Educational Institution	.673*	0.151	0.001	0.249	1.097
		Industry	.472*	0.147	0.018	0.059	0.885
		Financier	-0.363	0.184	0.341	-0.879	0.153
	Financier	Educational Institution	1.036*	0.160	0.000	0.587	1.486
		Industry	.835*	0.178	0.000	0.336	1.334
		Government	0.363	0.184	0.341	-0.153	0.879
#3	Educational Institution	Industry	0.153	0.189	1.000	-0.369	0.675
		Government	-0.152	0.202	1.000	-0.713	0.408
		Financier	.597*	0.169	0.006	0.130	1.065
	Government	Educational Institution	0.152	0.202	1.000	-0.408	0.713
		Industry	0.306	0.175	0.527	-0.179	0.790
		Financier	.750*	0.156	0.000	0.318	1.181
#4	Industry	Educational Institution	1.565*	0.201	0.000	0.990	2.139
		Government	1.201*	0.197	0.000	0.638	1.764
		Financier	0.105	0.296	1.000	-0.742	0.952
	Financier	Educational Institution	1.459*	0.278	0.000	0.664	2.254
		Industry	-0.105	0.296	1.000	-0.952	0.742
		Government	1.096*	0.229	0.000	0.440	1.751

3. The difference among the means for Cluster #3 was statistically significant due to which we can reject the null hypothesis and conclude that Cluster #3 was more dependent on Educational Institution and Government more than on other stakeholders; although Educational Institution as a stakeholder shows a significantly higher mean than Financiers, it was not significantly different than Government and Industry stakeholders. As well, Government score was significantly higher than Financiers but not Educational Institution and industry.

4. The difference among the means for Cluster #4 was statistically significant. Therefore, we can reject the null hypothesis and conclude that Cluster #4 is more dependent on the Financier and Industry stakeholder than on other stakeholders; both Industry and Financier showed

significantly higher mean than Educational Institution and Government, yet they were not significantly higher than each other.

6.6.3.3 Dependency Levels by Stakeholders on IIs

The other hypothesis was to examine the level of dependency on IIs by each stakeholder for each cluster/group. Thus, a one-way repeated measure ANOVA was conducted[139] for each cluster to determine whether there were statistically significant differences in dependency on IIs by stakeholders over the four main stakeholders. A similar approach as in Section 6.5.2.1 was followed; Table 6-52 show the results for the one-way repeated measures ANOVA for all clusters; and Table 6-53 show the significant post-hoc comparisons for all clusters. The conclusions of the analysis of every clusters were as follow:

Table 6-52 Result of One-Way Repeated Measure ANOVA for the Level of Stakeholder's Dependency on IIs

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
#1	Stakeholders	Greenhouse -Geisser	23.176	2.158	10.740	14.074	0.000	0.242	H3a (√)
	Error(Stakeholders)		72.459	94.946	0.763				
#2	Stakeholders	Sphericity Assumed	19.082	3.000	6.361	9.069	0.000	0.216	H3d (√)
	Error(Stakeholders)		69.437	99.000	0.701				
#3	Stakeholders	Sphericity Assumed	7.244	3.000	2.415	3.360	0.021	0.074	H3a (X)
	Error(Stakeholders)		90.546	126.000	0.719				
#4	Stakeholders	Sphericity Assumed	14.248	3.000	4.749	7.019	0.000	0.219	H3d (√)
	Error(Stakeholders)		50.748	75.000	0.677				

1. The difference among the means for Cluster #1 was statistically significant. Therefore, we can reject the null hypothesis and accept the alternative hypothesis that in Cluster #1 the Educational Institution stakeholder was highly dependent on IIs as compared to other stakeholders; Furthermore, the level of dependency on IIs by the Industry stakeholder scores the second highest, with significant difference with financier

[139] There were no significant outliers as assessed by box plot (Section 6.6.3) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix T (Part1)). Nevertheless, the assumption of sphericity was assessed by Mauchly's test of Sphericity, (See Supplementary Appendix T (Part1)).

2. The difference among the means for Cluster #2 was statistically significant. Therefore, we can reject the null hypothesis and conclude that Cluster #2 was more dependent on IIs by the Financier stakeholders as compared to other stakeholders; although Financier show significantly higher mean than Educational Institution and Industry, it was not significantly different than Government. Nevertheless, dependency on IIs by the Government stakeholder scores the second highest dependency level with significant differences higher than Educational Institution stakeholder.

Table 6-53 Post-hoc Result for the Level of Stakeholder's Dependency on IIs

Clusters	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	Educational Institution	Government	.718*	0.157	0.000	0.284	1.151
		Financier	.979*	0.156	0.000	0.547	1.411
		Industry	0.524	0.213	0.107	-0.064	1.113
	Industry	Educational Institution	-0.524	0.213	0.107	-1.113	0.064
		Government	0.193	0.136	0.963	-0.181	0.568
		Financier	.455*	0.147	0.021	0.048	0.861
#2	Government	Educational Institution	.583*	0.171	0.011	0.102	1.063
		Financier	-0.358	0.235	0.824	-1.017	0.302
		Industry	0.459	0.203	0.183	-0.111	1.028
	Financier	Educational Institution	.941*	0.213	0.001	0.343	1.538
		Government	0.358	0.235	0.824	-0.302	1.017
		Industry	.816*	0.207	0.002	0.234	1.399
#3	Industry	Educational Institution	0.269	0.185	0.914	-0.242	0.78
		Government	0.174	0.176	1	-0.312	0.661
		Financier	.566*	0.174	0.013	0.085	1.047
#4	Financier	Educational Institution	1.015*	0.253	0.003	0.29	1.739
		Government	0.731	0.256	0.051	-0.003	1.464
		Industry	0.572	0.261	0.226	-0.175	1.319

3. The difference among the means for Cluster #3 was statistically significant; however, Cluster #3 was more dependent on IIs by the Industry stakeholder as compared to other stakeholders; although Industry show a significantly higher mean than Financier, it was higher but not significantly different than Educational Institution and Government stakeholders. Thus, we can reject the null hypothesis but cannot accept the alternative hypothesis because for Cluster #3, the Educational Institution stakeholder is not highly dependent on IIs as compared to other stakeholders.

4. The difference among the means for Cluster #4 was statistically significant. Therefore, we can reject the null hypothesis and conclude that Cluster #4 was more dependent on IIs by the Financier stakeholder as compared to other stakeholders; although the Financier stakeholder showed significantly higher mean than Educational Institution, it was not significantly higher than that of Industry and Government.

For the sake of knowing who was depending more on other (IIs' cluster versus salient stakeholder), the initial glance on the means showed that salient stakeholders have lower dependency on IIs compared to the IIs dependency on that particular salient stakeholder; yet this was not the case for the Clusters #2 and #4. Nevertheless, a statistical comparison between the level of the dependency by the salient stakeholder on IIs in clusters and the level of IIs' clusters dependency on the same salient stakeholders for the four clusters of IIs was performed. The result showed that there was no significant difference for the salient stakeholders for each cluster (i.e. high interdependency). These findings will help in identifying type of influence by each salient stakeholders based on the stakeholders influence strategies theory by (Frooman, 1999).

6.6.3.4 Influence on IIs Strategy by Stakeholders

The other hypothesis was to examine which stakeholder was perceived to influence IIs more than other stakeholders. Thus, a one-way repeated measures ANOVA was conducted[140] for each cluster to determine whether there were statistically significant differences in the level of influence by stakeholders over the five main stakeholders: Community, Financier, Industry, Government and Educational Institution. A similar approach as in Section 6.5.2.1 was followed; Table 6-54 show the results for the one-way repeated measures ANOVA for all clusters; and Table 6-55 show the significant post-hoc comparisons for all clusters. The conclusions of the analysis of every clusters was as follows:

[140] There were no significant outliers as assessed by box plot (Section 6.6.3) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix T (Part1)). Nevertheless, the assumption of sphericity was assessed by Mauchly's test of Sphericity, (See Supplementary Appendix T (Part1)).

Table 6-54 Result of One-Way Repeated Measure ANOVA for the Level of Influence on IIs by Stakeholders

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
#1	Stakeholders	Greenhouse -Geisser	53.637	3.384	15.851	19.693	0.000	0.309	H5'a (√)
	Error(Stakeholders)		119.839	148.891	0.805				
#2	Stakeholders	Sphericity Assumed	22.342	4	5.585	7.327	0.000	0.182	H5'd (√)
	Error(Stakeholders)		100.617	132	0.762				
#3	Stakeholders	Greenhouse -Geisser	2.322	3.113	0.746	1.075	0.364	0.026	H5'a (X)
	Error(Stakeholders)		88.577	127.629	0.694				
#4	Stakeholders	Greenhouse -Geisser	51.136	2.793	18.308	17.841	0.000	0.416	H5'd (√)
	Error(Stakeholders)		71.656	69.827	1.026				

Table 6-55 Post-hoc Result for the Level of Influence on IIs by Stakeholders

Clusters	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	Educational Institution	Financier	1.516*	0.134	0.000	1.121	1.910
		Government	.533*	0.150	0.010	0.088	0.978
		Industry	.695*	0.179	0.003	0.166	1.225
		Community	.577*	0.150	0.004	0.134	1.019
	Financier	Educational Institution	-1.516*	0.134	0.000	-1.910	-1.121
		Government	-.983*	0.195	0.000	-1.558	-0.408
		Industry	-.820*	0.191	0.001	-1.384	-0.256
		Community	-.939*	0.205	0.000	-1.544	-0.334
#2	Financier	Educational Institution	.821*	0.167	0.000	0.319	1.324
		Government	0.349	0.182	0.637	-0.198	0.896
		Industry	.993*	0.203	0.000	0.383	1.603
		Community	0.304	0.213	1.000	-0.336	0.943
	Community	Educational Institution	0.518	0.254	0.497	-0.247	1.282
		Financier	-0.304	0.213	1.000	-0.943	0.336
		Government	0.045	0.260	1.000	-0.738	0.828
		Industry	.689*	0.187	0.008	0.128	1.250
#4	Financier	Educational Institution	1.506*	0.172	0.000	0.977	2.036
		Government	1.314*	0.258	0.000	0.520	2.107
		Industry	0.160	0.243	1.000	-0.587	0.907
		Community	1.201*	0.221	0.000	0.520	1.882
	Industry	Educational Institution	1.346*	0.215	0.000	0.685	2.007
		Financier	-0.160	0.243	1.000	-0.907	0.587
		Government	1.154*	0.181	0.000	0.595	1.712
		Community	1.041*	0.288	0.013	0.154	1.928

1. The level of influence showed statistically significant changes in stakeholders influence level for Cluster #1, therefore, we can reject the null hypothesis and accept the alternative hypothesis that the Educational Institution stakeholder influences Cluster #1 more than other stakeholders.

2. The difference among the means for Cluster #2 was statistically significant. Therefore, we can reject the null hypothesis and conclude that Financier influences Cluster #2 more than the other stakeholders. Nevertheless, although Financier show significantly higher mean than Educational Institution and Industry, it was not significantly different than that of Community and Government. Furthermore, the Community as a stakeholder scores the second highest influence level with significant difference with Educational Institution and Industry.

3. There was no statistically significant difference among the means for Cluster #3, therefore, we cannot reject the null hypothesis and accordingly may conclude that Cluster #3 receives equal high influence by all stakeholders.

4. The difference among the means for Cluster #4 was statistically significant due to which we can reject the null hypothesis and conclude that Cluster #4 is influenced by Financier more than the other stakeholders. Nevertheless, although Financier showed significantly higher mean than Educational Institution, Community and Government, it was not significantly higher than Industry. Furthermore, Cluster #4 differs from Cluster #2 on the basis of Industry which scores as the second highest influence stakeholder with significant difference from Government, Community and Educational Institution.

6.6.3.5 Relationship Between Influence Level and the Level of Salience and Dependency on Stakeholders

The analysis of this section as well as its conclusion was similar to what have been done in Section 6.5.2.5 For the IIs types (in the self-group part); yet, very trivial differences were there[141]. Thus, detailed explanation and all tables of this section have been removed to the Supplementary Appendix

[141] In fact, in these two sections (Section 6.5.2.5 and this section) almost the same data were analyzed; with some limited observations were different between the two analyzed data set due to identifying and removing different outliers; (there was 11 observations were identified as outliers in Section 6.5.2.5; as well, In 6.6.3.5 different set of observations were identified as outliers, (Supplementary Appendix T (Part1))

T (Part 2). Nevertheless, very similar findings were extracted from this section that confirmed the finings of Section 6.5.2.5.

In conclusion, most hypotheses were accepted (see Table 6-56) for Section 6.6.3 and all of its subsections, which in turn supports the first part of the model (Figure 6-8) in the context of innovation intermediaries who facilitate research commercialization. The overall conclusion is that each cluster perceives one of the main stakeholders as a salient stakeholder compared to other stakeholders, and depends on it. Nevertheless, each cluster was most influenced by its particular salient stakeholder. Cluster #3 and Cluster #2 have some unsupported hypotheses, which indicate unexplained behaviour; thus, additional analyses for all clusters including Cluster #3 and Cluster #2 could help explain this indication. Consequently, the results show that each stakeholder's salience level (five variables) and level of dependency on stakeholders (four variables) could explain a large portion of the level of influence that each particular salient stakeholder applies on the IIs (see Figure 6-8). These findings confirm the findings of Section 6.5.2, particularly for UTTO and III types. In the following sections, various dependent variables are discussed and compared among clusters to articulate the impact of stakeholders' influence on each cluster in terms of their operational strategies.

Figure 6-8 First Part of the Research Model (Stakeholders Related Constructs)

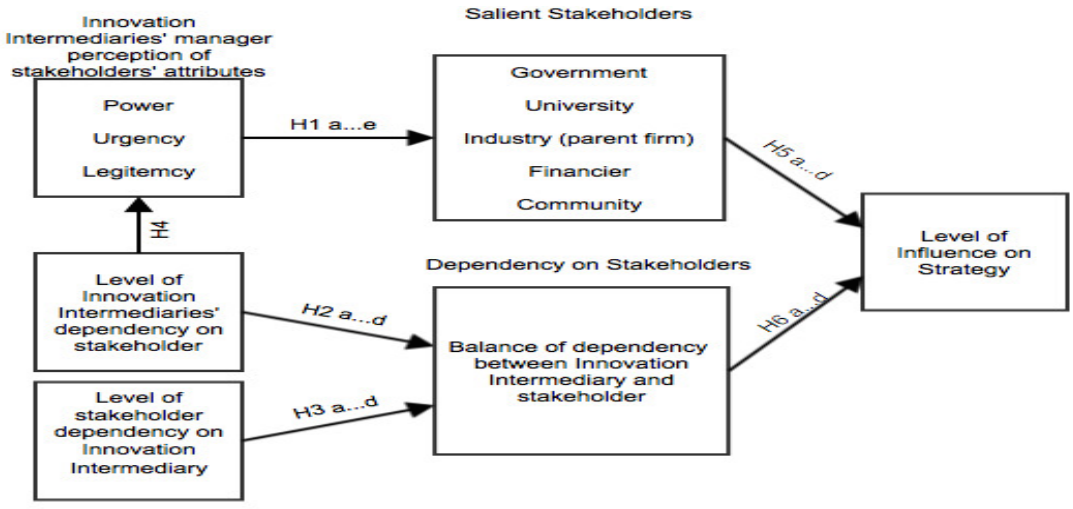


Table 6-56 Summary for All Hypothesis for IIs Types Relation With Stakeholders

Hypotheses (Stakeholder's Importance Level)	State
H1a: Cluster #1 perceives Educational Institution as a salient stakeholder.	Supported
H1d: Cluster #2 perceives Financiers as a salient stakeholder.	Supported
H1a: Cluster #3 perceives Educational Institution as a salient stakeholder.	Not Supported
H1d: Cluster #4 perceives Financiers as a salient stakeholder.	Supported
H1e: No Cluster perceives Community as a salient stakeholder.	Supported
Hypotheses (Dependency Level on Stakeholder)	**State**
H2a: Cluster #1 is highly dependent on the Educational Institution more so than on other stakeholders.	Supported
H2d: Cluster #2 is highly dependent on the Financiers more so than on other stakeholders.	Supported
H2a: Cluster #3 is highly dependent on the Educational Institution more so than on other stakeholders.	Supported
H2d: Cluster #4 is highly dependent on the Financiers more so than on other stakeholders.	Supported
Hypotheses (Stakeholder's Dependency Level)	**State**
H3a: Educational Institution is highly dependent on Cluster #1 compared to other stakeholders.	Supported
H3d: Financiers is highly dependent on Cluster #2 compared to other stakeholders.	Supported
H3a: Educational Institution is highly dependent on Cluster #3 compared to other stakeholders.	Not Supported
H3d: Financiers is highly dependent on Cluster #4 compared to other stakeholders.	Supported
Hypotheses (Stakeholder's Influence Level)	**State**
H5'a: Cluster #1 is influenced by Educational Institution more than by other stakeholders	Supported
H5'd: Cluster #2 is influenced by Financier more than by other stakeholders	Supported
H5'a: Cluster #3 is influenced by Educational Institution more than by other stakeholders	Not Supported
H5'd: Cluster #4 is influenced by Financier more than by other stakeholders	Supported
Hypotheses (Relationships Between Stakeholder's Importance Level and Dependency Level)	**State**
H4: Level of Cluster dependency on salient stakeholder is positively associated with managers' perception regarding stakeholders' saliency.	Supported
Hypotheses (Relationships Between Stakeholder's Influence Level and Importance Level)	**State**
H5a: Salient stakeholder (Educational Institution) influences Cluster #1 strategy more so than other stakeholders.	Supported
H5d: Salient stakeholder (Financiers) influences Cluster #2 strategy more so than other stakeholders.	Supported
H5a: Salient stakeholder (Educational Institution) influences Cluster #3 strategy more so than other stakeholders.	Not Supported
H5d: Salient stakeholder (Financiers) influences Cluster #4 strategy more so than other stakeholders.	Supported
Hypotheses (Relationships Between Stakeholder's Influence Level and Dependency Level)	**State**
H6a: High dependency of Cluster #1 on Educational Institution stakeholder influences Cluster #1's strategy toward purposes of Educational Institution more so than other stakeholders.	Supported
H6d: High dependency of Cluster #2 on Financiers stakeholder influences Cluster #2's strategy toward purposes of Financiers more so than other stakeholders.	Not Supported
H6a: High dependency of Cluster #3 on Educational Institution stakeholder influences Cluster #3's strategy toward purposes of Educational Institution more so than other stakeholders.	Not Supported
H6d: High dependency of Cluster #4 on Financiers stakeholder influences Cluster #4's strategy toward purposes of Financiers more so than other stakeholders.	Supported
Hypotheses (Relationships Between Stakeholder's Influence Level and Both Importance and Dependency Level)	**State**
For any IIs cluster that perceives a particular stakeholder as important more then other stakeholders, the variables for the level of that stakeholder's salience and its level of the dependency explain the level of influence by that particular stakeholder better than any of these variables separately.	Supported

6.6.4 The Relationship Between Clusters and Their Clients

In previous sections, emergent clusters were differentiated based on the clustering variables of certain stakeholders; however, this section investigated the relationship between clusters and their operational strategy in terms of their clients.

In the following paragraphs, one-way MANOVA tests were performed to compare clusters in terms of clients. These tests examined the Hypothesis H9, and simultaneously provided additional validation for the emergent clusters. Thus, a MANOVA was run[142] to examine the differences between the four clusters in terms of their clients. A statistically significant difference was found between the clusters in the combined dependent variables (clients), $F(9, 370.079) = 7.429$, $p < 0.0001$; Wilks' $\Lambda = 0.668$; Partial $\eta 2 = 0.126$. This in turn supports the initial idea that clients can be predicted by knowing to which clusters the innovation intermediary belongs.

Table 6-57 Result of Multivariate Analysis of Variance (MANOVA) for Clients

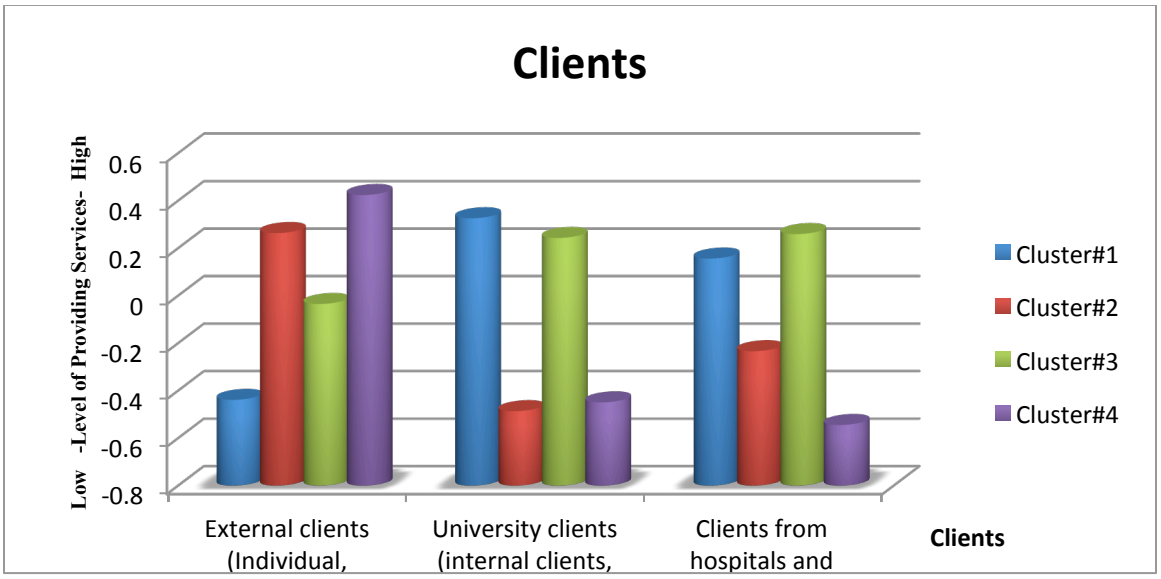
Dependent Variables	Cluster s	Mean	Multivariate F*	Univariate F*	P-value	Partial Eta Squared
			7.429		0.000	0.126
External clients (Individual, Entrepreneurs, new venture, establish firms, partners and other IIs)	#1	-0.439		6.366	0.000	0.11
	#2	0.264				
	#3	-0.035				
	#4	0.424				
University clients (internal clients, professors, students)	#1	0.326		8.361	0.000	0.14
	#2	-0.486				
	#3	0.243				
	#4	-0.449				
Clients from hospitals and research center	#1	0.156		5.433	0.001	0.096
	#2	-0.234				
	#3	0.259				
	#4	-0.545				

Follow-up univariate ANOVAs indicated that 'external clients' ($F(3, 154) = 56.366$, $p < 0.001$; Partial $\eta 2 = 0.11$); 'university clients' ($F(3, 154) = 8.361$, $p < 0.001$; Partial $\eta 2 = 0.14$); and 'clients from hospitals and research centres' ($F(3,154) = 5.433$, $p = 0.001$; Partial $\eta 2 = 0.096$) were statistically significantly different between the clusters. Tukey post-hoc tests showed that for 'external clients', innovation intermediaries from Cluster #4 had statistically significantly higher mean scores

[142] Assumptions were checked and met (Supplementary Appendix U)

than innovation intermediaries from Cluster #1 ($p = 0.001$); as well, Cluster #2 had statistically significantly higher mean scores than innovation intermediaries from Cluster #1 ($p = 0.005$). However, in terms of 'university clients', Cluster #1 and Cluster #3 were statistically significant with higher mean scores than innovation intermediaries from Cluster #2 and Cluster #4 (all $p < 0.01$). Furthermore, for the 'clients from hospitals and research centres', Tukey post-hoc tests showed that innovation intermediaries from Cluster #1 and Cluster #3 had significantly higher mean scores than innovation intermediaries from Cluster #4 ($p = 0.01$ and $p = 0.003$ respectively).

Figure 6-9 Means for the Three Main Clients



In addition, comparisons within clusters were investigated in terms of their clients. In other words, all three clients were compared within each cluster. These tests helped examine the Hypotheses H9, and determine which clients were served more by each cluster/group. One-way repeated measures ANOVA was conducted[143] for Cluster #1 to determine whether there were statistically significant differences in the providing of services to any of the three main clients. The level of service provision for clients showed significant differences, $F(2, 96) = 12.362$, $p < 0.001$, Partial $\eta 2 = 0.205$, with

[143] There were no significant outliers as assessed by box plot and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix U). Nevertheless, the assumption of Sphericity was assessed by Mauchly's test of sphericity (Supplementary Appendix U)

highest scores for 'university clients' (M = 0.326, SD = 0.808). Post-hoc analysis with a Bonferroni adjustment showed that service provision to 'university clients' was significantly higher than 'external clients' (M = 0.765, 95% CI [0.368, 1.162], p < 0.001); as well, service provision to 'clients from hospitals and research centres' was significantly higher than service provision to 'external clients' (M = 0.595, 95% CI [0.206, 0.985], p = 0.001). There was a statistically significant difference among means of some clients; therefore, we could reject the null hypothesis and accept the alternative hypothesis that Cluster #1 focused more on providing services to 'university clients' than on providing services to 'clients from hospitals and research centres', as compared to other clients.

Table 6-58 Result of One-Way Repeated Measure ANOVA for All Clients

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
#1	Clients	Sphericity	15.814	2	7.907	12.362	0.000	0.205	H9a (√)
	Error(Clients)	Assumed	61.403	96	0.640				
#2	Clients	Sphericity	10.192	2	5.096	6.691	0.002	0.164	H9 d (√)
	Error(Clients)	Assumed	51.789	68	0.762				
#3	Clients	Sphericity	2.575	2	1.287	1.425	0.246	0.03	H9a (X)
	Error(Clients)	Assumed	83.1	92	0.903				
#4	Clients	Greenhouse	15.386	1.612	9.546	8.212	0.002	0.24	H9 d (√)
	Error(Clients)	-Geisser	48.711	41.908	1.162				

The same approach was followed for the other three clusters. Results of one-way repeated measures ANOVA are listed in Table 6-58 and Table 6-59. Conclusions drawn from the analysis of one-way repeated measures ANOVA for clusters two, three, and four were as follow:

1. The differences among the means for Cluster #2 were statistically significant. Thus, we could reject the null hypothesis and conclude that Cluster #2 provides more services to some clients compared to others. 'External clients' was significantly higher than 'university clients', while 'external clients' consistently scored the higher means.

2. For Cluster #3, there was no statistically significant difference between the means; accordingly, we could not reject the null hypothesis for this cluster. In other words, Cluster #3 tends to be more open to all clients.

3. The difference among the means for Cluster #4 was statistically significant. 'External clients' was significantly higher than 'university clients' and 'clients from hospitals and

research centres'. As a result, we could reject the null hypothesis and accept the alternative hypothesis that Cluster #4 focused more on 'external clients' compared to other clients.

Table 6-59 Post-hoc Result for Providing Services to Clients Within Each Cluster

Clusters	(I) Clients	(J) Clients	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	1	2	-.765*	0.160	0.000	-1.162	-0.368
		3	-.595*	0.157	0.001	-0.985	-0.206
#2	1	2	.750*	0.205	0.003	0.233	1.266
		3	0.497	0.213	0.077	-0.040	1.035
#4	1	2	.873*	0.271	0.010	0.180	1.566
		3	.969*	0.195	0.000	0.469	1.468

6.6.5 The Relationship Between Clusters and the Objectives and Performance

This section investigates the relationship between clusters and operational strategy in terms of their objectives and performance. However, similar to Section 6.5.4, this investigation was done by using the scores of each factor/component of objectives[144] and the cumulative performance score. (See Section 6.5.4 for how cumulative performance was calculated).

In the following paragraphs, one-way MANOVA tests were performed to compare clusters in terms of their objective importance level. These tests examined the Hypothesis H10, and provided additional validation for the emergent clusters. Thus, a one-way multivariate analysis of variance (MANOVA) was run to examine the differences among the four clusters in terms of their objective's importance level. Assumptions[145] were checked[146] and met[147] (see Supplementary Appendix U). A statistically significant difference was found among the clusters in the combined dependent variables (objectives), $F(18, 453) = 4.52$, $p < 0.0001$; Pillai's Trace = 0.457; Partial $\eta 2 = 0.152$. This in turn

[144] See Section 6.3.
[145] Box's *M* test of equality is of significance with unequal sample sizes; thus, the test is not robust (Tabachnick & Fidell, 2001). Accordingly, Pillai's Trace result is recommended to correct for this violation of equality assumption for MANOVA.
[146] Although Levene's F test suggested that the variances associated with 'improve the economy of the local community' was not homogenous, an examination of the standard deviations (see Supplementary Appendix U) revealed that none of the largest standard deviations were more than four times the size of the corresponding smallest standard deviation, thus suggesting that the ANOVA would be robust in this case (Howell, 2009).
[147] Only one observation (106) was removed as an extreme outlier (see Supplementary Appendix U).

supports the initial idea that objectives can be predicted by knowing to which clusters the innovation intermediary belongs.

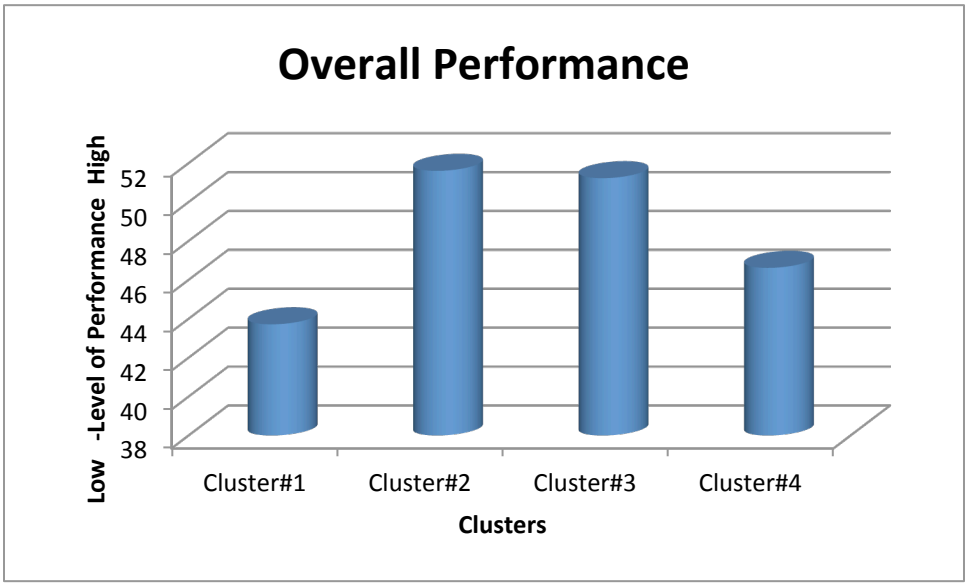
Table 6-60 Result of Multivariate Analysis of Variance (MANOVA) for Objectives

	Variables (Goals)	Cluster	Mean	Multivariate F*	Univariate F*	P-value
				4.52		0.000
1	Improve the economic performance of the local community	#1	-0.020		8.989	0.000
		#2	-0.099			
		#3	0.484			
		#4	-0.684			
2	Increase the financial success for companies	#1	-0.470		10.805	0.000
		#2	0.292			
		#3	-0.124			
		#4	0.702			
3	Support entrepreneurs/start-ups activity	#1	0.036		0.467	0.706
		#2	-0.016			
		#3	0.138			
		#4	-0.123			
4	Promote local industry by commercializing technologies	#1	0.105		2.806	0.042
		#2	-0.017			
		#3	0.199			
		#4	-0.465			
5	Increase the sustainability of success for companies	#1	-0.177		1.048	0.373
		#2	0.072			
		#3	0.170			
		#4	0.013			

Follow-up univariate ANOVAs indicated that ‘improve the economy of the local community’ ($F(3, 154) = 8.989$, $p < 0.001$; Partial $\eta 2 = 0.149$); ‘increase the financial success for companies’ ($F(3, 154) = 10.805$, $p < 0.001$; Partial $\eta 2 = 0.174$); and ‘promote local industry by commercializing technologies’ ($F(3, 154) = 2.806$, $p = 0.042$; Partial $\eta 2 = 0.052$) were significantly different between the clusters, while ‘support entrepreneurs/start-ups activity’ ($F(3, 154) = 0.467$, $p = 0.706$) and ‘increase the sustainability of success for companies’($F(3, 154) = 1.048$, $p = 0.373$) were not significant (See Table 6-60). Tukey post-hoc tests showed that for ‘improve the economy of the local community’, innovation intermediaries from Cluster #3 had significantly higher mean scores than innovation intermediaries from Cluster #1 ($p = 0.045$), from Cluster #2 ($p = 0.028$), and from Cluster #4 ($p < 0.001$); as well, Cluster #1 had significantly higher mean scores than innovation intermediaries from Cluster #4 ($p = 0.02$). However, in terms of ‘increase the financial success of companies’, Cluster #4 was statistically significant with higher mean scores than innovation intermediaries from Cluster #1 and Cluster #3 (all $p < 0.002$); as well, Cluster #2 had significantly

higher mean scores than innovation intermediaries from Cluster #1 (p = 0.001). Finally, the objective 'promote local industry by commercializing technologies' showed that innovation intermediaries from Cluster #3 had a significantly higher mean than innovation intermediaries from Cluster #4 (p = 0.03).

Figure 6-10 Overall Performance Means for Clusters



Before comparing objectives within each cluster, a cumulative performance was compared among the four clusters. One-way ANOVA was performed to determine if the cumulative performance was different among clusters. Assumptions were checked and met for ANOVA. Cumulative performance was significantly different between clusters, $F(3, 154) = 2.960$, $p = 0.034$, $\omega 2 = 0.42$. Cumulative performance mean was higher in Cluster #3 (M = 51.23, SD = 16.52) compared to Cluster #2 (M = 51.605, SD = 14.12); Cluster #4 (M = 46.62, SD = 12.87); and finally Cluster #1 (M = 43.72, SD = 13.896). LSD[148] post-hoc analysis revealed that the mean for Cluster #3 was statistically significantly higher than the mean for Cluster #1 (7.513, 95% CI [1.614, 13.411]); as well, the mean for Cluster #2 was significantly higher than the mean for Cluster #1 (7.89, 95% CI [1.548, 14.232]). However, no other differences were statistically significant.

[148] LSD was used instead of Tukey post-hoc.

Moreover, comparisons within clusters in terms of their objectives were investigated. In other words, all six objectives were compared within each cluster. These tests helped examine the Hypothesis H10, and determine which objective was most important for each cluster/group. Thus, a one-way repeated measures ANOVA was conducted[149] for each cluster to determine whether there were statistically significant differences in objectives. A similar approach as in Section 6.6.4 was followed; the results of one-way repeated measures ANOVA are listed in Table 6-61 and Table 6-62. Conclusions drawn from the analysis of one-way repeated measures ANOVA for the four clusters are as follow:

Table 6-61 Result of One-Way Repeated Measure ANOVA for All Objectives

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
1	Objectives Error(Objectives)	Greenhouse-Geisser	10.651 170.475	3.972 190.659	2.682 0.894	2.999	0.020	0.059	H10a (√)
2	Objectives Error(Objectives)	Sphericity Assumed	6.127 184.902	5 175	1.225 1.057	1.16	0.331	0.032	H10d (X)
3	Objectives Error(Objectives)	Sphericity Assumed	10.934 141.755	5 230	2.187 0.616	3.548	0.004	0.072	H10a (√)
4	Objectives Error(Objectives)	Greenhouse-Geisser	30.947 101.915	3.498 87.462	8.846 1.165	7.591	0.00	0.233	H10d (√)

1. There was a statistically significant difference among means of some objectives for Cluster #1; the objective 'promote local industry by commercializing technologies' was significantly higher than 'increase the financial success of companies'; therefore, we could reject the null hypothesis and accept the alternative hypothesis that Cluster #1 focused more on 'promote local industry by commercializing technologies' compared to other objectives.
2. For Cluster #2, there was no significant difference between the means; accordingly, we could not reject the null hypothesis for this cluster. In other words, Cluster #2 tended to have similar priority for all objectives.

[149] There were no significant outliers as assessed by box plot (Supplementary Appendix U) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix U). Nevertheless, the assumption of sphericity was assessed by Mauchly's test of Sphericity, (Supplementary Appendix U).

Table 6-62 Post-hoc Result for Objectives Within Each Cluster

Clusters	(I) Objectives	(J) Objectives	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	4	1	0.125	0.144	1	-0.32	0.569
		2	.575*	0.168	0.019	0.057	1.093
		3	0.068	0.223	1	-0.62	0.757
		5	0.282	0.157	1	-0.204	0.768
#3	1	2	.608*	0.139	0.001	0.178	1.038
		3	0.345	0.128	0.142	-0.049	0.74
		4	0.284	0.15	0.953	-0.179	0.747
		5	0.313	0.147	0.577	-0.142	0.769
#4	2	1	1.386*	0.194	0	0.756	2.017
		3	.826*	0.233	0.024	0.069	1.582
		4	1.168*	0.221	0	0.45	1.886
		5	0.689	0.247	0.15	-0.113	1.492

3. The difference among the means for Cluster #3 was statistically significant. Thus, we could reject the null hypothesis and concluded that Cluster #3 perceived that the objective 'improve the economy of the local community' was more important and was significantly higher than 'increase the financial success of companies'; therefore, we accepted the alternative hypothesis that Cluster #3 focuses more on 'improve the economy of the local community' compared to other objectives.
4. The difference among the means for Cluster #4 was statistically significant. 'Increase the financial success for companies' was significantly higher than all other objectives, but 'increase the sustainability of success for companies' was not significant. As a result, we rejected the null hypothesis and accept the alternative hypothesis that Cluster #4 focused more on 'increase the financial success of companies' compared to other objectives.

6.6.6 The Relationship Between Clusters and Commercialization Paths

This section examines the relationship between clusters in terms of their commercialization paths both between and within clusters. These tests examined the Hypotheses H7 and provided additional validation for the emergent clusters.

Table 6-63 Result of Multivariate Analysis of Variance for Commercialization Paths

Dependent Variables	Clusters	Mean	Multivariate F*	Univariate F*	P-value
			4.012		0.000
SELL	#1	0.330		3.661	0.014
	#2	-0.326			
	#3	0.030			
	#4	-0.217			
RENT	#1	0.507		8.298	0.000
	#2	-0.292			
	#3	-0.031			
	#4	-0.477			
RENT_nv	#1	0.428		6.181	0.001
	#2	-0.280			
	#3	0.016			
	#4	-0.433			
BUILD	#1	-0.247		4.477	0.005
	#2	0.350			
	#3	-0.207			
	#4	0.342			

First, one-way MANOVA tests were performed[150] to investigate the differences between commercialization paths based on the four suggested clusters. Four commercialization paths were assessed: BUILD, RENT, SELL, and RENT_nv. Clusters #1 and #3 scored higher in RENT, SELL, and RENT_nv in comparison to Clusters #2 and #4 which scored higher in BUILD. There was a statistically significant difference between the clusters in the combined dependent variables (commercialization paths), $F(12, 402) = 4.012$, $p < 0.0001$; Wilks' $\Lambda = 0.742$; and Partial $\eta 2 = 0.095$. Follow-up univariate ANOVAs indicated that SELL ($F(3, 155) = 3.661$, $p < 0.014$; Partial $\eta 2 = 0.066$), RENT ($F(3, 155) = 8.298$, $p < 0.001$; Partial $\eta 2 = 0.138$), RENT_nv ($F(3, 155) = 6.181$, $p < 0.001$; Partial $\eta 2 = 0.107$), and BUILD ($F(3, 155) = 4.477$, $p < 0.005$; Partial $\eta 2 = 0.08$) were significantly differences between the clusters using a Bonferroni adjusted α level of 0.025.

Tukey post-hoc tests showed that for BUILD scores, innovation intermediaries from Cluster #2 had statistically significantly higher mean scores than innovation intermediaries from Cluster #1 ($p < 0.05$) and Cluster #3 ($p < 0.05$). However, in terms of 'BUILD', Cluster #4 was not significantly

[150] Assumptions were checked and were met; preliminary testing of assumptions revealed that data were normally distributed, as assessed by Shapiro-Wilk test ($p > 0.05$). As well, there were no univariate or multivariate outliers, as assessed by boxplot and Mahalanobis distance ($p > 0.001$), respectively. There were linear relationships, as assessed by scatterplot; and there was no multicollinearity ($r = 0.393$, $p = 0.002$). There was homogeneity of variance-covariance matrices, as assessed by Box's M test ($p = 0.383$). (Supplementary Appendix U)

different than other clusters. For SELL scores, Tukey post-hoc tests showed that innovation intermediaries from Cluster #1 had significantly higher mean than innovation intermediaries from Cluster #2 ($p < 0.01$), but not between Cluster #1 and Cluster #3 ($p = 0.438$) or between Cluster #1 and Cluster #4 ($p = 0.094$). Furthermore, Tukey post-hoc tests showed that for RENT scores, innovation intermediaries from Cluster #1 had a statistically significantly higher mean than innovation intermediaries from Cluster #2 ($p < 0.001$), from Cluster #3 ($p < 0.05$) and Cluster #4 ($p < 0.001$). Finally, for RENT_nv scores, Tukey post-hoc tests showed that innovation intermediaries from Cluster #1 had statistically significantly higher mean scores than innovation intermediaries from Cluster #2 ($p < 0.005$) and from Cluster #4 ($p < 0.001$), but not between Cluster #1 and Cluster #3 ($p = 0.153$). This in turn supports the initial idea that commercialization paths can be predicted by knowing to which IIs types the innovation intermediary belongs.

Second, comparisons within clusters in terms of their commercialization paths were investigated. These tests helped us examine the Hypotheses H7 to examine which commercialization path was perceived as preferable for each cluster/group. A one-way repeated measures ANOVA was conducted[151] for each cluster to determine whether there were statistically significant preference differences between any of the four-commercialization paths. A similar approach as in Section 6.6.4 was followed; the results of one-way repeated measures ANOVA are listed in Table 6-64 and Table 6-65. The conclusions drawn from the analysis of one-way repeated measures ANOVA for all clusters are as follow:

[151] There were no significant outliers as assessed by box plot (Only one extreme outlier (observation 98) was removed) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix U). Nevertheless, the assumption of sphericity was not violated, as assessed by Mauchly's test of Sphericity (Supplementary Appendix U).

Table 6-64 Result of One-Way Repeated Measure ANOVA for All Commercialization Paths' Level of Importance

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
#1	CP	Greenhouse-Geisser	17.228	1.930	8.924	12.819	0.000	0.211	H7a (√)
	Error(CP)		64.506	92.659	0.696				
#2	CP	Greenhouse-Geisser	11.434	1.839	6.217	8.904	0.001	0.203	H7d (√)
	Error(CP)		44.947	64.368	0.698				
#3	CP	Greenhouse-Geisser	1.688	1.658	1.018	1.189	0.304	0.025	H7a (X)
	Error(CP)		65.320	76.259	0.857				
#4	CP	Greenhouse-Geisser	11.477	1.691	6.789	8.685	0.001	0.250	H7d (√)
	Error(CP)		34.358	43.953	0.782				

1. There was a statistically significant difference among commercialization paths for Cluster #1; therefore, we could reject the null hypothesis and accept the alternative hypothesis that Cluster #1 preferred RENT to BUILD path; nevertheless, SELL and RENT_nv were not significantly different from RENT.
2. The difference among the means for Cluster #2 was statistically significant. Thus, we rejected the null hypothesis and concluded that Cluster #2 preferred certain commercialization paths over others. BUILD was significantly higher than RENT, RENT_nv, and SELL. As a result, we rejected the null hypothesis and accepted the alternative hypothesis that Cluster #2 preferred BUILD compared to other commercialization paths.
3. For Cluster #3, there was no statistically significant difference between the means; accordingly, we could not reject the null hypothesis for this cluster. In other words, it seems that Cluster #3 members did not perceive any differences among their use of commercialization paths.
4. Almost similar to Cluster #2, the difference among the means for Cluster #4 was statistically significant. BUILD was significantly higher than RENT and RENT_nv, but it was not higher than SELL. As a result, we rejected the null hypothesis and accepted the alternative hypothesis that Cluster #4 preferred BUILD to other commercialization paths.

Table 6-65 Post-hoc Result for Commercialization Paths' Level of Importance Within Each Cluster

Clusters	(I) CP	(J) CP	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	BUILD	SELL	-.577*	0.164	0.006	-1.027	-0.127
		RENT	-.755*	0.152	0.000	-1.173	-0.336
		RENT_nv	-.676*	0.178	0.003	-1.167	-0.185
#2	BUILD	SELL	.676*	0.169	0.002	0.202	1.150
		RENT	.643*	0.208	0.024	0.060	1.226
		RENT_nv	.630*	0.187	0.011	0.108	1.152
#4	BUILD	SELL	0.559	0.198	0.055	-0.007	1.126
		RENT	.819*	0.232	0.009	0.158	1.480
		RENT_nv	.775*	0.245	0.024	0.075	1.475

6.6.7 The Relationship Between Clusters and Innovation Readiness Criteria

This section investigated the relationship between clusters in terms of their innovation readiness criteria. This investigation was done by using the scores of each factor/criteria within each of the four constructs of innovation readiness.

In the following paragraphs, five one-way MANOVA tests were performed to compare clusters in terms of innovation readiness and its four constructs[152]: idea (technology) (four main factors/criteria), market (3), entrepreneur (2), and new business venture (6). These tests examined the Hypotheses H8, and provided additional validation for the emergent clusters. Assumptions were checked and met[153]. A statistically significant difference was found among the clusters in the combined dependent variables (innovation readiness), $F(51, 411.654) = 3.053$, $p < 0.0001$; Wilks' $\Lambda = 0.385$; Partial $\eta 2 = 0.273$ (Table 6-66). That supports the initial idea that innovation readiness could be predicted by knowing to which clusters the innovation intermediary belongs. However, the MANOVA models for two of the four constructs of innovation readiness were significant: idea/technology construct ($F=4.745$, $p < 0.001$) and new business venture construct ($F=3.859$, $p < 0.001$); in contrast, the other two constructs were not significant. Nevertheless, individual univariate F-statistics for five factor/criteria out of 12 factor/criteria in relation to the two significant constructs were also significant

[152] These four constructs comprised the innovation readiness as it was introduced in Section 2.4.

[153] Assumptions were checked and were met; initially, one observation (98) was detected as outlier and was accordingly removed. After removing it, all assumptions were met. (Supplementary Appendix U)

(Table 6-67); this in turn further supported the idea that innovation readiness could be predicted by knowing to which cluster the innovation intermediary belongs.

Table 6-66 Result of MANOVA for Innovation Readiness and its Four Constructs

	Value (Wilks' Lambda)	F	Hypothesis df	Error df	P-value	Partial Eta Squared
Innovation readiness	0.385	3.053	51	411.654	0.000	0.273
Idea/technology	0.594	4.745	18	421.921	0.000	0.16
Market	0.936	1.138	9	370.079	0.335	0.022
Entrepreneurs	0.976	.617b	6	306	0.717	0.012
New business venture	0.65	3.859	18	421.921	0.000	0.134

LSD post-hoc tests showed that for 'synergy between capability of IIs and the proposed idea' criterion, innovation intermediaries from Cluster #1 had significantly lower mean scores than innovation intermediaries from Cluster #2, Cluster #3, and Cluster #4 (all $p < 0.05$). For the criterion of 'potential societal and environmental benefits from the idea' and 'potential contribution to local society and environment', LSD post-hoc tests showed that innovation intermediaries from Cluster #3 had significantly higher mean scores than innovation intermediaries from Cluster #2 and from Cluster #4 (all $p < 0.05$), but not Cluster #3 and Cluster #1 ($p > 0.077$). As well, Cluster #4 had significantly lower mean scores than innovation intermediaries from Cluster #1, Cluster #2, and Cluster #3 (all $p < 0.05$). Furthermore, LSD post-hoc tests showed that for the criterion of 'originality of the idea', LSD post-hoc tests showed that innovation intermediaries from Cluster #1 had significantly higher mean scores than innovation intermediaries from Cluster #2 ($p < 0.01$), Cluster #3 ($p < 0.001$), and Cluster #4 ($p < 0.01$). As well, Cluster #3 had significantly higher mean scores than innovation intermediaries from Cluster #2 ($p < 0.001$). In addition, Cluster #4 had statistically significantly lower mean scores than innovation intermediaries from all other clusters. Finally, for the criterion of 'scientific and technology foundation of the new business venture', LSD post-hoc tests showed that innovation intermediaries from Cluster #1 had significantly higher mean scores than innovation intermediaries from Cluster #2 ($p < 0.001$).

Table 6-67 One-Way ANOVA for All Criteria Between Clusters

Constructs	#	Dependent Variable (Criteria)	Type III Sum of Squares	Mean Square	F	P-value	Partial Eta Squared
Idea/technology	1	Synergy between capability of IIs and the proposed idea.	8.529	2.843	2.962	0.034	0.055
	2	Potential societal and environmental benefits from the idea	23.971	7.99	10.266	0.000	0.167
	3	Originality of the idea	23.599	7.866	9.085	0.000	0.15
	4	Innovation level of the idea (radical vs. incremental)	2.525	0.842	0.834	0.477	0.016
Market	7	Expected fit between market need and the proposed solution	5.782	1.927	2.161	0.095	0.04
	8	Path to market	1.982	0.661	0.659	0.579	0.013
	9	Potential opportunities in the targeted market	2.198	0.733	0.816	0.487	0.016
Entrepreneurs	10	Entrepreneur engagement	0.914	0.305	0.306	0.821	0.006
	11	Entrepreneur capabilities	2.761	0.92	0.948	0.419	0.018
New business venture	12	Viability of the new business venture	6.787	2.262	2.326	0.077	0.043
	13	Potential successful growth of the new business venture	4.877	1.626	1.636	0.183	0.031
	14	Potential contribution to local societal and environment	25.821	8.607	10.031	0.000	0.163
	15	Scope of the new business venture	6.69	2.23	2.391	0.071	0.044
	16	Scientific and technology foundation of the new business venture	8.129	2.71	2.918	0.036	0.054
	17	Payback potential of the new business venture	6.109	2.036	2.183	0.092	0.041

Errorr df=154, and df=3 for all variables

In addition, comparisons within clusters in terms of their innovation readiness criteria were investigated. In other words, all criteria were compared within each cluster. These tests helped examine the Hypotheses H8, and determined which criteria were perceived as more important for each cluster/group. Thus, one-way repeated measures ANOVA was conducted[154] for each cluster to determine whether there were significant differences in perceiving any of the 15 criteria as more important than others. A similar approach as in Section 6.6.4 was followed; the results of one-way repeated measures ANOVA are listed in Table 6-68 and Table 6-69. The conclusions drawn from the analysis of one-way repeated measures ANOVA for all clusters are as follow:

[154] There were no significant outliers as assessed by box plot (Only one extreme outliers (observations 98) were removed.) and the data were normally distributed for most of the variables, as assessed by Kurtosis and Skewness test and Shapiro-Wilk test, (Supplementary Appendix U). Nevertheless, the assumption of sphericity was not violated, as assessed by Mauchly's test of Sphericity (Supplementary Appendix U).

Table 6-68 Result of One-Way Repeated Measure ANOVA for All Criteria's Level of Importance

Clusters	Source		Type III Sum of Squares	df	Mean Square	F	P-value	Partial Eta Squared	Hypothesis
#1	All Criteria	Greenhouse-Geisser	36.558	10.117	3.614	2.831	0.002	0.057	H8a (√)
	Error(Criteria)		606.916	475.477	1.276				
#2	All Criteria	Greenhouse-Geisser	24.360	8.443	2.885	1.609	0.117	0.044	H8d (X)
	Error(Criteria)		530.041	295.519	1.794				
#3	All Criteria	Greenhouse-Geisser	19.622	10.009	1.960	1.461	0.151	0.031	H8a (X)
	Error(Criteria)		617.585	460.431	1.341				
#4	All Criteria	Greenhouse-Geisser	54.581	7.948	6.867	3.949	0.000	0.132	H8d (√)
	Error(Criteria)		359.313	206.645	1.739				

Table 6-69 Post-hoc Result for Criteria Level of Importance Within Each Cluster

Clusters	(I) Criteria	(J) Criteria	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	3	1	.833*	0.187	0.007	0.116	1.551
		12	.792*	0.182	0.010	0.095	1.489
		17	.651*	0.148	0.008	0.083	1.219
#4	2	7	-.859*	0.192	0.018	-1.644	-0.073
		15	-.991*	0.235	0.037	-1.955	-0.028
		17	-1.064*	0.167	0.000	-1.747	-0.380
	14	13	-.978*	0.209	0.011	-1.834	-0.123
		15	-1.115*	0.265	0.037	-2.198	-0.031
		17	-1.187*	0.226	0.002	-2.110	-0.263

1. There was a statistically significant difference among means of some criteria for Cluster #1; the importance of the criterion 'originality of the idea' was significantly higher than 'synergy between capability of IIs and the proposed idea'; higher than 'viability of the new business venture'; and higher than 'payback potential of the new business venture'. Therefore, we rejected the null hypothesis and accepted the alternative hypothesis that Cluster #1 focused more on idea/technology construct compared to other constructs of innovation readiness.
2. There were no significant differences among the means of criteria for Cluster #2. Thus, we could not reject the null hypothesis that there was no relation between Cluster #2 and the

innovation readiness' focus (idea/technology, market, entrepreneur, and new business venture).

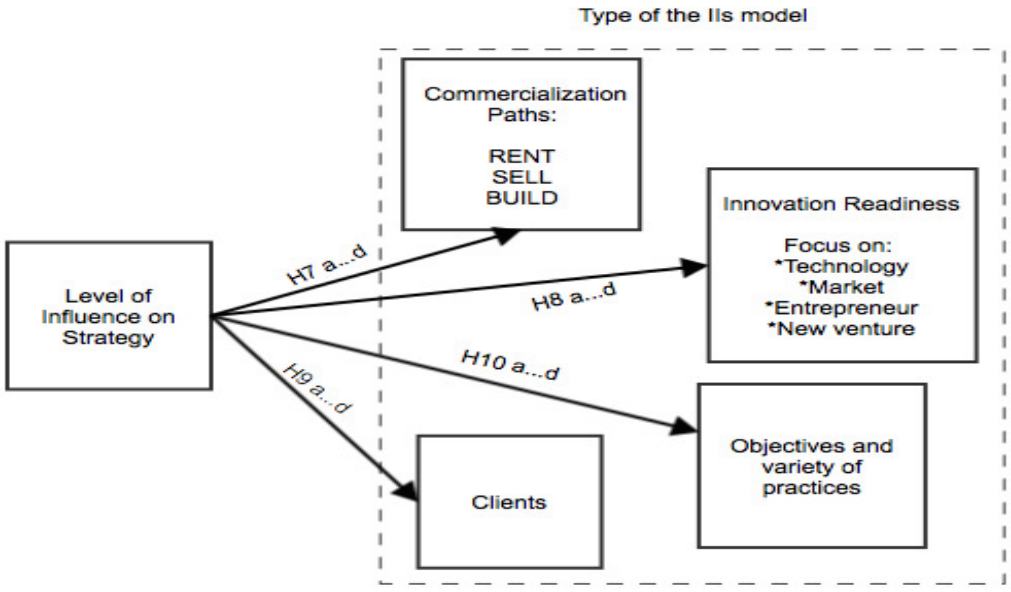
3. For Cluster #3, there was no significant difference between the means; accordingly, we could not reject the null hypothesis for this cluster.

4. The differences among the means for Cluster #4 were statistically significant. Thus, we could reject the null hypothesis and conclude that Cluster #4 perceived some criteria as more important than others. Some of the new business venture' criteria (e.g. 'potential successful growth of the new business venture', 'scope of the new business venture', and 'payback potential of the new business venture') were significantly higher than 'potential contribution to local society and environment'. As well, the criteria 'expected fit between market need and the proposed solution', 'scope of the new business venture', and 'payback potential of the new business venture' scored significantly higher than 'potential societal and environmental benefits from the idea'. As a result, we rejected the null hypothesis and accepted the alternative hypothesis that Cluster #4 focused more on new business venture construct compared to other constructs of innovation readiness; in addition, Cluster #4 perceived that having some societal and environmental benefits and contributions were not as much of a priority as the potential financial success and growth of new venture.

6.6.8 Summary

In conclusion, most hypotheses in Section 6.6.4 through Section 6.6.7 were accepted (see Table 6-70). That in turns support the second part of the model (Figure 6-11) in the context of innovation intermediaries who facilitate research commercialization. The overall conclusion is that each cluster translates the various influences that it receives from its salient stakeholders (as discussed in Section 6.6.3) into diverse operational strategies; however, although Cluster #1 and Cluster #4 respectively confirmed the findings[155] for UTTO and III (as discussed in Section 6.5.8), Cluster #3 and Cluster #2 have some unsupported hypotheses which indicate some unexplained behaviour; it may indicate new emergent behaviour or the continuation of established one; this will require more investigation. Chapter 7 discusses these findings and provides possible interpretation for the behaviour of Cluster #3 and Cluster #2. In sum, the findings of these sections provide additional proof for the validity of the clustering procedure, increase the validity of the proposed typology of II types, and simultaneously provide theoretical explanation for behaviour of II types. That in turn results in many implications and open new venues for future research, all of which are discussed in Chapter 7.

Figure 6-11 Second Part of the Research Model (Operational Strategies Constructs)



[155] It is evident through Section 6.6.9 and Section 6.5.8 that various clusters (II types) focus on serving particular clients, give more priority to some objectives, use a particular dominant commercialization path, and focus on specific criteria when selecting which innovation to commercialize.

Table 6-70 Summary for All Hypothesis for IIs Types Operational Strategies

Hypotheses (Commercialization Paths)	State
H7a: Cluster #1 is more likely to use 'RENT' as their dominant commercialization path in comparison to the other commercialization paths.	Supported
H7d: Cluster #2 is more likely to use 'BUILD' as their dominant commercialization path in comparison to the other commercialization paths.	Supported
H7a: Cluster #3 is more likely to use 'RENT' as their dominant commercialization path in comparison to the other commercialization paths.	Not Supported
H7d: Cluster #4 is more likely to use 'BUILD' as their dominant commercialization path in comparison to the other commercialization paths.	Supported
Hypotheses (Innovation Readiness)	**State**
H8a: CLUSTER #1 is likely to focus more on 'TECHNOLOGY' compared to other constructs of innovation readiness.	Supported
H8d: Cluster #2 is likely to focus more on 'NEW BUSINESS VENTURE' compared to other constructs of innovation readiness.	Not Supported
H8a: CLUSTER #3 is likely to focus more on 'TECHNOLOGY' compared to other constructs of innovation readiness.	Not Supported
H8d: Cluster #4 is likely to focus more on 'NEW BUSINESS VENTURE' compared to other constructs of innovation readiness.	Supported
Hypotheses (Clients)	**State**
H9a: CLUSTER #1 is likely to serve internal clients (i.e. affiliated clients, students, faculty, and university staff) more than other clients.	Supported
H9d: Cluster #2 is more likely to serve external clients (i.e. not necessarily affiliated clients).	Supported
H9a: CLUSTER #3 is likely to serve internal clients (i.e. affiliated clients, students, faculty, and university staff) more than other clients.	Not Supported
H9d: Cluster #4 is more likely to serve external clients (i.e. not necessarily affiliated clients).	Supported
Hypotheses (Objectives)	**State**
H10a: CLUSTER #1 is more likely to have focused objectives and practices that may be related to patenting and licensing.	Supported
H10d: Cluster #2 is more likely to have broad objectives and practices that may be related to creating a new business venture.	Not Supported
H10a: CLUSTER #3 is more likely to have focused objectives and practices that may be related to patenting and licensing.	Supported
H10d: Cluster #4 is more likely to have broad objectives and practices that may be related to creating a new business venture.	Supported

6.7 Common Method Variance Assessment

CMV has been discussed in detail in Section 4.2.2.3, including the implementation of several procedural remedies that have been suggested to minimize potential effects of CMV. These actions took place both before and during the design stage for the measurement tools. Following the collection of data by questionnaire, researchers have used statistical tools to assess CMV effects and in some cases control for it. Podsakoff et al. (2003) determined that for studies that have obtained IV[156] and DV[157] from the same source and have measured both within the same context without identifying sources of the method bias, it have been recommended to 1) "use all procedural remedies related to questionnaire design"; 2) "separate measurement of predictor [IV] and criterion variables [DV] psychologically and guarantee response anonymity"; and 3) use "single-common-method-factor approach" to assess and control the CMV effects (p. 898). The first two recommendations were considered in Section 4.2.2.3, while applying the third recommendation of using the statistical tools is discussed next.

Two tests were performed to assess the CMV effects, and accordingly to determine the level of biases that may limit the generalizability of the findings of this study: Harman's single-factor test and single-common-method-factor test.

Harman's single-factor test runs an exploratory factor analysis for all measurements and then checks if a single factor will emerge or if one general factor will explain the majority of variance for all measurements. Harman (1967) suggested that using the unrotated single-factor test examines the possibility that the data can be explained by only one single factor with a good fit in the context of factor analysis. Podsakoff et al. (2003) recommended using Harman's single-factor test and demonstrated that meeting conditions[158] indicate a significant amount of CMV. However, Harman's test is viewed as being less sensitive for moderate CMV effects and small CMV effects (Podsakoff et al., 2003); consequently, some scholars have argued against the usefulness of Harman's test (Gorrell

[156] IV= Independent Variables
[157] DV= Dependent Variables
[158] In other words, finding of one single factor or one general factor to explain the majority of variance for all measurements.

et al. (2011). In this study, Harman's single-factor test was performed (as in Appendix V). The results indicate the presence of many factors, but not one single factor. As well, the first factor accounted for only 17.245% of the total variance; nevertheless, this percentage does not represent the majority[159] or close to the majority of the total variance. Thus, as Harman's single-factor test did not reveal one single factor or find one general factor to explain the majority of total variance, the result implies the absence of significant CMV effects on this study's results and findings.

The other test is the single-common-method-factor test[160] (Podsakoff et al., 2003; Williams, Cote, & Buckley, 1989), which can be performed by using a hierarchical multiple-regression model where a one single latent variable[161] (i.e. CMV_Latent _factor) was introduced to the research model. Next, explanations provided by the regression model was compared with and without this latent factor to give an estimate for the effect of common method variance (Podsakoff et al., 2003). The result of this test in this study indicated that no significant improvement occurred in the model's fit after adding the latent factor to the model. This accounted for only 0.8% of the total variance compared with 66.4% of the total measurement variance for the original model without the CMV_Latent _factor. This in turn suggests that common method bias was not a major issue in this study and accordingly supported the result of the first test as reported.

Both analyses of CMV effects lead to the conclusion that this research could indeed exhibit CMV; however, this CMV would not significantly change the overall interpretation of research results.

6.8 Conclusion

This chapter employs two parallel approaches to analyze the proposed research model. Each of these approaches used a different independent variable while the dependent variables for both approaches were the same. The independent variable for the first approach was extracted from

[159] Majority is 50% or more of the total variance.
[160] This test is used to assess and statistically control for the effect of CMV.
[161] By using exploratory common factor analysis (ECFA) for all variables in the study and forcing ECFA to have only one factor, the resulting scores are calculated and named CMV_Latent _factor.

respondents' answers, while the independent variable for the second approach was extracted empirically based on clustering analysis. However, prior to the analysis, principal components analysis was used to reduce variables and to determine the main components for each concept. Furthermore, reliability, validity, and CMV were assessed in this chapter.

The findings of this chapter are summarized in four tables (Table 6-25, Table 6-42, Table 6-56 and Table 6-70) that include which hypotheses were supported and which were not. Two tables summarize each approach. In general, the findings indicate the validity of the suggested classification of innovation intermediary types, that is then confirmed by the clustering analysis. Moreover, it was evident that stakeholders' salient level and stakeholders' dependency level are good predictors for the level of influence that each stakeholder applies on the innovation intermediary organization. As well, it was evident that each type of II has a particular stakeholder which influenced it more than other stakeholders. That in turn results in various operational strategies that were significantly different between types. In sum, this study proves that there are various types of innovation intermediaries who are influenced by particular stakeholders and accordingly have diverse operational strategies to provide the commercialization-related services. The next chapter will elaborate more on these findings and suggest potential impacts and future research.

Chapter 7
Discussion and Conclusions

The main goal of this study was to understand various types of innovation intermediaries (IIs) who facilitate research commercialization in an effort to help identify exemplary practices for IIs. This study began by following an inductive approach in its research method. The learning gained from Phase One of this study helped in structuring the observations toward developing and identifying a theory that could explain innovation intermediaries as organizations. Phase Two of this study was conducted to operationalize the suggested theory and confirm its suitability in explaining the organizations of IIs that facilitate research commercialization.

This chapter interprets and demonstrates the findings and new learning obtained from the analyses that were conducted for Phase One and Phase Two data in Chapter 5 and Chapter 6, respectively. The chapter commences with an introduction which identifies the innovation intermediaries who facilitate research commercialization as well as the stakeholders that influence innovation intermediaries. Then, through the stakeholder lens and based on this study's findings, a new typology for innovation intermediaries is introduced. The main model/framework of this research is then introduced and discussed. In next to that, the impact of stakeholders' influence on each of the operational strategy constructs for IIs is demonstrated and interpreted, followed by a general discussion about various issues. The chapter presents a discussion about the expected theoretical, literature and practical implications of this research, followed by a proposed agenda for future research and explanation of the limitations of this study. Finally, a brief conclusion summarizes the key findings of this research.

7.1 Innovation Intermediaries and their Stakeholders

An innovation intermediary (II) that facilitates research commercialization has been defined in this study (in Section 2.3) as “an organization or body that acts as an agent or broker in any aspect of [the research commercialization] process between two or more parties” (Howells, 2006, p. 720). This

definition allows many actors who work in the context of research commercialization to be named IIs[162] (See Section 2.3). It is important to highlight that this study looks at any of these actors (IIs) as arm's-length stand-alone organizations[163]. In other words, in this study, the parent organization/firm of any II is counted as one of its stakeholders. However, these actors (IIs) comprise four main types of II (as discussed in the next section), which, to a great extent, deal with the same groups of stakeholders but with various favoring (predilection) as validated by the Phase One findings and confirmed by the Phase Two results.

In fact, a list of the main stakeholders for IIs was initially collected from the literature review (Section 3.1). These stakeholders were then validated by the IIs experts' judgments[164] to be: Government, Community, Industry (and/or parent firm), Educational Institution (university, college), Financiers (funding partners, shareholders), Customers/Clients, Employees (including volunteers), and other innovation intermediaries (Siegel et al., 2003; Swamidass & Vulasa, 2008; Collier, 2008). The first five were observed and then confirmed to have various salience levels, dependence levels, and influence levels for the various types of IIs (see Chapter 6). These were illustrated through the next two sections. However, the other three stakeholders: clients, employees, and other IIs were excluded from our comparison due to the different nature of theses stakeholders in comparison with the other five stakeholders. According to Freeman's (1984) definition of stakeholder, and based on Clarkson (1995) and Goodpastor (1991) suggestions on classifying stakeholders, the former group is classified as secondary stakeholders while the latter five stakeholders are identified as primary stakeholders; thus, and for the sake of parsimony, these three[165] stakeholders were excluded; future research may consider them further.

[162] Some actors did not recognize themselves as Innovation Intermediaries (see Section 4.2.4.1), and some other actors were not included in the study due to the criteria of inclusion and exclusion (see Appendix I for the criteria) (Also see Section 4.2.2.4).
[163] For example, if IIs (UTTOs) receive support from a university, then consider this support as if it comes from a separate budget allocation, or for a cost center, rather than from an internal source. A similar approach is followed with IFOI with their parent firm.
[164] IIs' experts participated in the Phase One exploratory study. The findings are in Section 5.2.5
[165] The three secondary stakeholders are: Clients, employees (including volunteers), and other innovation intermediaries.

7.2 Typology of Innovation Intermediaries Through the Lens of Stakeholders

Innovation intermediaries exist worldwide. They are referred to by various names, and use a range of business models. To explain them (IIs) appropriately, researchers tend to group IIs based on services, functions, roles, structural environment, organization forms, and goals (see Section 2.3.1 and Table 2-3). Still, IIs target various clients and use a diversity of organizational forms, governance structures, objectives, practices, business orientation, innovation readiness criteria, and commercialization paths that have not yet been fully explained in the literature. Thus, this study developed a typology for IIs through the lens of stakeholder theory, a typology that was intended to explain a great portion of the diversity among IIs.

The suggested typology is based on how IIs favor some stakeholders over others, as was observed from the literature and through our exploratory study; such favoring was measured for the five main stakeholders in terms of three concepts: 1) how IIs perceive the importance (salience) of each stakeholder; 2) how much IIs depend on each stakeholder; and 3) to what extent stakeholders influence each II. Theses concepts, in general, were informed by stakeholder identification and salience theory by Mitchell et al., (1997) and stakeholders' influence strategy theory by Frooman (1999), as explained in the following section.

As reported in Section 6.5.1, the self-reported 13 II subgroups[166] were mapped into four main groups/types (UTTO, CBI, IFOI and III). This grouping was based on the aforementioned theories regarding how IIs favor and depend on one stakeholder over others (Section 5.2.5). Thus, this grouping was called a self-report classification, and this was compared and contrasted with a classification that emerged based on clustering procedures (Section 6.6.1), which is discussed later in this section.

[166] All subgroups that were associated with educational institutes were grouped into the 'University Technology Transfer Offices' (UTTO) type; similarly, all subgroups (incubators and accelerators) that were supported mainly by any level of government were grouped into the 'Community Business Incubators' (CBI) type; and all subgroups that were part of an industry firm were grouped into the 'Industry Facilitators Open Innovation' (IFOI) type; Finally, all subgroups that were not associated with, or were mainly supported by, the above three stakeholders were grouped into the 'Independent Innovation Intermediaries' (III) type, which favors Financiers (funding partners, shareholders) stakeholders more than did other stakeholders. Respondents of this study answered a question to report their subgroups (self-report). The reports were then used to map them into these four main groups/types (See Section 6.5.1)

Phase Two, the confirmatory study, shows that three II types[167], UTTO, CBI, and III, had significant perceived differences (Section 6.5.2) among themselves with regard to the level of the three concepts: stakeholders' salience, dependence on stakeholders, and influence by stakeholders. As well, it shows that each type of II had significant differences (Section 6.5.2) within itself with regard to the level of the three concepts. That in turn validates the suitability of using a stakeholder's lens as a base for typology. Perhaps the most interesting finding is that each of these three types tends to favor one stakeholder over other stakeholders; in other words, each type tends to perceive a particular stakeholder as having more salience, depending on it more, and being influenced by it more than by the other stakeholders. This finding suggests that the University Technology Transfer Offices' (UTTO) type perceives Educational Institutions (university, college) as the most salient stakeholder, they depend on it the most, and they are influenced by it greatly. Similar findings were found for the CBI and III types, with Government and Financiers stakeholders, respectively (See Section 6.5.2). Furthermore, the result indicates (See Section 6.5.2) that there is a type that perceives Industry stakeholders as the most salient stakeholder, depends on it the most, and is influenced by it greatly, which aligns with our definition of 'Industry Facilitators Open Innovation' (IFOI). However, this particular type (IFOI) was not included in the typology because no representing sample was collected for it in the confirmatory study (Section 4.2.2.4).

Interestingly, this study's typology explains why each type of II is characterized by some demographic as well as operational strategy features that distinguish it from other types (Section 6.5.3 through Section 6.5.6). It is all about how a particular stakeholder influences an II type toward: having specific demographic characteristics; performing specific goals/objectives, practices/services, and commercialization paths; directing them to select inventions by focusing on specific innovation readiness criteria; and leading them to serve particular clients. These all represent a great portion of IIs' operational strategies. This is discussed in Section 7.4, where each type of II has been described in detail based on the typology of this study, including the various characteristics mentioned above. Nevertheless, the relation between the level of favoring and depending on a particular stakeholder and the level of being influenced by it are discussed in Section 7.3.

Moreover, the clustering procedure[168] that was performed for the above three concepts validate the above typology. Four clusters were obtained from the clustering procedures (Section 6.6.1); two of

[167] Due to a very low volunteer rate, IFOI type was dropped from the study as indicated in Section4.2.4.1.
[168] SPSS-21 was used to cluster the 163 responses based on 14 variables that were representing the three aforementioned concepts; no other initial seeds were used to inform the clustering procedure (see Section 6.6.1).

them (Cluster #1 and Cluster #4) validate two II types as reported in the self-report typology (UTTO and III respectively); while the other two clusters (Cluster #2 and Cluster #3) revealed an undefined type of II. However, a CBI type was not apparent as a separate cluster through the clustering procedure, and was distributed through the various clusters; this could be due to the small CBI sample size, or that many of the sample's constituents are in the process of moving toward being part of the new emergent trend/type.

To illustrate, Cluster #1 has characteristics similar[169] to the UTTO type in terms of perceiving Educational Institution as the most salient stakeholder, depending on it the most, and being influenced by it greatly. Indeed, 81.6% of Cluster #1 members are from those who self-reported themselves as UTTO; as well, UTTO and Cluster #1 share the similar demographics and operational strategy features, as was illustrated in Section 6.5.7 and Section 6.6.8. Similarly, Cluster #4 and III share the similar stakeholders-related characteristics, as well as demographics and operational strategies features; in fact, 81.5% of the members of Cluster #4 were from those who self-reported themselves as III.

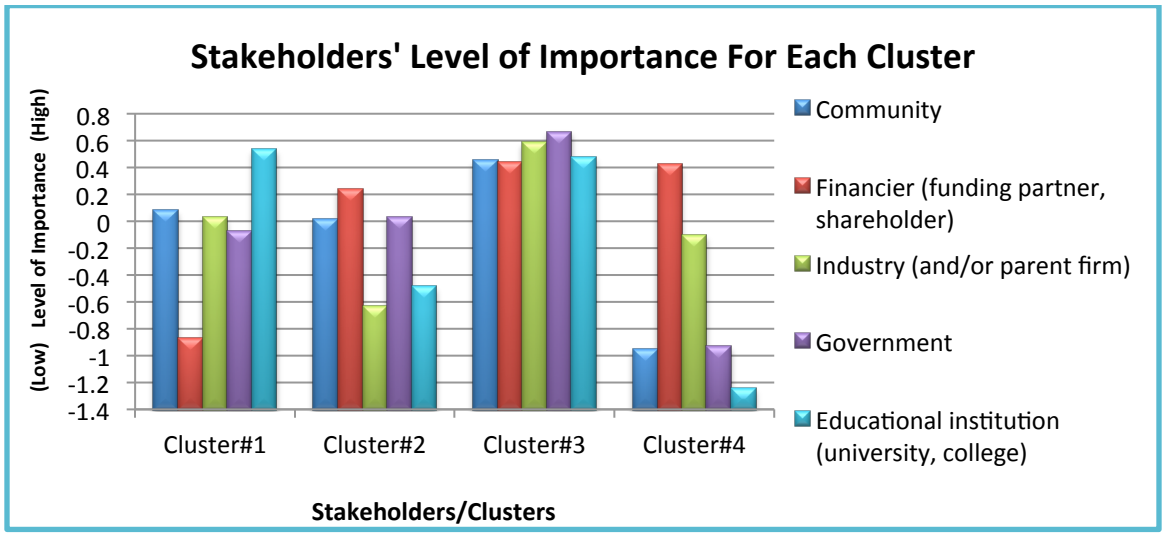
On the other hand, the emergent type represented by Cluster #2 and Cluster #3 showed some departure from the uni-stakeholder approach toward the multi-stakeholder approach. The uni-stakeholder approach is when an organization pays more attention to one particular dominant stakeholder and either ignores or pays less attention to the other stakeholders; while the multi-stakeholder approach is when an organization maintains more balanced care for all stakeholders by not having one or a few salient stakeholders. In the cases of UTTO, CBI, III, Cluster #1 and Cluster #4, the uni-stakeholder approach was followed, whereby each of them perceives one salient stakeholder. Conversely, Cluster #2 and Cluster #3 depart from the uni-stakeholder approach; in that Cluster #3 advanced further away from the uni-stakeholder approach and was much nearer the multi-stakeholders than was Cluster #2.

To illustrate, in terms of the three aforementioned concepts, although 72.3% of Cluster #3 members were from those who self-reported themselves as UTTO, Cluster #3 showed no apparent difference in the level of salience among all five stakeholders. In other words, in Cluster #3 the magnitude of the salience level of the Educational Institution stakeholder was reduced (see Figure 7-1), while the magnitude of the salience level of other stakeholders in Cluster #3 increased compared with the magnitude of Cluster #1 stakeholders' salience level. That shows how members in Cluster #3

[169] See summaries at the end of Section 6.5.2 and Section 6.6.3.

departed from the uni-stakeholder approach toward multi-stakeholders by perceiving no difference in the salience level among stakeholders (i.e., they maintained more balanced care toward all stakeholders).

Figure 7-1 The Means of Stakeholders' Level of Importance for Each Cluster



Moreover[170], in terms of the perceived level of dependence on stakeholders, the magnitude of the dependence level on the Educational Institution stakeholder decreased, while the magnitude of the dependence level on stakeholders was increased for the other stakeholders in Cluster #3, compared with the magnitude of Cluster #1 stakeholders' dependence level. However, dependence on Educational Institution and Government stakeholders was reported as significantly higher than dependence on the Financiers (funding partners, shareholders) stakeholder. We believe this result was because Cluster #3 still progressing toward diversifying its dependence on many stakeholders, instead of one, as in the three II types (UTTO, CBI and III). Cluster #3 members reported a decreased level of dependence on Educational Institution yet increased for other stakeholders; nevertheless, this action of increasing the dependence on Financier was not enough to remove all significant differences for the level of dependence among stakeholders of the new emergent II type. This could be because the IIs do not want to overly rely/depend on Financiers, or maybe Financiers are very conservative as

[170] See Appendix T for all figures that compare all clusters' means (similar to Figure 7-1).

pertains to providing resources for those IIs that cannot be predominantly influenced by them. This can be investigated in future research.

Thirdly, in terms of the level of stakeholders' influence, Cluster #3 is not influenced predominantly by any particular stakeholder; in other words, there is no difference in the perceived influence level among stakeholders on Cluster #3. That does not mean there is no influence on Cluster #3; conversely, the magnitude of influence by all stakeholders increased, and only the influence of Educational Institution was decreased compared with the magnitude of Cluster #1 stakeholders' influence. This result restores the concern of 'how organizations can deal with the different interests of their stakeholders' (e.g. Freeman, Harrison, Wicks, Parmar & De Colle, 2010). Obviously, in this study, the organization will be IIs who facilitate research commercialization, which suggests another question for future research.

Cluster #2 – to a great extent – has a similar interpretation as Cluster #3; yet Cluster #2 seems less inclined toward the multi-stakeholder approach. For example, although, 63.9% of Cluster # 2 members were from those who self-reported themselves as III, Cluster #2 has different characteristics than III and Cluster #4. However, in Cluster #2, the salience level of Financier (funding partners, shareholders) shows a significantly higher mean than Educational Institution and Industry, but it was not significantly different than the means for Community and Government. In other words, in Cluster #2 the magnitude of the salience level of Financier (funding partners, shareholders) and Industry stakeholders was decreased, while the magnitude of the salience level was increased for other stakeholders in Cluster #2, compared with the magnitude of Cluster #4 stakeholders' salience level (see Figure 7-1). That suggests how members in Cluster #2 acted by departing from the uni-stakeholder and approaching toward multi-stakeholders by increasing the salience level of those stakeholders that were less salient and maintained an acceptable salience level toward other stakeholders. As a result, making all stakeholders share more or less similar salience levels (i.e., the cluster maintained a balance of importance for all stakeholders).

Similarly, in terms of the level of dependence on stakeholders[171], and in terms of the level of influence by stakeholders[172], Cluster #2 shows similar responses as demonstrated in previous paragraph for the stakeholder's salient level. These changes may validate the initial conclusion that Cluster #2 is working toward a departure from the uni-stakeholder approach toward multi-stakeholders.

In sum, this section shows a new typology through the lens of stakeholders for IIs that facilitate research commercialization; particularly, based on the three concepts of the salience of stakeholders, dependence on stakeholders, and influence by stakeholders. Three II types (UTTO, CBI and III) were evident by this study and then validated by the result of clustering analysis; nevertheless, an emergent type of II was unfolded. The three types follow the uni-stakeholders' approach, while the emergent type departs from a uni-stakeholders' approach and toward a multi-stakeholders' approach. The typology is based primarily on the stakeholders' influence strategy theory by Frooman (1999) and, secondly, by the stakeholder identification and salience theory of Mitchell et al., (1997), as explained in the following section. This typology provides new insights toward improved understanding of the innovation intermediaries. Although this typology is similar to other existing typologies in terms of offering a method for classification, the typology of this study has the advantage of being more comprehensive by including all known types of innovation intermediaries who facilitate research commercialization. Thus, it is believed that the typology of this study may form the foundation for future research with a comprehensive perspective of IIs.

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[171] In terms of the level of dependence on stakeholders, the magnitude of the dependence level on Financiers and Industry stakeholders decreased, while the magnitude of the dependence on stakeholders increased for the other stakeholders in Cluster #2 compared with the magnitude of Cluster #4 stakeholders' dependence level. Yet, the dependence on Financiers and Government stakeholders was significantly higher than the dependence on Educational Institutions and Industry stakeholders. In our opinion, this result was revealed because Cluster #2 is still progressing toward diversifying their dependence on many stakeholders, instead of one stakeholder; whereas Cluster #2 members decreased the dependence level on Financiers and industry, and increased it for other stakeholders. Yet this increased dependence on Educational Institutions was not enough to remove all significant differences for the level of dependence among stakeholders for the new emergent II type. This could be because the IIs from Cluster #2 focus more on external clients and much less on university internal clients, which to some extent justifies their lower dependence on the Educational Institution stakeholder

[172] Finally, in terms of the third concept regarding the level of influence by stakeholders, though Financiers showed a significantly higher mean than Educational Institution and Industry, it was not significantly different than Community and Government. Furthermore, Community as a stakeholder scores the second-highest influence level with a significant difference to Industry. In other words, the magnitude of the influence level by Financiers and Industry stakeholders was decreased, while the magnitude of the influence level by stakeholders was increased for the other stakeholders in Cluster #2 compared with the magnitude of Cluster #4 stakeholders' influence level.

7.3 Stakeholders Influence Innovation Intermediaries' Strategies: The Model

Recall the base for typology in the previous section; namely, that innovation intermediary types tend to perceive some stakeholders as having more salience than others. They tend to depend on those salient stakeholder(s) more than they depend on others; and by connecting that with Frooman's (1999) theory that any organization that depends on any stakeholder will experience some type of influence on its decision-making and behavior by that particular stakeholder. This section conceptualizes and discusses that notion in the context of innovation intermediaries who facilitate research commercialization.

Recall that two underlying theories were used to explain why there are various types of innovation intermediaries that facilitate research commercialization (IIs), and why they use different strategies toward the same ultimate goal[173]. The primary theory is Stakeholder Influence Strategies Theory[174] (SIST) by Frooman (1999); and the second theory is Stakeholder Identification and Salience Theory[175] by Mitchell et al. (1997). Both theories were combined in one model that can address the above questions.

Stakeholder Influence Strategies Theory (SIST) offers suggestions for action that stakeholders can perform on any focal organization to influence its decision and behavior (Frooman, 1999). This action varies based on who depends on whom (Figure 7-2). Accordingly, four types of strategies are employed by stakeholders to influence the focal organization: 1) indirect withholding for the resources provided; 2) indirect conditions on the usage of the resources provided; 3) direct withholding for the resources provided; and 4) direct conditions on the usage of the resources provided. Direct action is implemented by the stakeholder itself; while indirect action is performed through an alliance or network of stakeholders. In this study, an organization is meant to be any II, while a stakeholder is any one of the five main stakeholders: Government, Community, Industry, Educational Institution, Financiers (funding partners, shareholders), as discussed in Section 7.1.

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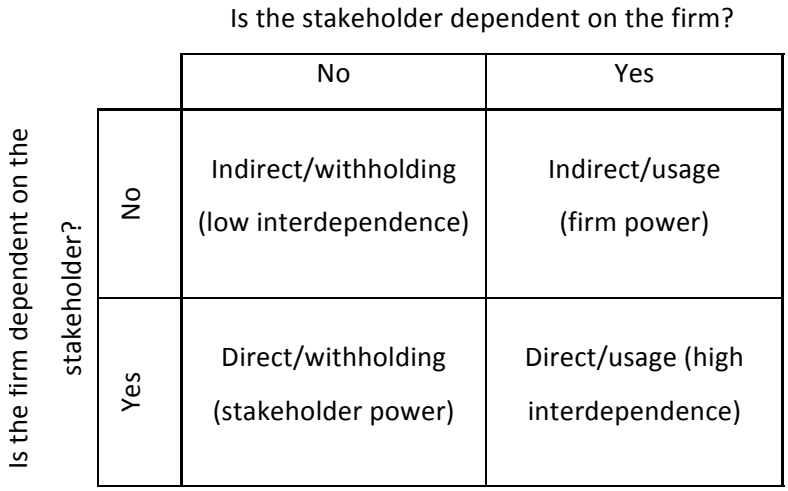
[173] The ultimate goal is to facilitate research commercialization.

[174] Stakeholder Influence Strategies Theory (SIST) was introduced in Section 3.1.3; it simply answers the question: "What types of influence strategies do stakeholders have available, and what determines which type the stakeholders choose to use?" (Frooman, 1999, p. 191).

[175] Stakeholder Identification and Salience Theory (Mitchell et al., 1997) was discussed in Section 3.1.1. It helps to identify which stakeholders are salient (important) to an organization by measuring each stakeholder's power, legitimacy, and urgency (Mitchell et al., 1997). Stakeholders that have highest power, legitimacy, and urgency will be the salient stakeholders for that particular organization.

Figure 7-2 Typology of Influence Strategies



* Adopted from Frooman (1999)

This study operationalized the aforementioned theories in the context of innovation intermediaries that facilitate research commercialization. Thus, some scales were developed from scratch, while others were customized to the context of this study. Then, the explanatory power offered by the Stakeholder Influence Strategies Theory (SIST) was evaluated and analyzed. Subsequently, one modification – adding the concept of salient stakeholders (Mitchell et al., 1997) to the Frooman model – better explains the research questions. Finally, an extension of the Stakeholder Influence Strategies Theory (SIST) was introduced to more fully explain both the existing and the emergent types of IIs. Next subsections provide illustration and interpretation for the findings to describe all the above steps toward constructing the final suggested model. Furthermore, in Section 7.4, various operational strategies and behavior that show how various II types were influenced differently by their corresponding salience stakeholders are investigated and connected to the proposed model.

Scale Development

In order to operationalize the Frooman's model in the context of innovation intermediaries that facilitate research commercialization, scales were developed or modified to measure the concepts of both aforementioned theories and the dependent variables of operational strategies. In general, all statements in these scales were made to be appropriate for use in the context of all types of innovation

intermediaries that facilitate research commercialization but without being biased toward any particular type of II.

Chapter 4, and particularly Section 4.2.1 provides full details on how Churchill's (1979) recommendations were followed to develop and modify these scales. As a result, this study provides the literature with validated scales to measure the three main concepts of Stakeholder Influence Strategies Theory (SIST): dependence on stakeholders, dependence by stakeholders, and influence by stakeholders; as well, it modifies scales to measure power, legitimacy, and urgency for the concept of stakeholders' salience (Agle et al., 1999) in the context of IIs. Furthermore, scales for II's operational strategies variables (objectives, clients, commercialization paths, practices, and innovation readiness) were collected from various literature, and were then compiled with the learning that was gained from the exploratory study and finally tested. Assessment for the validity and statistical reliability of all scale items and constructs were performed, and no major issues were found.

Do 'Stakeholder Influence Strategies Theory' (by Frooman, 1999) Explain the Types of II?

Hypothesis H2, H3 and H6 were formulated (Chapter 3), tested, and supported[176] (Section 6.5.2) to answer the above question; these hypotheses investigated the level of each stakeholder's dependence on IIs, the level of II's dependence on each stakeholder, and the influence level that each stakeholder exerted on IIs. Nevertheless, analyses of the relation between these concepts were performed.

For some types of II, the mean values show that stakeholders always have lower dependence on IIs compared to IIs' dependence on their particular stakeholder; however, this is not the case for type III. These findings helped in identifying the type of influence stakeholders have based on the Stakeholders Influence Strategies Theory (Frooman, 1999). As a result, following from the finding that stakeholders have the power of being less dependent on their IIs, UTTO and CBI are expected to receive a direct withholding influence from their respective stakeholders, Educational Institution, and Government (Frooman, 1999). However, these influence strategies by the stakeholders could change with the variation in the balance of the level of dependence. For example, it would not be surprising if stakeholders moved to apply the direct usage influence strategy, particularly if the level of

[176] The II types UTTO, CBI, and III were found to depend on one particular stakeholder more than the others. These were, respectively, Educational Institution, Government, and Financiers (funding partners, shareholders) (Section 6.5.2, Hypothesis H2). In addition, the same above stakeholders were found to depend on their corresponding IIs types more than other stakeholders did (Section 6.5.2, Hypothesis H3).

dependence on each other was considered to be dynamic (Tietze, 2010). Moreover, in general, it is rarely expected that UTTO or CBI will have power over their stakeholders, particularly if they continue their uni-stakeholders' approach. Furthermore, decreasing the dependence level between II types (UTTO, CBI) and their stakeholders so as to be in the cell of low interdependence (Figure 7-2) is almost impossible in the context of IIs that facilitate research commercialization, as both parties (IIs and stakeholders) depend on each other in their goal of research commercialization.

On the other hand, III type was found to have power over its stakeholder, as III's dependence on its stakeholder (Financiers) was less compared to the dependence of Financiers on it; this is may be due to the type of resource dependency by III which mostly being financial resource from Financiers rather than other resources. Thus, III was expected to receive indirect usage influence strategy from its stakeholders; however, this influence strategy could change along with the change in dependence balance. Thus, other strategies, such as direct usage influence and direct withholding influence are expected to be used by the Financiers stakeholder when these changes happen.

In reality, and from the above discussion it is obvious that the differences in the level of dependence between IIs and their corresponding stakeholder would not be noticeable, unless there was a very large difference. In addition, this study collected the perceptions of participants for both levels of dependence (i.e., the IIs' dependence on stakeholders and the stakeholders' dependence on IIs) from the same participants (from the II side). Thus, it is might be expected (due to self-report bias (Orne, 1962; Crowne & Marlowe, 1960)) that respondents underestimate their dependence on others and overestimate others' dependence on them to show their organization's superiority[177]. However, determining the types of stakeholder influence was not the main priority of this study. Rather, one of the top priorities was to show the existence of stakeholders' influence on IIs (as discussed in the next paragraph) and the impact of that influence on the II's operational strategies (as discussed in Section 7.4).

Based on Frooman's (1999) model, stakeholders' influence on an organization (IIs) always occurred within the four cells (Figure 7-2). In other words, stakeholders tended to influence the focal organization, regardless of the balance of dependence (Frooman, 1999). Although there is no mention of the influence level in Frooman's model, this study bridged that gap by measuring the level of influence by each stakeholder, comparing all stakeholders' influence within each II type, and then

[177] Although with this expected (unproved) bias for the concept of the level of stakeholders' dependence on IIs, the result in the discussion of this section will not be changed. Conversely, it will become more significant, particularly for the UTTO and CBI types.

evaluating the explanatory power of the II's dependence on stakeholders to predict the level of influence by the same stakeholder.

This study confirmed that the II type was influenced the most by the stakeholders that the II depended on it the most (Hypothesis H6)[178]. As well, regression analysis[179] shows that the level of II's dependence on a particular stakeholder explains a good portion of that stakeholder's level of influence on that particular II (Section 6.5.2). However, this was not the case for the III type; although it is evident that III depends on the Financiers stakeholder and is influenced by it the most, in the regression model dose not show that dependence on Financiers stakeholder explain its influence on III. However, for all other II types, this study validates that the level of dependence on stakeholders greatly explains the level of influence by those stakeholders (12.4% – 53.4%) (Section 6.5.3) which indicates 'YES' as an answer for the question in the title of this subsection. Yet, there is a room to improve the explanatory power of the model as in next subsection.

Toward Improved Explanatory Power of the Model:

Although dependence level is counted as something that can be measured (mostly tangible resources), some portion of it are based on the perception of the organization's managers (IIs) (e.g. the intangible networking resources); thus, they make their decisions regarding any influence based on the combination of actual and perceived levels of dependence. That introduced the concept of stakeholders' level of importance (salience) to the model that explains IIs.

Therefore, in order to improve the explanatory power of the model, the level of stakeholder salience was introduced to the model to be tested (Section 6.5.3); actually, the stakeholders' level of importance (salience) was discussed in the typology process (Section 7.1) where it was shown to vary among IIs types (Hypothesis H1). Interestingly, for each II type, the stakeholder who was perceived to be the most important is the same one that II depend on the most, and the same one that influences II the most (Hypothesis H5 and H6).

[178] For example, Educational Institution, Government, and Financiers highly influenced UTTO, CBI, and III, respectively, more than other stakeholders (Hypothesis H5'). In fact, UTTO, CBI, and III depend highly on the same corresponding stakeholders, as discussed above (Hypothesis H2).

[179] Regression was between all variables that measure the dependence of all IIs on the four main stakeholders and each of the variables that measure the influence level of each stakeholder (159 samples).

The question that comes to mind now is: Are both concepts (salience level and dependence level) the same? In Section 6.5.3, the relation between these concept were investigated, where the results indicate that despite the correlation between Educational Institution level of dependence and Educational Institution level of importance, all other stakeholders did not show high correlation or explanation of stakeholders' importance level by the level of dependence on the same stakeholder. Though, at first glance, both concepts seem to be similar, these findings indicate that they mostly explain some part of each other but cannot claim to be identical or even highly similar to each other.

Thus, initially the stakeholders' level of importance concept was used alone to examine explanation power to explain the influence level; secondly, explanatory power for both concepts together (level of importance and dependence level) were investigated. Regression analysis[180] shows that the perception of IIs regarding the importance of stakeholders explains a good portion of that stakeholders' influence level on that particular II (Section 6.5.3). For example, for all II types, this study validates that the level of stakeholder importance explains to a great extent the level of influence by that stakeholder (33.6% – 63.7%) (Section 6.5.3). On the other hand, regression analysis for the variables of both concepts[181] and each of the variables that measure the influence level of each stakeholder (159 samples) show that a combination of both concepts better explains a greater portion of that stakeholders' influence level on II (see Section 6.5.3). For all II types, this study validates that both the level of stakeholder importance and the level of dependence on that salient stakeholder largely explains the level of influence by that particular stakeholder (36.6% – 71.1%) (Section 6.5.3).

Consequently, it is better to incorporate a concept of salient stakeholders into the model; this can be done when the model would only consider those stakeholders that have been identified to be salient. For instance, only the Educational Institutional stakeholder would be counted when testing the model for UTTO, and similarly all the four main stakeholders would be counted in the case of Cluster #3.

[180] Regression was between all variables that measure the perception of all IIs regarding the importance of the five main stakeholders and each of the variables that measure the influence level of each stakeholder (159 samples).
[181] The two concepts include nine variables, five measure the perception of all IIs regarding the importance of the five main stakeholders, and four of them measure the dependence of all IIs on the four main stakeholders.

Examine the Model Through Clustering results:

By considering the findings that were detected in the clustering-groups (II types based on the empirical clusters), all conclusions for Cluster #1 and Cluster #4 were similar to the conclusions that were discussed above for UTTO and III, respectively[182]. This validates the above conclusion for UTTO and III, and so there is no need to discuss them again. However, Cluster # 2 and Cluster #3 need to be further discussed. In Section 7.2 it was evident both Clusters #2 and #3 were moving from the uni-stakeholder approach toward a multi-stakeholders' approach; where, for example, Cluster #3 perceived no differences in the level of salience and in the level of influence by all the main stakeholders, and this showed that it depended highly on more than one stakeholder. These characteristics for Cluster #3 (the additional II type, as discussed in Section 7.2) were not explained by the suggested modified model. On the other hand, although Cluster #2 showed evidence of moving toward the multi-stakeholders' approach, still, the modified model with some shortcomings could explain Cluster #2. However, the modified model does not account for the other high dependence that Cluster #2 has (Section 6.6.8). Actually, the suggested modified model works based on a one-on-one relationship. In other words, the model explains the influence strategies for each II type that has dependency on stakeholder partially failed to explain Cluster #2 by not accounting for its dependence on many stakeholders. Therefore, an extension for the above model was suggested in the next subsection to improve the model explanation and to account for one-to-many relationships. A one-to-many relationship means a relationship between one organization (II in this study) and many stakeholders (i.e., the four main stakeholders in this study). However, many-to-one or many-to-many are beyond the scope of this study, and thus could be recommended as a subject for future research.

Extending the Model to Deal With More Than One Stakeholder:

The main purpose of the extension was to account for the dependence on more than one stakeholder simultaneously. Hence, if the dependence was only on one salient stakeholder (a uni-stakeholder), then the previous modified model would explain the II types (see Figure 7-3, the upper part); otherwise, the extension was proposed to explain the multi-stakeholders' approach (see Figure 7-3, the lower part).

[182] Trivial differences existed.

Figure 7-3 The Extended for Stakeholders' Influence Strategies Theory

Consider salient stakeholder(s) only				C) Is the stakeholder dependent on the firm?	
				No	Yes
A) Is the firm dependent on more than one stakeholder?	No	B) Is the firm dependent on the stakeholder?	No	Indirect/withholding (low interdependence)	Indirect/usage (firm power)
			Yes	Direct/withholding (stakeholder power)	Direct/usage (high interdependence)
	Yes	B) Is the firm dependent on all stakeholders?	Unequally	Direct/withholding (stakeholder power)	Direct/usage (high interdependence)
			. .	.	.
			Equally	Indirect/withholding (low interdependence)	Indirect/usage (firm power)

The suggested model should work as follows:

First, as suggested above, only the stakeholders that have a high salience level will be counted in the model. For example, UTTO has only Educational Institutional stakeholder as a salient stakeholder; while, Cluster #3 has no differences among stakeholders in terms of the salience level; yet, all stakeholders in Cluster #3 were perceived to have high salience level. Consequently only Educational Institutional stakeholder would be counted when testing the model for UTTO, and all the four main stakeholders would be counted in the case of Cluster #3.

Second, if the answer was 'NO' to the Question (A): Is the firm dependent on more than one stakeholder? Then, the upper part of the model would be used. For example, in the case of UTTO, the answer to the above question is 'NO'; thus UTTO was explained by the above part of the model, which will be exactly as it was discussed in the previous subsections.

Third, if the answer was 'YES' for the Question (A): Is the firm dependent on more then one stakeholder? Then, the lower part of the model would be used. That means there is dependence on

more than one stakeholder. Thus, the next question asked is Question (B): Is the firm dependent on all stakeholders equally or unequally? The answer to this question and the answer to the other Question (C): "Is the stakeholder dependent on the firm?" would determine the strategy stakeholders might use to influence the focal organization (II). One of three strategies will result, based on the answers to the above two questions; if the answer to the first Question (B) was, 'unequally;' then that means there was dependence on two or more stakeholders and that the dependence level among stakeholders was unequal. In other words, II (the organization) seems to depend on one or more of the salient stakeholders more than others. Thus, for each of these salient stakeholders, the answer to the Question (C) would determine the stakeholder's influence strategy. For example, Cluster #2, which depends highly on two salient stakeholders, Financiers and Government, would receive either 'direct withholding' or 'direct usage' by each of these two aforementioned salient stakeholders. That would be determined for each stakeholder based on how much that particular stakeholder depended on the organization (II).

On the other hand, if the answer to the first Question (B) was, 'equally,' that means there were dependencies on all salient stakeholders and that the dependence level on all of them was equal. Although none of the II types and clusters in this study falls exactly into this category[183], the category can be conceptualized based on similar concepts that were used for the other cells in the model, which were based initially on Frooman's stakeholder influence strategy theory (1999). Thus, in this case, the equal dependence on all stakeholders could be either equally high dependence on all, or equally low dependence on all. By using Cluster #3 as an example of IIs that moved from dependence on one stakeholder toward dependence on many stakeholders, Cluster #3 shows that it tends to diversify its dependence by increasing its dependence on many of those stakeholders that had low dependence by Cluster #3, and decrease its dependence on the one stakeholder identified as having high dependence by Cluster #3. In other words, Cluster #3 may achieve equal dependence on all stakeholders while the level of dependence is high, and it may then work on decreasing that high dependence for all stakeholders to maintain greater equality of dependence. Therefore, when organization (II) moves from unequal dependence and achieves equal high dependence for all stakeholders, the influence strategies in this situation would be similar to unequal dependence (as discussed above). However, the influence strategies would flip gradually after that, particularly when the organization (II)

[183] Cluster #3 is expected to be in this category soon, as it perceives all stakeholders as salient stakeholders and seems to work on either increasing dependence on the Financiers stakeholder or reduced dependence on other stakeholders to achieve equal dependence on all stakeholders. Furthermore, Cluster #3 receives no difference in influence from all stakeholders.

decreases its dependence on all stakeholders while keeping it more or less equal for all of them. The influence strategies in the situation of equal low dependence will be similar to the category of no dependence on stakeholders. It would be 'indirect withholding' for all stakeholders that have no dependence on the organization (IIs); while it would tend to be 'indirect usage' for all stakeholders that have dependence on the organization (II).

In our opinion, the situation of using indirect withholding will not happen in the context of IIs, as both entities depend on each other toward the goal of research commercialization. Furthermore, it is expected that IIs would typically have the power when achieving the category of equal low dependence on all stakeholders, regardless of the level of stakeholders' dependence on IIs. In other words, with these equal low dependencies on all stakeholders, the organization (IIs) would be in a better situation in terms of bargaining with stakeholders, as it would have many alternatives. That results in the organization (II) having power over its stakeholders even when the balance of dependence is for the sake of the stakeholders. We think, this aligns with what Freeman (1984) (the father of stakeholder theory) suggested in his stakeholder theory, strive to balance the interests of all stakeholders.

Figure 7-4 New Stakeholders' Influence Strategies Theory (The Simple Version).

Consider salient stakeholder(s) only			(C) Is the stakeholder dependent on the firm?	
			No	Yes
(A) Is the firm dependent on the stakeholders?	No		Indirect/withholding (low interdependence)	Indirect/usage (firm power)
	Yes	Unequally *	Direct/withholding (stakeholder power)	Direct/usage (high interdependence)
		Equally**	Indirect/withholding (low interdependence)	Indirect/usage (firm power)

* Unequally means a firm depends on one or more salient stakeholders more than other stakeholders
** Equally means a firm depends on and perceives all stakeholders as salient (almost equally)

Furthermore, Figure 7-4 shows a simple version of the extended theory shown in Figure 7-3. Both figures show no border between the categories of equally and unequally; this was to indicate the gradual change from one strategy to the other strategy, which happens simultaneously with the gradual moving from unequal dependence on all salient stakeholders to equal dependence on all salient stakeholders.

In sum, this section suggested a model that may explain the existence of various types of II, including the emergent type. Various scales were developed to operationalize the underling theories. Then, a modification, by adding the concept of salient stakeholders (Mitchell et al., 1997; Agle et al., 1999) to the model was made to improve the model's explanatory power. After that, an extension of the model was conceptualized and proposed to account for the multi-stakeholders' approach and the uni-stakeholder approach. The whole suggested model shows the existence of high influences by certain stakeholders on a certain type of II. The model also shows, through its extended part, the new or established trend for organizations that work in the context of IIs. Furthermore, it shows various types of strategies that stakeholders tend to use to influence an organization to make certain decisions or to change its behaviors. Next, Section (7.4) shows the impact of stakeholders' influence on IIs' operational strategies.

7.4 Influence of Stakeholder(s) on Innovation Intermediaries (IIs)

Previous sections (Sections 7.2 and 7.3) suggest a typology that indicates the existence of various types of IIs (UTTO, CBI, III, and the emergent type). Moreover, it is suggested that all types were influenced by one or more of their main stakeholders. The terminology 'influence' is often associated with negative connotation[184]; yet, in the context of IIs, some organizations may perceive influence negatively and others may perceive influence positively. This section does not examine the valence of how organizations perceive influence by stakeholders. Instead, this section investigates the impact that may result from these influences on many of the characteristics of IIs' demographics and operational strategies (e.g.,Tankhiwale, 2009; Miller et al., 2014). This in turn may help future researchers to assess if the influence should be perceived positively or negatively. In the following

[184] Influence is perceived negatively in terms of an external force pressuring an organization to take an action that it does not want to take.

subsections, many characteristics, demographics, and operational strategies are discussed, including goals/objectives, performance, innovation readiness criteria, commercialization paths, clients, and practices. Every subsection includes some comparison and contrast between all types and clusters of IIs that facilitate research commercialization.

General Characteristics and Demographics:

Analyses that were conducted in Chapter Six for various characteristics and demographic features of IIs types and clusters show many significant differences among them (Section 6.5.1 and Section 6.6.1.4). As well, the analyses show that UTTO and Cluster #1, and III and Cluster #4 share similar characteristics and demographics features to a great extent.

For example, UTTO and Cluster #1 were found to provide free commercialization-related services and to be open to facilitating the commercialization of ideas of multiple sectors and/or disciplines, more so than III and Cluster #4; conversely, III and Cluster #4 were shown to charge clients for commercialization-related services, and to focus on facilitating the commercialization of ideas in a particular sector or discipline more so than UTTO and Cluster #1.

Note that the above broad and focused strategies in serving various sectors were validated elsewhere. Although UTTO and Cluster #1 serve a broad range of sectors, analysis shows that they focus on serving many individual sectors more so than III and Cluster #4, particularly in an environmental sector.

In terms of co-location, UTTO and Cluster #1 tend to co-locate with a university, college, or hospital more often than Cluster #4 and III; while III and Cluster #4 have a higher ratio of being more independent (i.e., not co-located with any organization) in comparison to UTTO and Cluster #1.

Furthermore, in terms of legal status, UTTO and Cluster #1 were more likely to be a public organization and/or part of a university, college, or hospital in comparison to III and Cluster #4. On the other hand, III and Cluster #4 legally tend to be an incorporated private for-profit firm and/or a single-owner organization more often than were UTTO and Cluster #1.

All of the above characteristics and demographics features make sense when connecting each type/cluster to its salient stakeholders. For example, UTTO and Cluster #1, who perceive Educational Institution as their salient stakeholder and accordingly are influenced the most by it, can justify

having the following characteristics and demographic features: 1) provide free commercialization-related services while serving their parent universities, and consequently limit their free services to university clients (see clients' subsection); 2) be open to facilitating the commercialization of ideas of multiple sectors and/or disciplines because their parent universities always have various disciplines which cannot be excluded; 3) co-locate with a university, college, or hospital as in most cases their parent universities provide offices and require them to be located close to the targeted clients (university clients); 4) have similar legal status background as their parent university; thus, they are at times officially part of a university, college, or hospital; or they at least follow their parent university's legal statutes and are public organizations.

A similar approach is used for III and Cluster #4 when connecting them with their salient stakeholder of financier.

On the other hand, CBI tends to provide both free and paid commercialization services, some of which target broad sectors while others are very focused and specialized on a particular sector (Section 6.5.1 and Section 6.6.1.4). These variations are attributed to the targeted programs by CBI's salient stakeholder of government. In addition, CBI tends to be co-located with a small- to mid-size incorporated private for-profit firm (fewer than 300 employees); co-located with regional government department, laboratory, or agency; and co-located with a municipal government department, laboratory, or agency. These characteristics show CBI's strong association with its salient stakeholder of government. In most cases, CBI is legally an incorporated not-for-profit firm, and in some cases is part of a university, college, or hospital. To a great extent that shows its main financial dependency on government to operate toward achieving its goals.

Finally, Cluster #2 and Cluster #3 which represent the emergent type of IIs still share many characteristics and demographic features as their original groups III and UTTO, respectively. However, the clusters differ with III and UTTO in very minor characteristics and demographic features; for example, Cluster #3 is less likely to be part of a university, college, or hospital in comparison with UTTO.

Goals/Objectives:

Based on using PCA on 22 various objectives [185] (as discussed in Section 6.3), five general objectives for all types of IIs were found:

1. Improve the economic performance of the local community;
2. Increase the financial success for companies;
3. Support entrepreneurs/start-ups activity;
4. Promote local industry by commercializing technologies; and
5. Increase the sustainability of success for companies.

Analyses for how these five objectives differentiate among IIs types and clusters were performed in Section 6.5.4 and Section 6.6.5, respectively.

Comparing between IIs types showed that CBI and UTTO focus more on improving the economy of the local community; while III focus more on increasing the financial success for companies that are being helped in commercialization process. Furthermore, comparing objectives within each IIs type validated the above, in that III prioritize increasing the financial success of companies that they helped to commercialize, while UTTO place that goal as last priority.

Similarly, Cluster #3 and Cluster #1 focus more on improving the economy of the local community; while Cluster #4 and Cluster #2 focus more on increasing the financial success of companies that they helped to commercialize. This is consistent with the findings for UTTO, CBI, and III in the above paragraph. Furthermore, interestingly, Cluster #3 gives higher priority for certain goals such as 'Promote local industry by commercializing technologies' in comparison with other clusters. Nevertheless, comparing objectives within each cluster validated that Cluster #1 focuses the most on promoting local industry by commercializing technologies while Cluster #4 focuses the most on increasing the financial success of companies. Cluster #3 focuses mostly on improving the economic performance of the local community.

The above results show that almost every type of II has a somewhat different focus, which is sometimes opposite to each other. These differences can be explained by knowing the dominant

[185] See Chapter Four for how these 22 objectives are comprised.

influencer stakeholder of each type. For example, UTTO and Cluster #1 were primarily influenced by educational institute stakeholder; thus, their strategies were affected by this stakeholder. Nevertheless, educational institute stakeholder looked forward to increasing the commercialization's success rate and speed and helping to enrich local clustering. At the same time, educational institute stakeholder does not like to dispense its inventors (researchers and faculty); thus, educational institute stakeholder found that it is better to focus on local improvement. Accordingly, educational institute stakeholder influences both UTTO and Cluster #1 to focus on objectives such as improving the economy of the local community and promoting local industry by commercializing technologies.

Similarly, III and Cluster #4 are influenced by financers (funding partners, shareholders) that generally focus on financial performance. Thus, financers influence III and Cluster #4 to focus more on increasing the financial success of companies that are being helped in their commercialization process. This in turn will result in some financial benefits for the III and accordingly to their financers.

Finally, an emergent type that is more focused on multi-stakeholders' approach has a broader scope of objectives; thus, it gives a higher priority to goal such as 'promote local industry by commercializing technologies' in comparison to other clusters. Nevertheless, Cluster #3 scored higher than did other clusters in on 'improving the economic performance of the local community'. These results with other characteristics of Cluster # 3 assure the extent of the broader goals that Cluster #3 performs in comparison to other clusters. Might Cluster #3 be more inclined to effectively manage sensitive tradeoffs between economic prosperity and environmental sustainability?

Reported Performance:

This section reflects on the reported performance of each II type in terms of all the suggested goals/objectives (Section 6.3). Overall, this study considered many recommendations to account for the various objectives that were prioritized by each IIs type; thus, a cumulative performance was calculated by drawing upon two responses: 1) the measure of the importance of each objective for IIs; and 2) the measure of how IIs performed in each particular objective over the past year (out of 100%). Accordingly, 22 objectives were summated using the following equation:

(Sum of (Objective's importance level (i) * Objective's performance level (i)/100))*0.9091 (Where i= from 1 to 22)[186]

Using the cumulative reported performance scores helped develop a performance indicator that takes into account the various perceptions of each IIs regarding the importance level of goals.

Interestingly, the results showed that the highest reported average was 57.4%, which reflects the unappreciated performance by II in general; yet, some types reported performance were better than others. For example, cumulative performance was shown to be higher for CBI (M = 57.362, SD = 13.77) and III (M = 50.709, SD = 15.584), which is higher than UTTO (M = 44.736, SD = 13.326). Similarly, cumulative performance was reported as higher in Cluster #3 (M = 51.23, SD = 16.52) and Cluster #2 (M = 51.605, SD = 14.12), which is higher than Cluster #1 (M = 43.72, SD = 13.896). However, no other differences were statistically significant. These results show that UTTO and Cluster #1 performances were seen as the lowest among II types. Furthermore, CBIs were reported to perform well in comparison with UTTO. On the other hand, the new emergent type that is represented in Cluster #3 and Cluster #2 that follows the multi-stakeholders approach reported a better performance in comparison with Cluster #1.

This result may indicate the need for UTTO to re-evaluate what they are doing. The multi-stakeholder approach might be suggested as a new approach for IIs to operate. However, longitudinal future research is suggested, with independent performance metrics, to confirm if the multi-stakeholder approach represents the new trend or not.

Clients:

The literature review and exploratory study identified 11 types of clients who use the services from IIs that facilitate research commercialization. Applying PCA (Section 6.3) on these 11 types results in three main components of clients:

1. External clients (individuals, entrepreneurs, new ventures, established firms, partners, and other IIs)
2. University clients (internal clients, professors, students)

[186] The result of this equation is normalized to be out of 100 by multiplying it to (100/110= 0.9091).

3. Clients from hospitals and research centres.

Analyses of how these clients differ among IIs types and clusters were performed in Section 6.5.3 and Section 6.6.4, respectively.

By comparing II types and clusters, it is evident that UTTO, Cluster #1, and Cluster #3 tend to serve university clients more than do III, Cluster #2, and Cluster #4; however, the latter serves external clients more so than do UTTO and Cluster #1, but not more than Cluster #3. Moreover, CBI serves external clients more so than UTTO, while Cluster #1 and Cluster #3 serve 'clients from hospitals and research centres' more than does Cluster #4. On the other hand, through within comparisons, Cluster #1 is similar to UTTO in preferring to serve university clients and 'clients from hospitals and research centres' more than they did with external clients; as well, Cluster #4 shows similarities with III in terms of preferring to serve external clients rather than serving other clients. However, Cluster #3 and Cluster #2 exhibit different behaviours in dealing with various types of clients. For example, Cluster #3 shows no differences in preferring to serve one client type over other types; however, although Cluster #2 shows a preference to serve external clients in comparison to university clients, it does not show differences in preference between serving external clients and 'clients from hospitals and research centres'.

These comparisons validate our earlier conclusions regarding the relation between changes in IIs' operational strategies and behaviours with changes in stakeholders' salience and influence level. Also, this analysis shows that the multi-stakeholder's approach may broaden the scope of commercialization, which is demonstrated here by Cluster #3 serving all clients.

Commercialization Paths:

Four commercialization paths or strategies were used in this study: SELL, RENT, RENT_nv, and BUILD (Pries, 2006). These commercialization paths were measured through ten variables, as discussed in Section 6.3.

Analyses of how these four commercialization paths differentiate among IIs types and clusters were performed in Section 6.5.5 and Section 6.6.6, respectively.

As was expected, and aligning with previous subsections' conclusions, UTTO and Cluster #1 demonstrated similar attitudes toward the preferences of using commercialization paths; UTTO and

Cluster #1 were shown to prefer RENT, RENT_nv, and SELL more than BUILD path and more than other II types and clusters. As well, III, Cluster #4, and surprisingly Cluster #2 showed preferences for BUILD path more than other paths and more so than did UTTO and Cluster #1. Cluster #2 was expected to have a somewhat different preference than III and Cluster #4; interestingly, it did not. Moreover, CBI was shown to prefer BUILD more than did UTTO and more than SELL and RENT_nv paths, but not more than RENT path. Finally, Cluster #3 indicated no preference among commercialization paths even though UTTO and Cluster #2 were shown to have a higher preference than Cluster #3 in terms of RENT_nv and BUILD, respectively.

It is obvious that UTTO and Cluster #1 follow their most salient stakeholder, Educational Institution, by preferring RENT, RENT_nv, and SELL more than BUILD. In fact, universities (solvers) look forward to increasing the commercialization success rate and speed, and aim for fast financial benefits (royalties, equities, and/or licensing fees); as well, universities do not like to dispense their inventors (researchers and faculty); thus, Educational Institutions prefer RENT, RENT_nv, and SELL more than BUILD (which help Educational Institutions stakeholder to achieve their preferred goals with minimum loss). On the other hand, III and Cluster #4 follow their most salient stakeholder, financiers (partners, shareholders), by preferring BUILD more than other commercialization paths. Financiers look to maximize profit out of the commercialization process, and simultaneously prefer the path that increases the duration in which both IIs and their clients work together for on-going knowledge exchange; thus, financiers prefer BUILD more than other commercialization paths.

The relation between changes in IIs' operational strategies and behaviour with changes in stakeholders' salience and influence level was once again evident by the above result for commercialization paths. Furthermore, this subsection shows that multi-stakeholder's approach looks toward broadening the scope, which is demonstrated here by its being open to all commercialization paths for Cluster #3.

Innovation Readiness:

As introduced in Section 2.4, four constructs comprising the innovation readiness criteria with various criteria[187] were included in each construct: idea (technology) (21 criteria), market (12

[187] The literature and our exploratory study suggested these criteria.

criteria), entrepreneur (10 criteria), and new business venture (23 criteria). Innovation readiness is the process of evaluating a new invention as it moves toward commercialization. In other words, innovation intermediaries evaluate the innovation readiness of new inventions in order to select the most promising among them, often due to the limits of funding and resources (Galbraith et al., 2006, 2007; Heslop et al., 2001; Graettinger et al., 2002; Rahal & Rabelo, 2006). The result of PCA procedure helped in reducing the number of criteria to the main components for each of the four constructs (Section 6.3), as presented in the following Table 7-1.

Analyses for how these 15 criteria differentiated among IIs types and clusters were performed in Section 6.5.6 and Section 6.6.7, respectively.

By comparing II types and clusters, it is evident that UTTO and Cluster #1 tend to place higher importance on the criterion 'the originality of the idea' and 'the potential contribution to local society and environment' more than do III and Cluster #4; nevertheless, UTTO and Cluster #1 perceive the criterion 'the originality of the idea' as the most important criterion among other criteria. That in turn demonstrates the 'technology push' orientation for UTTO and Cluster #1; in other words, they focus more on which technology to commercialize and focus less on the market need. This focus is understandable considering that the salient stakeholders for UTTO and Cluster #1 are Educational Institutions. Educational Institutions are knowledge creators and favour inventors/solvers over seekers; thus, it is a priority for Educational Institutions to push any new invention toward commercialization even if the invention does not yet have an appreciated market.

On the other hand, III and Cluster #4 tend to place higher importance on the criterion 'the synergy between capability of IIs and the proposed idea' more than other types and clusters; nevertheless, III and Cluster #4 perceive the criteria 'the level of the expected fit between market need and the proposed solution', and 'the potential successful growth of the new business venture' as the most important among other criteria. That in turn demonstrates the balance between 'technology push' and 'market pull' orientation for III and Cluster #4, and shows the focus on the financial aspects and benefits of participating in the commercialization process by III and Cluster #4. This is understandable when knowing that the salient stakeholders for III and Cluster #4 are financiers. Financiers do not favour inventors/solvers or seekers; instead, they favour the financial benefits.

Table 7-1 Innovation Readiness Constructs and Criteria

	Constructs	# of original items/criteria	Main components (items/criteria)
Innovation Readiness	Idea/Technology Construct	21	1. Synergy between capability of IIs and proposed idea; 2. Potential societal and environmental benefits of idea; 3. Originality of idea; 4. Innovation level of idea (radical vs. incremental);
	Market Construct	12	1. Level of the expected fit between market need and the proposed solution; 2. Path to market; and 3. Potential opportunities in the targeted market.
	Entrepreneur Construct	10	1. Level of entrepreneur engagement; and 2. Individual entrepreneur capabilities.
	New Business Venture Construct	23	1. Viability of the new business venture; 2. Potential successful growth of the new business venture; 3. Potential contribution to local society and environment; 4. Scope of the new business venture; 5. Scientific and technological foundation of the new business venture; and 6. Payback potential of the new business venture.

Unexpectedly, CBI shows no differences among the 15 criteria, and does not seem to perceive any of the criteria to be of higher importance than do other IIs types; it is may be due to low sample of this type. Also, Cluster #3 and Cluster #2 show no differences among the 15 criteria; however, comparing with other clusters, Cluster #3 places higher importance on the following criteria: 'the potential societal and environmental benefits of the idea' and 'the potential contribution to local society and environment'. This in turn demonstrates the importance of societal and environmental aspects for the emergent type (Cluster #3) when they are selecting an invention to help toward commercialization. It may suggest some advantages for Cluster #3 (the emergent type) over other IIs types in terms of looking beyond the short-term goal of just commercializing an invention.

This validates our earlier conclusions regarding the relation between changes in IIs' operational strategies and behavior, and changes in stakeholders' salience and influence level. Also, it shows that multi-stakeholder's approach is broadening the scope, as demonstrated by Cluster #3, which focuses on all criteria and paying higher attention to societal and environmental aspects.

7.5 Exemplary Practices for Innovation Intermediaries (IIs)

As stated, exemplary practice describes a process that stands out as an example for others to use as a benchmark, to reflect on, to learn from, and to inform their own practice. Although *exemplary* and *best* have different meanings, exemplary practice and best practice have similar approaches to expressing good practices. The former indicates a practice that is admirable, praiseworthy, excellent, and commendable, suggesting it may be the best but not necessarily. The latter expresses a practice that surpasses all others in quality, skill, and effectiveness, suggesting it should be the best. This study used the word *exemplary* instead the word *best*.

Essentially, finding exemplary practices was among the main goals of this study. Hence, it was necessary to understand the appropriate approach to do so, as well as to identify the requirements necessary to identify exemplary practices. This was done in Section 2.5. Unfortunately, the existing literature review shows no attempt to identify exemplary practices in the context of all types of IIs that facilitate research commercialization. However, some studies have tried to identify best practices by focusing on a single type of II (e.g. Bergek & Norrman, 2008). Nevertheless, many of these studies proposed best practices based on a partial sample that did not include even all the subtypes that are supposed to be under the targeted type (Bergek & Norrman, 2008). Moreover, the existing literature review shows the absence of many of the requirements necessary to identify exemplary practices (See Section 2.5). For example, a lack of consensus on the unique evaluation framework (Bhabra-Remedios & Cornelius, 2003) leads to a lack of benchmarking, which is essential in defining best practices for innovation intermediaries (Bergek & Norrman, 2008).

Consequently, for the above reasons, the main focus of this study was changed from finding exemplary practices into bridging the real gap by identifying a framework and foundation that can be used to identify exemplary practices. Accordingly, this study suggested two frameworks to be used in the context of IIs that facilitate research commercialization:

The first framework is proposed for those who would like to benchmark their organization among peers. Innovation intermediaries often need to benchmark themselves against others to figure out exemplary practices that will improve their performance and reduce waste. The suggested model outlined in the previous section can work as a framework to identify the type of organization that would like to be benchmarked. Furthermore, this will help identify the exemplary practices of organizations[188] of the same type[189]. By doing so, practitioners (executives) will at least avoid poor decisions that lead them to a fall into "casual benchmarking" (Pfeffer & Sutton, 2006a, p. 6). In other words, they will not simply set standards for their own organizations based on other organizations' performances and experiences. Rather they need to find evidence that benchmarking is suitable for their organizations, which could be done by checking both organizations through the lens of the suggested framework. This will help identify the differences in strategies, competitive environments, and business models among other factors, as "some things that help one organization can damage another" (Pfeffer & Sutton, 2006a, p. 7).

A second framework is suggested for all types of II that facilitate research commercialization; the exemplary practice is to move from a uni-stakeholder approach to a multi-stakeholder approach. In other words, it can be hypothesized that the II type needs to follow the same approach as the emergent type (Cluster #3), which is to perceive all stakeholders as equally salient, and to depend on them equally as little as possible. That will result in a decrease of dominant influence by any of the stakeholders, which may put the innovation intermediaries in a better position of power to decide their strategic movement without excessive dominating or threatening influence. Consequently, IIs that follow the multi-stakeholder approach will have the advantage of targeting a broader segment of clients, offering a wide range of services, and may yield better performance (see Section 7.4). Cluster #3 (the emergent type) reported that it performed better than the clusters that followed the uni-stakeholder approach (Cluster #1). However, multi-stakeholders approach is not yet confirmed to be the best approach, and further longitudinal study is suggested as future research.

[188] By using the suggested typology, it will be viable to identify the exemplary practices for those who are from the same type; where their goals, practices, clients and innovation readiness are almost similar and then the performance metrics will work as a reference to benchmark others to the exemplary practices.

[189] Through the model lens, two IIs that show to have similar type of influence by same stakeholder(s) are considered similar.

In sum, this section suggested two frameworks as exemplary practices: one for those who would like to continue on the same approach of uni-stakeholder, the other for those wanting to apply the multi-stakeholder approach.

7.6 General Discussion (Uni-stakeholder versus Multi-stakeholders)

In recalling the initial signals from the literature along with the learning that was gained through the exploratory stage, the confirmatory study revealed some expected and unexpected results. Accordingly, four expected types of innovation intermediaries were uncovered as uni-stakeholder types, while one emergent unexpected type was unfolded as a multi-stakeholders type. The multi-stakeholders type (Cluster #3) aligned with the description from Freeman's (1984) theory of stakeholders for organizations. The mean age of this emergent type is the lowest among other clusters' means; nevertheless, it is only significantly less than Cluster #1. However, it is early for this research to ascertain whether this type is in fact a new emergent type or an established type; thus, further research is recommended.

Furthermore, simple readings for the findings of all II types in both approaches show interesting outcomes; however, some of these outcomes require further investigation. Supplementary Appendix W presents visual representations for the means of the various constructs for each II type and cluster. For example, Cluster #3, which represents the multi-stakeholders approach, is shown to experience a less dominant influence from any particular stakeholder in comparison to those clusters which follow the uni-stakeholder approach. As well, the reported performance for Cluster #3 is better. In addition, the emergent type (Cluster #3) indicated through many of its characteristics to have no preference for one particular operational strategy over others; in other words, this type is more open to using many operational strategies in comparison to those who follow the uni-stakeholder approach. For instance, Cluster #3 is shown to have no differences among commercialization paths or differences among clients; as well, this cluster paid similar attention to all criteria of innovation readiness. However, this was not the case for the uni-stakeholder types, which have particular preferences. Moreover, in terms of the various objectives, Cluster #3 perceived that to 'improve the economy of the local community' was more important than other objectives, and this objective was particularly significantly higher than to 'increase the financial success of companies'. In fact, Cluster #3 gave higher priority to this

objective of 'improve the economy of the local community' more so than any other cluster (II types). Finally, in comparisons among clusters, particularly between Cluster # 3 in one hand and Clusters #2 and #4 in the other hand, the emergent multi-stakeholders type gave higher priority to considering the criteria of having 'potential societal and environmental benefits from the idea' and 'potential contribution to local society and environment' when selecting which new invention and business venture to help. These characteristics of the emergent multi-stakeholders type maybe indicated as a new development of a comprehensive innovation intermediary to serve all stakeholders and clients, rather than focusing only on a particular portion of stakeholders and clients; all while focusing on objectives and criteria that are essential over the long term (e.g., local community and environmental benefits). This development may lead to many short and long term benefits, including resolving of the path switching phenomena.

On the other hand, these outcomes highlight the importance of the existence of all types of innovation intermediaries to fully support the commercialization ecosystem within a city/region, particularly with the absence of the emergent multi-stakeholders type. The implication is that all types of innovation intermediaries should function in roles that are complementary to each other; however, researchers have instead perceived many indicators of a competitive environment among innovation intermediaries during the exploratory stage of this study. Thus, further studies may confirm or refute this perception.

7.7 Implications

This study aimed to explore and understand various types of innovation intermediaries (IIs) who facilitate research commercialization through investigating various lenses used to differentiate among IIs. The study prioritized the attitude of asking the question of "why[190]" before "what" to investigate the main question of this research. This process in turn leads to several theoretical and practical implications.

[190] The question: 'Why is there more than one type of II to facilitate research commercialization?' was asked before 'What are these types of IIs doing to facilitate research commercialization?'

7.7.1 Theoretical and Literature Contribution

This study helps bridge the gap in the literature by studying why there is more than one type of II to facilitate research commercialization; furthermore, this work is among the first to adopt a comprehensive consideration of most of the known II types rather than focusing on a particular type. Thus, this research contributes to our understanding of various established types of innovation intermediaries, and uncovers many of unexplained phenomena in the context of IIs (e.g., the absence of unique metrics to measure performance).

The study explored and validated the lenses of three established theories: stakeholder theory, absorptive capacity, and business orientation model (technology push and market pull) to differentiate among II types. After that, stakeholder theory, particularly stakeholder influence strategies theory (Frooman, 1999) and stakeholder identification and salience theory (Mitchell et al., 1997) were utilized to explain the various II types.

Consequently, the study contributes to the literature by developing and/or modifying scales for the aforementioned theories. In addition, scales were developed for many of the operational strategies constructs. The former scale was used through the collected data to operationalize these theories in the context of IIs, while the latter was used to measure the importance level for each of the operational strategy constructs.

As well, this study associates 'stakeholder identification and salience theory' with 'stakeholder influence strategies theory' in one model, and highlights the differences and complementary aspects between the two theories. This process helps in identifying the various main salient stakeholder(s) that influence the operational strategies of the various II types.

Combining cluster analysis findings with the above groupings of theories contributes to theoretical development starting from the Frooman theory (1999). This development was represented by an extension to account for one-to-many relationship between one organization and many stakeholders; as well as requiring that only salient stakeholders be considered in the model.

The suggested model employed the relationships between stakeholders and organization (IIs) to identify the II type to which each particular organization belongs. This in turn identified a scientific framework to compare and contrast various II types based on evidence. Accordingly, this work contributes to the best practices literature as a foundation to identify similar organizations which

facilitate appropriate benchmarking among peers. As well, researchers are able to use this as a base to find comparable organization in order to identify best practices for each IIs type.

Furthermore, the study validated that the influence by the salient stakeholder(s) – to a great extent – explains what IIs do; as well, both the level of dependency by II on stakeholders and the II's perception of its stakeholder's salience level predict the level of stakeholder influence on II. Moreover, by knowing the level of stakeholder dependency on II, in addition to the above information, the model made it possible to identify the type of influence that a stakeholder may apply to an II.

Through stakeholders lens, and by using the stakeholders-related variables including level of stakeholder influence, stakeholder salience level, and level of dependency by II on stakeholders, the study contributes to the literature of II with a new typology for II types. This typology has an advantage over other existing typologies by including the most known types of IIs; as well, it uncovers barriers that have hindered researchers from perceiving the various types of IIs under the same umbrella.

As well, the study provides methodological contributions for researchers on how to compare and contrast among any objects by using the adopted reparatory grid technique similar to this study. Moreover, it opens many new venues for further and future research in the fields of IIs, commercialization, and stakeholders; this is discussed in greater detail in the future research section.

7.7.2 Practical Implications

This research provides highly essential knowledge for practitioners and managers about the various types and operational strategies for each innovation intermediary type. Practitioners and managers are provided with an evidence-based framework to compare and contrast themselves with other II types. This knowledge can aid in forming a better understanding of self for each II type, and can simultaneously inform each II type about other existing IIs types. Consequently, this understanding can guide innovation intermediaries toward being more complementary to each other rather than competitive; likewise, this information can inform practitioners' decisions of possible ways to change their operational strategies through managing the dependency level on their stakeholders. Furthermore, practitioners are encouraged to use the suggested model to identify themselves as well

as others when benchmarking to avoid poor decisions that may lead them to fall into “casual benchmarking”. On the other hand, practitioners need to utilize the model as a guideline to understand any limitations in their operational strategies which may prevent them from dealing effectively with various situations with their existing tools and knowledge. For instance, if an II's dominant commercialization path was to sell the invention while the invention had higher potential of being commercialized through new ventures, then the practitioners must realize their limitation in preferring the ‘sell’ option, and must understand that referring to other IIs may be more productive than pushing the invention toward sell option. Overall, use of this model may contribute to reducing the path change phenomenon.

On the other hand, this study contributes to main stakeholders in the context of IIs by showing the various impacts on the operational strategies of various types of IIs. This in turn identifies the many types of IIs that follow the uni-stakeholder approach and the one emergent type of II that has been shown to almost use the multi-stakeholders approach. Main stakeholders are encouraged to evaluate the advantages and disadvantages over the short and long term of various II types who follow the uni-stakeholders approach and the advantages and disadvantages of the II type that follows the multi-stakeholders approach. As well, stakeholders are invited to share the findings of this study, particularly regarding which II type has more potential to consider the environmental aspects and pay extra attention to the development of local community as high priorities while facilitating commercialization.

Furthermore, the study presents implications for clients in general and inventors and entrepreneurs in particular regarding where to seek help. In other words, with the findings of this study, clients are more informed about which II type is most appreciative of them. As well, based on the findings of this study, clients may have the privilege to select the II types that match their preferred commercialization paths. This may save time and effort by avoiding having to make path changes at a later stage.

7.8 Future Research and Limitation

Many issues requiring potential future research were triggered by the limitations of this study. First, introducing control variables is appropriate when other or additional explanatory independent

variables are anticipated to influence the dependent variable; however, this study does not consider any control variables as the priority in investigating the complex suggested model and for the sake of parsimony. Accordingly, it is recommended that the effects of some potential control variables related to stakeholders and innovation intermediaries (e.g., university policy, diverse country context, and extent of government support) be measured and controlled for. Second, this study does not consider the influence of the following stakeholders: employees, clients, and other innovation intermediaries. This work only focuses on the main stakeholders that are unalike in nature with those discarded stakeholders. Thus, we suggest that studying the aforementioned stakeholders may provide additional insights which could aid in developing the model. Third, it would be valuable to consider some additional variables to describe the operational strategies of each II type. For example, one of the most promising variables is the innovation-stage, which investigates the stage that each II type prefers when selecting which invention to help commercialize. Fourth, although the statistical analyses that were used in this study were adequate, the response rate for this study was low and limited, which thereby limits its generalizability to the North American context and to those types who have participated. However, finding a way to increase the number of responses and to approach the missing type, IFOI, will validate the suggested model and prove some of the hypotheses that were related to IFOI type. Furthermore, replicating this study by using various samples from developing and developed countries will increase our understanding of innovation intermediaries in different contexts. As well, a broad study that targets a wide cross-international sample may offer some insights that cannot be gained from studying one particular context. In addition, collecting responses from multiple informants instead of a single key informant – as the case for this study[191] – will contribute toward reducing most of the potential CMV and accordingly increase the validity of any study. However, researchers should be careful by being aware of possible drawbacks that are associated with collecting responses from multiple informants.

On the other hand, some potential extensions for this research model are raised next. Recall that the study contributes to Frooman's theory by accounting for one-to-many relationships between one organization (II in this study) and many stakeholders (the four main stakeholders in this study). However, many-to-one or many-to-many relationships were beyond the scope of this research; thus, studying these additional relationships may contribute toward developing the proposed model to work

[191] See Section 4.2.2.3 and Section 6.7 for more details about CMV assessment for this study.

on complex levels of relationships between many organizations and many stakeholders. In addition, the absorptive capacity lens has been validated through the exploratory study as having potential to distinguish II types. Thus, using absorptive capacity lens with the two lenses of stakeholder theory and business orientation model, may contribute to the explanatory power of the model; as well, these lenses may provide additional insights that are yet uncovered by the current suggested model.

Furthermore, using the findings of this study as a foundation for future studies may open many venues; first, more research that considers the comprehensive perspective of all types of innovation intermediaries is encouraged. Second, considering the suggested typology of this study, researchers are encouraged to conduct systematic reviews of all available typologies. It is expected that this study's typology will work as an umbrella for other of the existing typologies. Third, one of the known gaps in the literature of commercialization and innovation intermediaries is the agreed upon performance metrics; this study suggests that by considering IIs that belong to the same type, it may be possible to find consensus regarding the performance metrics. With the use of this study as a foundation, that in turn may make it possible to investigate exemplary practices for every type of II. On the other hand, the model showed that each type is influenced by at least one dominant stakeholder; the question is, in terms of positives and negatives, how each II type perceives this influence and why.

In addition, researchers could utilize the developed scales within different contexts and studies; this will in turn confirm the scales' validity or at least improve the developed scales. As well, researchers could approach the same problem of this study from different perspectives. For instance, researchers could target the perspective of stakeholders instead of the perspective of innovation intermediaries. Alternatively, researchers could target the perspective of various types of clients. This might help in understanding the problem from many perspectives, which could then increase the validity of some constructs and modify the understanding of other constructs. Nevertheless, using very sophisticated statistical analysis tools such as Structural Equation Model (SEM) may be considered an advanced validation for the model, particularly when high numbers of responses are available.

Finally, other questions related to stakeholder literature have surfaced. The emergent type of innovation intermediaries that follow the multi-stakeholders approach endorse the question of how

innovation intermediaries can deal with the different interests of their stakeholders, and consequently achieve success. In fact, many other questions are connected to the emergent type of innovation intermediaries that follows the multi-stakeholders approach. For instance, does this type represent a new or established approach? In our opinion, longitudinal and time-series studies are required to answer the question. As well, this emergent type was reported by some respondents to have a better performance. This finding requires additional investigation and comparison; if it is proved, then emergent type may serve as an exemplary practice for innovation intermediaries who facilitate research commercialization.

7.9 Conclusion

This study helps bridge the gap in the literature regarding the existence of more than one type of II to facilitate research commercialization. This work is among the first to adopt a comprehensive perspective of most of the known II types rather than focusing on a particular type. Instead, this study focused on understanding more about various types of innovation intermediaries through the lens of stakeholders. Although most of the existing literature has focused on what innovation intermediaries do, this study prioritized the inquiry of 'why do they do that?' to investigate the main question of this research.

As a whole, this research expands our understanding of various types of innovation intermediaries by focusing on which main stakeholder influences particular II types, and by determining the impact of that influence on each II's operational strategy. Thus, Frooman's model with some modification and extension suggests an explanation for the various types of IIs. This explanation provides us with a novel evidence-based typology that covers all known IIs; as well, many discriminating characteristics of each II type are identified. This study developed and modified many scales to measure the constructs of the suggested model; accordingly, most hypotheses were tested and found supported.

The findings of this study help validate the hypotheses that there are four types of innovation intermediaries, each dominantly influenced by a different individual stakeholder. Nevertheless, one additional II type was shown empirically to follow the multi-stakeholders approach, which reduces a dominant influence by one particular stakeholder. In other words, this study suggests that all types of II could be located on a continuum that has a 'uni-stakeholder approach' (e.g. all IIs who perceive one

particular stakeholder as most salient to them, upon which they most depends, and by which they are most influenced) on one end, into 'multi-stakeholders approach' on the other end (e.g. IIs that has no dominate dependency or influence by a particular stakeholder); where each of those who hold a uni-stakeholder perspective (USP) have distinguishing characteristics in terms of their main operational strategy (e.g. objectives for commercialization, paths used for commercialize, clients who are served, estimates of innovation readiness); thus, they are recommended to work on a complementary mode in order to create a more comprehensive commercialization ecosystem. The multi-stakeholder perspective (MSP) type shows a broad operational strategy that may allow a comprehensive commercialization ecosystem; additionally, MSP signifies higher priorities for local, societal and environment aspects of any new invention. Furthermore, innovation intermediaries' perceptions of the salient level of the stakeholders, as well as innovation intermediaries' dependency on their stakeholders, explained a great portion of the influence level that innovation intermediaries received from their stakeholders. Finally, analyzing the operational strategies for each type of II captured the impacts of these influences.

This study contributes to the literature by adding to our understanding as to why there is more than one type of II to facilitate research commercialization. This research contributes a new typology of II types, and a suggested model identifies a scientific framework to compare and contrast various II types based on evidence. Accordingly, this work contributes to the literature of best practices as a foundation to identify similar organizations that in turn facilitate appropriate benchmarking among peers. Moreover, this knowledge may help practitioners be more complementary to each other instead of acting in a competitive mode.

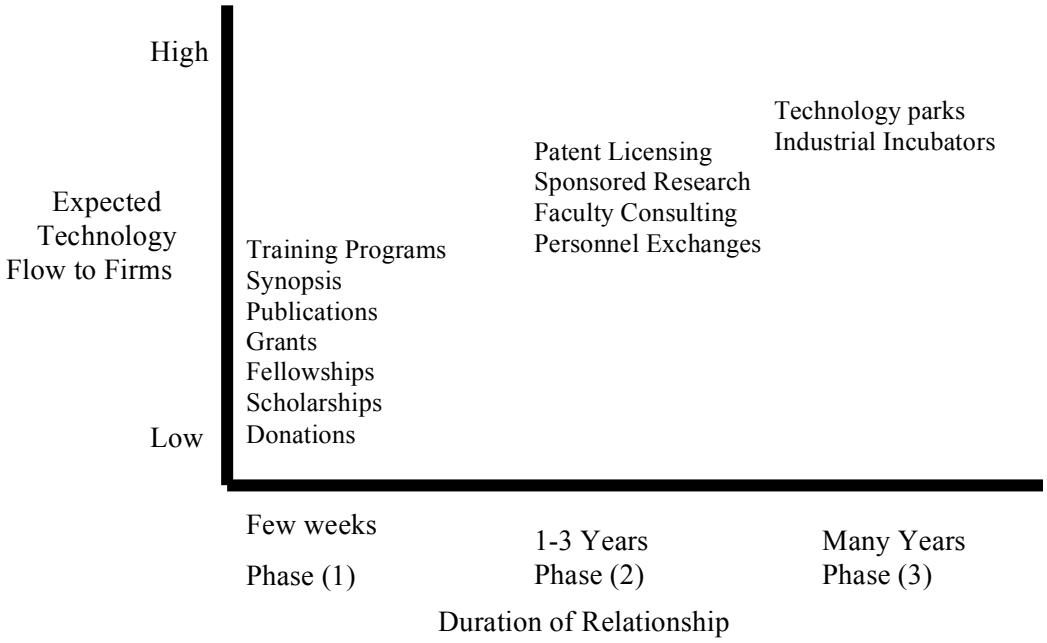
Appendix A

Topologies for the Relation Between Universities and Industries

There are many topologies and taxonomies for the relation between universities and industries:

1) "Chen (1994) classified the forms of [the universities and industries relationship] for technology transfer according to the duration of the relationship and the technology flow as shown in Figure 1:"

Figure (1)



Note: from source: Chen (1994, p. 451)

2) " Santoro (2000) represents the universities and industries relationship in four classifications:"

Table (A-1)

NO	Classification	Example
1	Research Support	Fund
2	Cooperative Research	Institutional Agreements, Informal Intentions
3	Knowledge Transfer	Hiring of Recent Graduates
4	Technology Transfer	Product Development and Commercialization Activities Through University Research Centers

Appendix B

Universities and Industries Relationship Channels

There are many channels used for universities and industries relationship, Different authors reported different lists with different names, Table 2 and Table 3 are two examples for these lists:

Table (B-1):

Channels	Examples
Publications	Scientific publications of companies Co-publications Consulting of publications
Participation in conference professional networks & boards	Participation in conferences Participation in fairs Exchange in professional organizations Participation in boards of knowledge institutions Participation in governmental organizations
Mobility of people	Graduates Mobility from public knowledge institutions to industry Mobility from industry to public knowledge institutions Mobility between public knowledge institutions Trainees Double appointments Temporarily exchange of personnel
Other informal contacts\ networks	Networks based on friendship Alumni societies Other boards
Cooperation in R&D	Joint R&D projects Presentation of research (vice versa) Supervision of a trainee or PhD. student Financing of PhD research Sponsoring of research
Sharing of facilities	Shared laboratories Common use of machines (vice versa) Common location or building (Science parks) Purchase of prototypes (vice versa)
Cooperation in education	Contract education or training Retraining of employs Working students Giving information to students Influencing curriculum of university programs Providing scholarships Sponsoring of education
Contract research and advisement	Contract research Contract advisement
IPR	Apply for patents Information via patents Co-patenting Emitting licensees Acquire licenses Copyright and other forms of intellectual property
Spin-offs and entrepreneurship	Spin-offs Startups Incubators at universities Stimulating entrepreneurship

Note: from Reginald et al., (2006)

Table (B-2)

Classifications	Organizational forms
Personal Informal Relationships	Academic spin-offs (or spin-off companies - also referred to as spin-out companies). Individual consultancy (paid for or free). Information exchange forums. Collegial interchange, Conference, Joint Research presentations and/or publications. Joint or individual lectures. Personal contact with university academic staff or industrial staff. Co-locational arrangement.
Personal Formal Relationships	Student internships and sandwich courses. Students' involvement in industrial projects. Scholarships, Studentships, Fellowships and postgraduate linkages. Joint supervision of PhDs and Masters theses. Exchange programs. Sabbaticals periods for professors. Hiring of graduate students industry. Use of university or industrial facility (equipment, library, laboratory, etc.)
Third Party	Institutional consultancy (university companies including Faculty Consulting). Liaison offices (in universities or industry). General Assistance Units (including Technology Transfer Organizations) Government Agencies (including regional technology transfer networks) Industrial Associations (functioning as brokers). Technological Brokerage Companies.
Formal Targeted Agreements	Contract research (including Technical Services Contract and Procurement of Services). Patenting and Licensing Agreements (licensing of intellectual property rights). Cooperative research projects. Equity holding in companies by universities or faculty members. Exchange of research materials or Joint curriculum development:. Joint research programs (including Joint venture research project with a university as a research partner or Joint venture research project with a university as a subcontractor). Training Programs for employees (including Continuing Professional Education).
Formal Non-Targeted Agreements	Broad agreements for U-I collaborations. Endowed Chairs. Advisory Boards. Funding of university posts. Industrially sponsored R&D in university departments. Research grant, gifts, endowment, trusts donations, (financial or equipment), general or directed to specific departments or academics.
Focused Structures	Association contracts. Innovation/incubation centers. Research, science and technology parks. University-Industry Consortia. University-Industry research cooperative research centers. Subsidiary ownerships. Mergers.

Note: from Ankrah (2007)

Appendix C

Type of Innovation Intermediaries

Table 4-C Comparison of the four-commercialization agents

Agents / Characteristics	**University Technology Transfer Office.**	**Community Business Incubators/Accelerators.**	**Industry Facilitators of Open Innovations.**	**Independent Innovation Intermediaries.**
Location	Close to a University	Close to a knowledge source	Inside firms	NA
For Profit / Not for Profit	Not for Profit	Not for Profit	For Profit	For Profit
Dominant function(s)	Patenting and Licensing	Startups	Acquisitions/Licensing	Mostly Startups (All)
Technology push and market pull	Technology push (+++)	Technology push (+++) and market pull (++)	Technology push (+) and market pull (+++)	Technology push (+++) and market pull (+++)
Type of governance	Under the governance of a University	Under the governance of Sponsors (often the Government)	Under the governance of a Firm.	Independent governance structure
Favour of Stakeholders (Seekers & Solvers)	Favor Solvers (University's researchers and faculty)	Solvers = Seekers	Favor Seekers (parent firm)	Solvers = Seekers
Formulation and process	Plantation > Rainforest	Rainforest > Plantation	Plantation = Rainforest	Rainforest
Absorptive capacity	Absorptive capacity (+)	Absorptive capacity (++)	Absorptive capacity (+++)	Absorptive capacity (++)
Innovation stage	Early stage (+) and Prototype (+++)	Early stage (+++) and Prototype (+)	Early stage (+) and Prototype (+++)	Early stage (+++) and Prototype (+++)

Appendix D

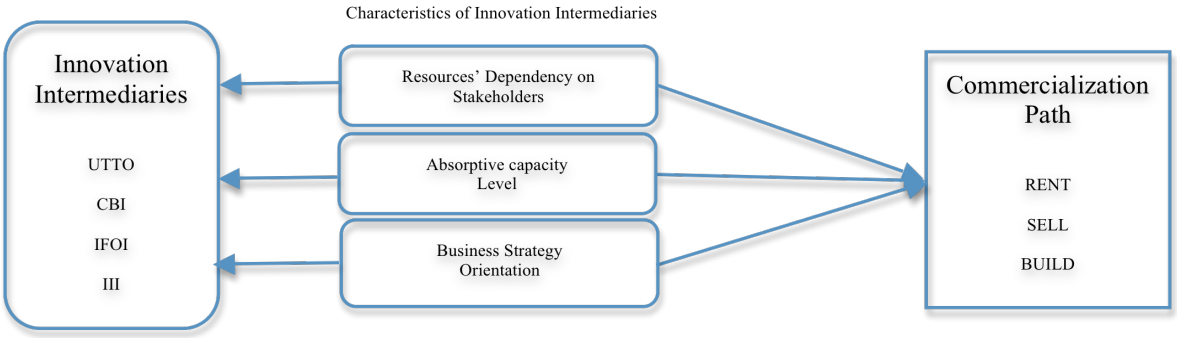
Technology Readiness Level

Technology Readiness Level	Description
1. Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2. Technology concept and/or application formulated	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3. Analytical and experimental critical function and/or characteristic proof of concept	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4. Component and/or bread-board validation in laboratory environment	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.
5. Component and/or bread-board validation in relevant environment	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high-fidelity" laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a proto- type in a high-fidelity laboratory environment or in a simulated operational environment.
7. System prototype demonstration in an operational environment	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft.
8. Actual system completed and qualified through test and demonstration	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9. Actual system proven through successful mission operations	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Note: from (Graettinger et al., 2002, p. 17)

Appendix E

Initial Proposed Model (Exploratory Stage)



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Characteristics of University Technology Transfers Officers

1) UTTO

1) Resources' Dependency on Solvers.==H1=======➔
2) Low Absorptive capacity. =========H4========➔
3) Technology Push oriented. ========H9========➔

C.P. RENT

Characteristics of Community business incubators/accelerators

2) CBI

1) Resources' Dependency on Seekers.==H2========➔
2) High Absorptive capacity. =========H5========➔
3) Market pull oriented. ==========H10=======➔

C.P. SELL

Characteristics of Industry facilitators of open innovation

3) IFOI

1) Resources' Dependency on Government.==H3=====➔
2) Medium Absorptive capacity. ==========H6=====➔
3) Balance Business Strategy oriented. ======H11====➔

C.P. Build

Characteristics of Independent innovation intermediaries

4) III

1)No Resources' Dependency on Stakeholder.==H4===➔
2) Medium Absorptive capacity.. ==========H7===➔
3) Balance Business Strategy oriented.=======H12===➔

Less Dominant C.P.

Appendix F

First Phase Interview (Questionnaire for Phone Interview)

List of Factual Questions for Innovation Intermediaries

1. Please indicate the year in which your organization was established? ----------

2. This organization is legally (please mark one only):
    a. An incorporated private for-profit firm
    b. Part of a larger incorporated private for-profit firm
    c. An incorporated not-for-profit firm
    d. Part of a university, college or hospital
    e. Part of a federal government department or agency
    f. Part of a provincial government department or agency
    g. Part of a municipal or regional government department or agency
    h. Other (please specify: ----------)

3. This organization is co-located with (please mark all that apply):
    a. A university, college or hospital
    b. A federal government laboratory
    c. A small- to mid-sized incorporated private for-profit firm
    d. A large incorporated private for-profit firm
    e. An incorporated not-for-profit firm
    f. A federal government department or agency
    g. A provincial government department or agency
    h. A regional government department or agency
    i. A municipal government department or agency
    j. Not co-located
    k. Co-located with other (please specify: ----------)

4. Please indicate the total number of employees currently in your organization who work as:
    a. Full time employees ----------
    b. Part time employees ----------
    c. Contract employees ----------
    d. Volunteer contributors ----------
    e. Number of analyst and/or experts for technology transfer and commercialization. ----------

5. Who are the main partners or stakeholders that participate in the operation of your organization? (please mark all that apply)
    a. Federal government

b. Provincial government
c. Municipal and/or Regional government
d. University
e. Community college
f. Private for profit company
g. Private non-profit organization
h. Lending institution
i. No partners or stakeholders
j. Other, please specify: ----------

6. For each of the following sources, please indicate from whom your organization has obtained funding for its operational activities. (please mark all that apply)
   a. University
   b. Provincial government
   c. Federal government
   d. Regional government
   e. Municipal government
   f. Parent firm
   g. Industry partners
   h. Other (please specify: ----------)

7. Does your organization receive support from university: (Yes, No)
   a. If yes, please indicate the type of assistance received (please mark all that apply)
      i. Technological expertise and advice
      ii. Financial assistance for R&D activities
      iii. Support and business management advice
      iv. Support for industry networking assistance in building partnerships
      v. Assistance in entering the market
      vi. Delivery of competitive technical intelligence (CTI)
      vii. Other (please specify: ----------)

8. Please specify the various sectors your organization serves. (please mark all that apply)
   a. Information and Communications Technology
   b. Energy
   c. Medical
   d. Manufacturing
   e. Environment
   f. Other (please specify: ----------)

9. Who are your regular clients? (please mark all that apply)
   a. Inventors who create new uses for technologies
   b. Researchers who create new technologies from research results
   c. Other organizations (who work on technology transfer and commercialization)

d. Enterprises who may be receptors of new technologies or knowledge
e. Individual consumers
f. Other (please specify: ----------)

10. Does your organization have a selection process for the purpose of accepting new applicants? (Yes, No)

If yes:

a. How many applications did you receive from prospective clients during the last year? --------
b. How many new applicants were approved to become clients during the last year? ----------
c. What are three main criteria that your organization uses to assess viability for the purpose of selection process?
    1. ----------.
    2. ----------.
    3. ----------.

11. Please indicate the number of products or services or applications that your organization helped to introduce to the market during the last year (through its clients). ----------

a. How many of these represent completely new-to-the-world products or services or applications that customers would not expect? ---------
b. How many of these represent products or services or applications that contribute to an improved solving of exisiting problems? ----------

12. For the following list, please indicate the number of productivity metrics that your organization reported during the last year.

a. Licensing agreements ---------- (if more then 0, please answer next question, otherwise go to Q14)
b. Startups formed ----------
c. Patent applications (priority filings) ----------
d. Granted patents ----------
e. Invention disclosures ----------

13. How many of the above reported licenses and option agreements were granted to:

a. Startups? ----------
b. Established firms? ----------

14. Please answer the following questions by selecting one of the answers

a. Does your organization collect fees for any provided services? (Yes, No)
b. Does your organization provide any type of funding to clients? (Yes, No)
c. Does your organization collect any royalties/license fees? (Yes, No)
d. Does your organization conduct research on client inventions to help create a new value in products or services or applications? (Yes, No)
e. Does your organization perform development on existing inventions to help create a new value in products or services or applications? (Yes, No)

15. We are interested in how you measure the success of your organization. Which of the following are measures of success for your organization? (please mark all that apply)

a. Royalties/license fees generated
b. Amount of collected fees for the services
c. Sponsored research funds
d. Number of licenses/options signed
e. Number of patents awarded
f. Number of inventions commercialized
g. Number of startups formed
h. Other (please specify: ----------)

16. Which commercialization path(s) (or strategies) do you use in your organization in order to help move ideas (inventions) into the market: (please mark all that apply)

a. Sell (exclusive license)?
b. Rent (non-exclusive license)?
c. Build (Startup)?

17. Which best describes your office? (please select the most appropriate option only)

a. UTTO, **University technology transfer officers (UTTO)** are agents working on facilitating the utilization of publicly funded research through licensing to the industry.
b. CBI, **Community Business Incubators/Accelerators (CBI)** is an organization that accelerates the successful development of entrepreneurial companies through an array of business support resources and services, developed or orchestrated by incubator management and offered both in the incubator and through its network of contacts.
c. IFOI, **Industry Facilitators of Open Innovation (IFOI)** is a unit or department inside a firm that works on connecting the parent firm to the external knowledge by finding, acquiring and exploiting new inventions when possible.
d. III, **Independent Innovation Intermediaries (III)** is any organization or individual who works independently to facilitate the commercialization of publicly funded research, either directly or indirectly.
e. Other (please specify: ----------)

18. Knowing the above-suggested types of innovation intermediaries, could you please nominate three innovation intermediaries that match the remaining three types of above suggested types? Please notice that the nominated innovation intermediaries should be from the same region that you are located in, and well known for each other.
    a. ----------
    b. ----------
    c. ----------
19. We are going to have in person interview (which will be mainly on how you see other innovation intermediaries in region similar or different), it will take 45 minutes to 1 hour.
    a. Are you willing to participate? (Yes, No)
    b. If yes, what time is convenient for you? (day, date, time, location)

Appendix G

First Phase Interview (Questionnaire for In-person Interview)

Questions for in person interview (through a customized software)

1. In terms of **the practices to search for relevant information to facilitate commercialization of ideas or inventions,** how are two of these innovation intermediaries similar to each other and different from the third?

2. In terms of **the ability to support the development of prototypes to validate opportunities,** how are two of these innovation intermediaries similar to each other and different from the third?

3. In terms of **the main criteria used to assess viability for project selection**, how are two of these innovation intermediaries similar to each other and different from the third?

4. In terms of the **use of evidence in their selection decision regarding ideas or inventions for commercialization**, how are two of these innovation intermediaries similar to each other and different from the third?

5. In terms of the **important stakeholders to be satisfied**, how are two of these innovation intermediaries similar to each other and different from the third?

6. How do you classify each of these organizations to these four types of innovation intermediaries? (You can use percentage if you think it falls in more than one category)?

#	Innovation Intermediary (Organization)	**University technology transfer officers (UTTO)**	**Community Business Incubators/Accelerators (CBI)**	**Industry Facilitators of Open Innovation (IFOI)**	**Independent Innovation Intermediaries (III)**	Other
1	A					
2	B					
3	C					
4	D					

7. In your opinion, which commercialization paths or strategies do each of the following innovation intermediary use to move ideas (inventions) to market?

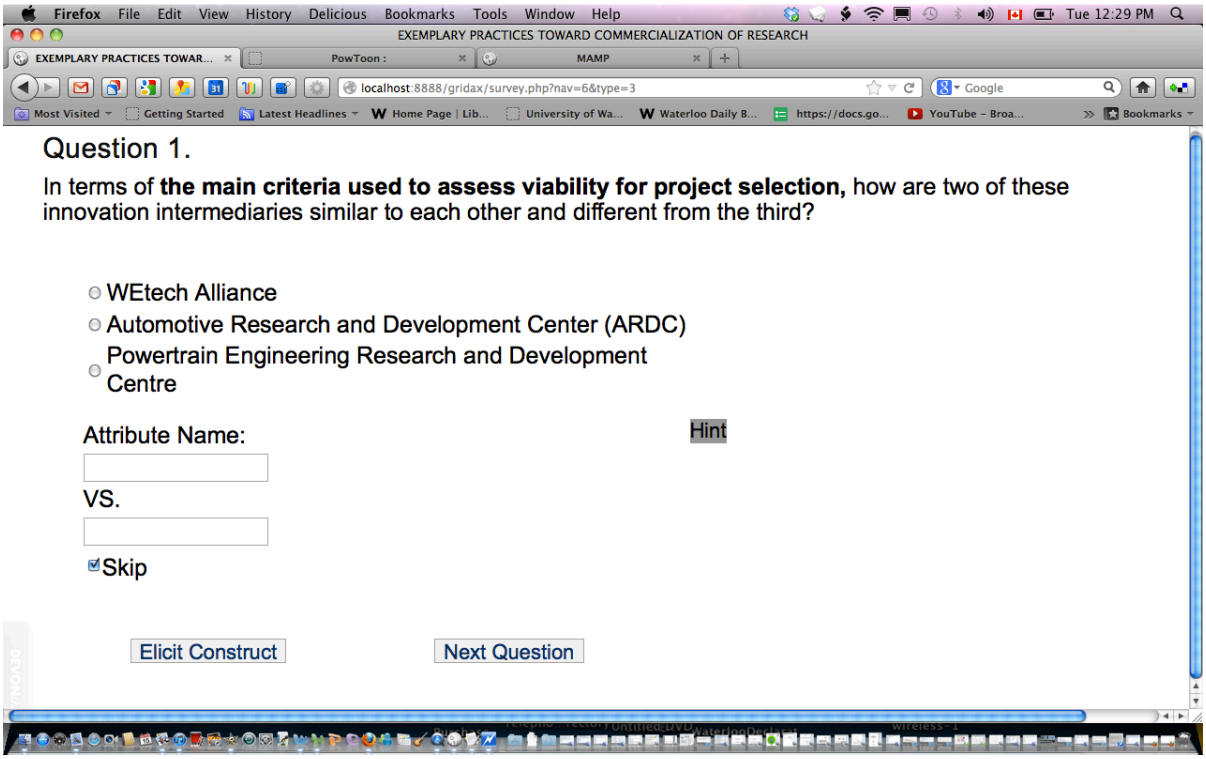
#	Innovation Intermediary (Organization)	Sell/Buy (acquiring)	Rent (exclusive licensing)	Rent (non exclusive licensing)	Build (startup)	Other
1	A					
2	B					
3	C					
4	D					

8. Please list the most important 3 practices in your organization and indicate the evidence tools that you use on them

9. How are two of these innovation intermediaries similar to each other and different from the third? (in term of region development).

#	Innovation Intermediary (Organization)	Left polar	1	2	3	4	5	6	7	8	9	Right polar
1	A	Least effective										Most effective
2	B											
3	C											
4	D											

Figures 4-G-2: Picture for one question of the in-person software that was developed for this study.



Appendix H

Scale Development

Table 4-H-1 Criteria for Commercialization Classification

Criteria for analysis of firms

	Build	*Rent*	*Sell*
Criteria:			
1) Firm that commercializes the technology	New firm (Start up sells products)	Established firm(s) (Start up sells IP)	Established firm (Start up sells IP)
Indicators:			
▪ Product development	Startup	Other firms	Other firms
▪ Manufacturing and distribution	Startup	Other firms	Other firms
Examples of what might appear in company descriptions	Product descriptions Manufacturing facilities Sales/distribution networks	Mention of other firms that manufacture and distribute products based on startups technology	Mention of other firms that manufacture and distribute products based on startups technology "Out-licensing"
2) Ownership of property rights to the technology	New firm	Majority retained by inventor/university or a firm created by them to market the technology to established firms	Established firm
Indicators:			
Right to use technology	Startup	Startup retains right to use technology and to let others use	Established firm – startup can no longer use in field of use covered by license
Right to appropriate returns from technology	Startup	Startup returns primarily from fixed payments and/or royalties	Startup returns primarily from milestone payments and royalties
Right to change assets form or substance	Startup	Startup	Established firm
Examples of what might appear in company descriptions	Product sales Discussion of operating margins	Licensing revenue Royalties Non-exclusive licenses Multiple licensees in same field of use Focus on developing technology in same field of use	Revenue from licensing Milestone payments Royalties Exclusive licenses Focus on developing technology in other fields of use or developing new technologies

Other classifications:
Hybrid – Commercialization of the technology involves the combined efforts of both the startup and an established firm(s). For example, the technology may have been commercialized through a joint venture or partnership with an established firm with the startup contributing manufacturing capabilities and the established firm contributing marketing and distribution capabilities to the joint venture.
Development stage –Products based on the technology have not yet been put into commercial use.
Multiple – In some cases, multiple methods of commercialization are used by the startup. In these cases, the method of commercialization used should be categorized based on the primary method used.

Table 4-H-2 Dimensions to Measure Commercialization Path

Table 5.2 Dimensions and items for dependent variable

Dimension	*Items*
Firm that commercializes the technology	The innovation was commercialized by: 1) A newly created firm founded by you/other key researchers on the project, 2) A newly created firm founded by someone other than you/other key researchers on the project, 3) One or more established firms, 4) Other (please describe) [If 1) above] The purpose of the newly created firm was to: 1) Produce and sell new products or services based on the innovation, 2) Market the innovation to other firms that would produce and sell new products or services based on the innovation. Marketing the innovation may occur through selling licenses, development kits, or consulting services related to the innovation, 3) Other (please describe)
Ownership of property rights to the technology	My/my university's rights to receive income from the innovation took the form of: 1) A fixed license fee or consulting fees, 2) Royalties based on product sales, 3) Equity in the commercializing firm (e.g., shares in the commercializing firm, stock options, dividends), 4) I have no rights to receive income from the innovation, 5) Other (please describe)

Table 4-H-3 Sample of Questions Used to Measure Commercialization Path (Pries, 2006, p. 142-145)

Organizational form used to commercialize the innovation

The following questions relate to the approaches used to commercialize the innovation. For example, innovations may be commercialized through licensing arrangements, start-ups, consulting arrangements, etc.

In the questions that follow, the *commercializing organization* is the organization that put the innovation into use (e.g., by producing and selling new products or services based on the innovation or by using the innovation in production or other processes).

28. Attempts to commercialize an innovation may involve a fluid phase where different approaches to commercialize the innovation are tried (e.g., licensing may be tried, a start-up venture may be created, etc.)

    Did your innovation go through a fluid stage where more than one approach to commercializing the innovation was tried? (Circle the applicable answer)

    Yes ↓ No (Proceed to question 29)

    a) Which of the following approaches were tried:

    _____Licensing

    _____Creation of start-up venture

    _____Consulting arrangements

    _____Sale of rights to the innovation to another firm

    _____Other (please describe) _____

    b) Approximately how long, in years, did this fluid phase last? _____

    c) Did the attempt to commercialize eventually settle into a stable approach? Y N

For the remaining questions, please focus on the *most recent* approach used to commercialize the innovation.

29. The innovation was commercialized by: (Select one answer only)

    _____ A newly created firm founded by you/other key researchers on the project (Proceed to question 30)

    _____ A newly created firm founded by someone other than you/other key researchers on the project (Proceed to question 31)

    _____ One or more established firms (Proceed to question 31)

    _____ Other (please describe and proceed to question 32) _____

30. The purpose of the newly created firm was to:

_____ Produce and sell new products or services based on the innovation

_____ Market the innovation to other firms that would produce and sell new products or services based on the innovation. Marketing the innovation may occur through selling licenses, development kits, or consulting services related to the innovation

_____ Other (please describe) _____

Proceed to question 32

31. The innovation was transferred to the established firm or independent start-up through: (Select all that apply)

_____ Non-exclusive license(s)

_____ Exclusive license

_____ Sale of intellectual property rights (e.g., database, patent, copyright, etc.)

_____ Other (please describe) _____

32. Researchers may be involved in the transfer of knowledge/know-how related to the innovation to the commercializing firm and/or may be involved in the ongoing operations of the commercializing firm. Which of the following best describes your involvement in *transferring knowledge* related to the innovation to the commercializing firm? (Select the answer that best describes your role)

_____ I had *no* involvement in transferring the innovation to the commercializing firm

_____ I had *limited* involvement in transferring the innovation to the commercializing firm (e.g., on a consultancy basis)

_____ I had *heavy* involvement for a *limited* period of time in transferring the innovation to the commercializing firm (e.g., through a fixed term employment or contract research arrangement)

_____ I had a significant *ongoing* operational role with the commercializing organization and transferring knowledge related to the innovation is part of that ongoing involvement

33. Which of the following describes your *operational role* with the commercializing firm? (Select all that apply)

_____ Principal

_____ Another executive position (e.g., chief technology officer)

_____ Member of the board of directors

_____ Member of the scientific advisory board

_____ No operational role

_____ Other (please describe) _____

34. My rights to receive income from the innovation took the form of: (Select all that apply)

_____ A fixed license fee or consulting fees

_____ Royalties based on product sales

_____ Equity in the commercializing firm (e.g., shares in the commercializing firm, stock options, dividends)

_____ I have no rights to receive income from the innovation

_____ Other (please describe) _____

_____ Don't know

35. My university's rights to receive income from the innovation took the form of: (Select all that apply)

_____ A fixed license fee

_____ Royalties based on product sales

_____ Equity in the commercializing firm (e.g., shares in the commercializing firm, stock options, dividends)

_____ My university has no rights to receive income from the innovation

_____ Other (please describe) _____

_____ Don't know

36. The right to further develop the innovation belongs to:

_____ Me or a firm controlled by me

_____ My university

_____ The commercializing firm

_____ Don't know

37. Did the innovation arise from industry sponsored research?

Yes ↓ No (Proceed to question 38)

a) If so, was the innovation commercialized by the sponsor of the research? Y N Don't know

b) Did the sponsor hold a right of refusal or right of offer on the innovation as a result of their sponsorship of the research? Y N Don't know

38. Was the innovation ultimately put into use (i.e., made available for sale to the ultimate consumer if a product/service or put into use if a process)?

Yes ↓ No Don't know (Proceed to question 39)

a) In approximately what year was the innovation put into use? _____

b) Is the innovation or a later revised or improved version of the innovation still in use? Y N Don't know

39. Has the innovation produced revenue (e.g., through license fees or sales of products or services)? Y N Don't know

40. If the innovation was licensed, have any of your other innovations been licensed to that particular licensee? Y N N/A Don't know

41. If the innovation was commercialized through a start-up company in which you were a founder, did you have any previous experience founding start-up companies? Y N N/A

Listed below are statements concerning the organizational form used to commercialize the innovation. Please circle one number for each statement to show the extent to which the statement characterized the method used to commercialize the innovation.

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

	Strongly Disagree				Strongly Agree	Not Relevant
42. The commercializing organization had information on the state-of-the-art of the technology.	1	2	3	4	5	0
43. The commercializing organization had the technical competence to commercialize the innovation.	1	2	3	4	5	0
44. The commercializing organization had the managerial competence to commercialize the innovation.	1	2	3	4	5	0
45. The method used to commercialize the innovation was effective.	1	2	3	4	5	0
46. I would choose the same method of commercialization if I were doing it over again.	1	2	3	4	5	0

Table 4-H-4 Scale to Measure Absorptive Capacity

Table 10 Final ACAP scale.

Final ACAP scale	
Acquisition	
Please specify to what extent your company uses external resources to obtain information (e.g., personal networks, consultants, seminars, internet, database, professional journals, academic publications, market research, regulations, and laws concerning environment/technique/health/security):	
Acquire 4	The search for relevant information concerning our industry is every-day business in our company.
Acquire 5	Our management motivates the employees to use information sources within our industry.
Acquire 7	Our management expects that the employees deal with information beyond our industry.
Assimilation	
Please rate to what extent the following statements fit the communication structure in your company:	
Assimilate 1	In our company ideas and concepts are communicated cross-departmental.
Assimilate 2	Our management emphasizes cross-departmental support to solve problems.
Assimilate 4	In our company there is a quick information flow, e.g., if a business unit obtains important information it communicates this information promptly to all other business units or departments.
Assimilate 5	Our management demands periodical cross-departmental meetings to interchange new developments, problems, and achievements.
Transformation	
Please specify to what extent the following statements fit the knowledge processing in your company:	
Transform 1	Our employees have the ability to structure and to use collected knowledge.
Transform 4	Our employees are used to absorb new knowledge as well as to prepare it for further purposes and to make it available.
Transform 6	Our employees successfully link existing knowledge with new insights.
Transform 10	Our employees are able to apply new knowledge in their practical work.
Exploitation	
Please specify to what extent the following statements fit the commercial exploitation of new knowledge in your company (NB: Please think about all company divisions such as R&D, production, marketing, and accounting):	
Exploit 2	Our management supports the development of prototypes.
Exploit 4	Our company regularly reconsiders technologies and adapts them accordant to new knowledge.
Exploit 5	Our company has the ability to work more effective by adopting new technologies.

Table 4-H-5 Five Suggested Dimensions for Resource Dependency Measure

"The point of departure for the operationalization process of the dependence construct is research performed by Hakansson and Snehota (1995) who identify a set of appropriate underlying dimensions of the dependence construct in a business context between firms.

The framework consists of five dependence dimensions (Hakansson and Snehota, 1995), namely:

1. Technical dependence: i.e. referring to when two firms use compatible equipment and adapt their mutual business activities to each other in a technical sense.
2. Time dependence: i.e. referring to when two firms have a time-based need or synchronization of their mutual business activities;
3. Knowledge dependence: i.e. referring to the interaction processes between two firms learning each others' strengths and weaknesses. The interaction creates awareness and knowledge about each others' ability to solve problems;
4. Social dependence: i.e. referring to that the interaction between two firms often is based upon personal relationships. This means that the social atmosphere and the personal chemistry between the involved executives affect the business activities in a business relationship between two firms; and
5. Economic/juridical dependence: i.e. it refers mostly to the formal dependence that may exist between two firms, such as written agreements. It strengthens the dependence between two firms' business activities in an economic and juridical sense.

The illustrated dependence dimensions will be used to measure and evaluate the perceived dependencies." (Svensson, 2002, P. 62)

Table 4-H-6 Suggested Attributes for Resource Dependency Measure

TABLE II ENABLING FACTORS OF SUCCESSFUL UTBI DEVELOPMENT

Type of resources	Attribute(s)	Descriptions	References
Technological Resources	Infrastructure	The physical infrastructure includes rental spaces, equipments, and administrative facilities.	[2], [16], [19], [45]
	Know-how	Collectively all research, inventions, technical, engineering and scientific information, methods, processes, procedures, techniques, discoveries, protocols, formulas, designs, and drawings or other information of university arising from the studies whether or not patentable, copyrightable or otherwise protected by law or commercially useful or reducible to writing or practice.	[19]
	Technology/ideas	The application of science, especially to industrial or commercial objectives.	[19]
Organizational Resources	Mutual trust and respect	An ability to: accept differences in culture, values, interests, goals and priorities; focus on problems not personalities; hold one's own position while seeing and respecting others' right to hold a different opinion.	[11], [47], [48], [49]
	Concise program milestones with clear policies and procedures	Know performance measures, develop a leveraged/ cooperative environment, and establish metrics for success.	[20], [42], [43][44], [46]
	Selection process for tenants	Evaluate, recommend, and select, measure success, determine exit policy.	[20], [42], [43], [44], [46]
	Culture of self-employment	The willingness that people opt for self-employment	[2]
	Technology transfer and R&D	Technology transfer including intellectual property management and licensing agreement are also available at all technology business incubators, and R&D including innovation and innovative product development.	[16]
Financial Resources	Access to financing and capitalization	Evaluation, access to loans and grants, loan packaging, access to venture capital.	[20], [42], [43], [44], [46]
	In-kind financial support	Ability to provide incubatees with access to: secretarial, administrative, facilities and equipment; professional support such as patent agents and attorneys, and a cluster of existing companies who may act as potential collaborators.	[20], [42], [43], [44]
	Financial support and consulting	The act or process of providing incubatees with information, analysis of data, and recommendations or conclusions on finance, and monetary assistance provided by the institution. Project managers, who understand the running of business	[16]
Human Resources	Talented project managers	Incubators manage the incubators and develop effective programs.	[19]
	Expert organization	Incubator's role as an expert organization is to harmonize enforcement of simulative measures, realizes it if it's obligated, and monitors, analyses and reports on gain results, in cooperation with other bodies and institutions that are involved in enhancement of SME development.	[16]
	On-site business expertise	Ability to provide incubatees with business mentoring and consulting on their existing management, marketing, business plan, accounting.	[20], [42], [43], [44]
	Coaching	Training and educational workshops offered. Seminars or programs offered either for a fee or free of charge to the tenants of the incubators	[45]

Note: from (Somsuk, Punnakitikashem & Laosirihongthong, 2010, p. 1037)

Table 4-H-7 Strategy Orientation Characteristics Summary

	Technology orientation 'Technology push'	**Market orientation, 'Market pull'**
Strategy orientation characteristics	a) Large research and development investments	a) Ability to identify customers
	b) Drive for big advancements in technology	b) Focus on customer value
	c) Long term focus and duration of development initiatives	c) Ability to generate information about customers
	d) Adoption of new technologies	d) Long-term proactive drive to understand customer needs

Note: adopted from (Isoherranen & Kess, 2011)

Appendix I

Sampling Information for Each Type of Innovation Intermediary

II type	UTTO	CBI	IFOI	III
Definition	A unit or department associated with an educational institution (university/college) that works on facilitating the utilization of publicly funded research by industry	A not-for-profit organization that accelerates the successful development of entrepreneurial companies through an array of business support resources and services	A unit or department inside a firm that works on connecting the parent firm to external knowledge by finding, acquiring, and exploiting new technologies or inventions when possible	An individual or for-profit organization that works independently to facilitate (either directly or indirectly) the commercialization of publicly funded research
Targeted population	All technology transfer offices (or equivalent) in Canada and USA	All business incubators and accelerators (or equivalent) in Canada and USA	All top businesses in Canada and USA (biggest public companies, most profitable companies, and fastest growth companies)	All private business incubators and accelerators, consultants, angel investors, and venture capital (or equivalent) in Canada and USA
Databases and groups used to extract participants	1. AUTM, (Association of University Technology Managers) 2. AUCC (Association of Universities and Colleges of Canada) 3. LES (Licensing Executives Society) 4. Ritsumei (list of TTO) 5. *Wikipedia* (list of universities) 6. Utexas (list of universities) 7. LinkedIn 8. University websites	1. CABI (Canadian Association of Business Incubation 2. (NBIA) National Business Incubation Association 3. ACCT (Canada - Alliance for Commercialization of Canadian Technologies) 4. LES (Licensing Executives Society) 5. AUTM (Association of University Technology Managers) 6. F6S (accelerators list) 7. Angels Corner 8. Seed-DB 9. Findthebest.com 10. LinkedIn 11. Organizations' websites	1. Branham-300 list 2. Forbes list 3. The-Global-and-Mail list 4. Deloitte list 5. CCC (*Canadian Company Capabilities)* 6. Reuters 7. Bloomberg 8. LinkedIn	1. Angels Corner 2. Canadian Association of Management Consultants 3. Institute of Management Consultants USA 4. VCpro database 5. Boogar Lists 6. LinkedIn

II type	UTTO	CBI	IFOI	III
Various names of offices/ organizations and/or individuals' titles	*These offices are normally called Technology Transfer Offices, but are also called Commercialization Office, Technology Licensing Office, Industry Liaison Office, Office of Research Development, Research & Technology Development Services, Division of Patents & Licensing, Office of Technology Management. * We targeted CEOs and Managers	* We targeted CEOs and Managers	* We targeted CTOs (Chief Technology Officers) and equivalent titles: VP or Director of R&D, Director of Advanced Technology, Chief Innovation Officer, Chief Communications and Liaison, Technology Transfer Officer, Vice President of Engineering, Vice President Intellectual Property, Chief Intellectual Property Counsel, VP of IP Strategy & Licensing, Commercial Licensing, Corporate Development, Chief Information Officer (CIO).	* We targeted CEOs/principals and Managers
Inclusion / exclusion criteria	• They are neither ***Solvers (1)*** nor ***Seekers (2)***, nor do they qualify as being primarily members of one ***Stakeholder*** type (3). • They have recently assisted with the commercialization of at least one idea that emerged from university research. 1. ***Solvers*** are researchers who create new knowledge in university settings; they advance frontiers of learning through scholarship; they disseminate new learning using peer-reviewed outlets; their institutions receive some funding from the 'public purse'. 2. ***Seekers*** are businesses who aspire to innovate with new offerings to markets; they are receptors of technologies and/or knowledge from solvers; they create value for customers by introducing new products/service; they anticipate benefits from their innovations to sustain enterprise. 3. ***Stakeholders*** are universities, governments, industries, financers, and communities.			
Canada	295	240	794	2030
United States	970	1355	1068	3069
Total	1265	1595	1862	5099

Appendix J

Imputation

Table 4-H-1 T-test to comparing original and imputed data*

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	P-value	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q6_3	Equal variances assumed	4.841	.029	.056	273	.955	.021	.380	-.727	.770
	Equal variances not assumed			.054	210.049	.957	.021	.393	-.753	.796
Q6_4	Equal variances assumed	7.405	.007	.069	249	.945	.063	.905	-1.719	1.84
	Equal variances not assumed			.064	143.472	.949	.063	.978	-1.870	1.99
Q19C_4	Equal variances assumed	5.271	.023	-.279	254	.780	-.038	.136	-.306	.230
	Equal variances not assumed			-.267	166.405	.790	-.038	.142	-.319	.243
Q19D_8	Equal variances assumed	4.956	.027	.249	255	.803	.046	.185	-.318	.411
	Equal variances not assumed			.242	176.861	.809	.046	.191	-.330	.423
Q19B_9	Equal variances assumed	8.045	.005	-.537	260	.592	-.101	.188	-.472	.270
	Equal variances not assumed			-.518	184.195	.605	-.101	.195	-.486	.284
Q19D_9	Equal variances assumed	7.850	.005	.039	254	.969	.007	.190	-.368	.383
	Equal variances not assumed			.038	170.915	.970	.007	.198	-.383	.398
Q19B_11	Equal variances assumed	4.743	.030	-.356	262	.722	-.060	.169	-.394	.273
	Equal variances not assumed			-.346	192.851	.730	-.060	.174	-.404	.283
Q21C_1	Equal variances assumed	4.566	.034	.439	262	.661	.065	.148	-.227	.357
	Equal variances not assumed			.425	189.516	.672	.065	.153	-.237	.368
Q21B_2	Equal variances assumed	5.661	.018	.524	257	.601	.079	.150	-.217	.374
	Equal variances not assumed			.502	174.348	.616	.079	.156	-.230	.387
Q21A_3	Equal variances assumed	5.869	.016	.663	262	.508	.113	.171	-.223	.450
	Equal variances not assumed			.645	193.561	.520	.113	.176	-.233	.460
Q21B_6	Equal variances assumed	4.404	.037	.388	265	.698	.058	.149	-.235	.351
	Equal variances not assumed			.378	199.413	.706	.058	.153	-.244	.360
Q21C_6	Equal variances assumed	5.822	.017	.662	257	.509	.121	.183	-.240	.482
	Equal variances not assumed			.643	182.090	.521	.121	.189	-.251	.493
Q22_7	Equal variances assumed	5.159	.024	-.467	268	.641	-.061	.130	-.316	.195
	Equal variances not assumed			-.458	211.752	.647	-.061	.132	-.322	.200
Q22_11	Equal variances assumed	6.436	.012	-.363	268	.717	-.047	.129	-.302	.208
	Equal variances not assumed			-.353	204.461	.725	-.047	.133	-.309	.215
Q22_12	Equal variances assumed	6.434	.012	-1.325	249	.186	-.171	.129	-.426	.083
	Equal variances not assumed			-1.269	157.525	.206	-.171	.135	-.438	.095
Q24A_1	Equal variances assumed	4.245	.040	-.683	263	.495	-.112	.164	-.434	.211
	Equal variances not assumed			-.665	196.828	.507	-.112	.168	-.443	.220
Q24B_1	Equal variances assumed	6.517	.011	.210	258	.834	.036	.170	-.298	.370
	Equal variances not assumed			.202	177.372	.840	.036	.177	-.313	.384
Q24B_B	Equal variances assumed	5.657	.018	-.079	221	.937	-.012	.158	-.323	.298
	Equal variances not assumed			-.072	90.170	.942	-.012	.172	-.355	.330
Q24A_3	Equal variances assumed	4.987	.026	-.207	262	.836	-.035	.168	-.366	.296
	Equal variances not assumed			-.201	193.610	.841	-.035	.173	-.375	.306
Q24B_3	Equal variances assumed	5.470	.020	-.226	264	.821	-.034	.151	-.331	.263
	Equal variances not assumed			-.218	192.220	.827	-.034	.156	-.343	.274
Q24A_6	Equal variances assumed	4.064	.045	-.193	260	.847	-.036	.186	-.403	.331
	Equal variances not assumed			-.188	191.666	.851	-.036	.191	-.412	.340
Q31_7	Equal variances assumed	4.261	.040	-.832	263	.406	-.072	.086	-.241	.098

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	P-value	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
	Equal variances not assumed			-.811	196.482	.418	-.072	.088	-.246	.102
Q31_8	Equal variances assumed	5.510	.020	-.204	264	.838	-.020	.096	-.209	.170
	Equal variances not assumed			-.198	192.706	.844	-.020	.099	-.216	.177
Q31_13	Equal variances assumed	4.100	.044	-.372	264	.710	-.042	.113	-.263	.180
	Equal variances not assumed			-.359	192.521	.720	-.042	.116	-.272	.188
Q32_5	Equal variances assumed	6.183	.014	-.538	263	.591	-.049	.091	-.229	.131
	Equal variances not assumed			-.519	189.629	.605	-.049	.095	-.236	.138
Q37A_13	Equal variances assumed	4.670	.032	.155	224	.877	.699	4.495	-8.160	9.55
	Equal variances not assumed			.175	147.695	.861	.699	3.987	-7.179	8.57
Q37A_19	Equal variances assumed	4.258	.040	.333	219	.739	2.105	6.314	-10.339	14.5
	Equal variances not assumed			.392	142.195	.696	2.105	5.372	-8.514	12.7
Q39B_8	Equal variances assumed	5.961	.015	-.385	241	.701	-.056	.147	-.345	.232
	Equal variances not assumed			-.363	135.412	.717	-.056	.156	-.364	.251
Q39B_9	Equal variances assumed	9.878	.002	.142	239	.887	.019	.136	-.248	.287
	Equal variances not assumed			.132	125.498	.896	.019	.147	-.272	.310

*Only 29 variables out of 340 variables has significant differences in variances (only 8%)

Appendix K

Statistical Descriptive Analysis

Visual assessment was done by using Histograms and Boxplots graphs, it is available upon request in .spv format (i.e. using SPSS to open it)

Statistical tests:

The following table provides detailed table for the statistical descriptive analysis that includes Kurtosis and Skewness values.

Descriptive Statistics

Variables	Mean	Std. Error	Std. Deviation	Variance	Skewness	Kurtosis
Q3	1998.64	0.898	11.323	128.215	-1.031	0.685
Q6_1	6.0443	0.39872	5.02762	25.277	1.533	2.531
Q6_3	2.55	0.229	2.884	8.32	2.348	6.657
Q6_4	4.77	0.492	6.198	38.417	2.26	6.053
Q6_5	3.69	0.243	3.058	9.353	1.38	2.124
Q9_1	3.45	0.092	1.163	1.352	-0.51	-0.514
Q9_2	2.77	0.087	1.102	1.214	0.087	-0.699
Q9_3	2.76	0.089	1.118	1.249	-0.17	-1.014
Q9_4	2.7	0.093	1.178	1.387	-0.106	-1.052
Q9_5	2.54	0.084	1.059	1.122	-0.034	-0.957
Q9_6	2.3	0.078	0.983	0.967	0.141	-1.029
Q9_7	2.35	0.098	1.239	1.536	0.589	-0.721
Q9_8	3.02	0.109	1.376	1.893	-0.14	-1.247
Q9_9	2.97	0.107	1.344	1.807	-0.084	-1.167
Q9_10	3.13	0.101	1.277	1.63	-0.263	-0.973
Q12_1	3.37	0.109	1.381	1.906	-0.338	-1.107
Q12_2	3.18	0.098	1.239	1.535	-0.189	-0.913
Q12_3	3.85	0.088	1.113	1.238	-0.738	-0.194
Q12_4	3.86	0.094	1.186	1.407	-0.88	-0.103
Q12_5	3.94	0.091	1.145	1.31	-0.977	0.219
Q13_1	3.69	0.105	1.319	1.74	-0.68	-0.726
Q13_2	2.5	0.088	1.116	1.245	0.35	-0.532
Q13_3	3.62	0.089	1.12	1.254	-0.501	-0.387
Q13_4	3.57	0.103	1.293	1.672	-0.535	-0.812
Q13_5	4.03	0.089	1.12	1.253	-1.116	0.449
Q14_1	2.61	0.101	1.27	1.612	0.25	-1.001
Q14_2	2.5	0.09	1.14	1.3	0.423	-0.458
Q14_3	3.29	0.098	1.236	1.529	-0.301	-0.775
Q14_4	3.34	0.097	1.225	1.5	-0.268	-0.887
Q14_5	3.46	0.092	1.156	1.336	-0.368	-0.729
Q15_1	3.69	0.085	1.071	1.148	-0.633	-0.197
Q15_2	3.15	0.087	1.097	1.204	-0.113	-0.511
Q15_3	3.68	0.086	1.088	1.183	-0.815	0.335

Descriptive Statistics

Variables	Mean	Std. Error	Std. Deviation	Variance	Skewness	Kurtosis
Q15_4	3.66	0.094	1.182	1.397	-0.566	-0.478
Q15_5	3.92	0.083	1.051	1.105	-0.868	0.239
Q16_1	3.06	0.11	1.383	1.912	-0.134	-1.245
Q16_2	2.64	0.089	1.116	1.246	0.126	-0.678
Q16_3	3.77	0.089	1.123	1.26	-0.728	-0.056
Q16_4	3.56	0.105	1.329	1.765	-0.521	-0.933
Q16_5	3.69	0.097	1.229	1.509	-0.788	-0.23
Q17_1	3.54	0.111	1.398	1.953	-0.558	-0.99
Q17_2	2.48	0.097	1.218	1.484	0.394	-0.794
Q17_3	3.32	0.108	1.357	1.841	-0.395	-1.045
Q17_4	3.38	0.114	1.438	2.068	-0.287	-1.262
Q17_5	3.68	0.11	1.393	1.941	-0.677	-0.796
Q18_1	3.68	0.12	1.515	2.294	-0.762	-0.935
Q18_2	2.35	0.105	1.325	1.755	0.569	-0.844
Q18_3	2.65	0.112	1.411	1.99	0.338	-1.15
Q18_4	3.43	0.123	1.545	2.386	-0.427	-1.327
Q18_5	3.33	0.12	1.512	2.286	-0.316	-1.325
Q19A_1	3.18	0.144	1.816	3.297	-0.311	-1.495
Q19B_1	2.04	0.104	1.307	1.708	0.975	-0.161
Q19C_1	1.88	0.102	1.286	1.653	1.077	0.461
Q19D_1	1.65	0.104	1.307	1.708	1.126	1.05
Q19A_2	2.78	0.138	1.74	3.027	-0.096	-1.079
Q19B_2	1.91	0.094	1.186	1.406	1.226	1.017
Q19C_2	1.66	0.094	1.19	1.415	0.968	1.196
Q19D_2	1.55	0.088	1.112	1.237	1.309	1.934
Q19A_3	3.06	0.122	1.534	2.353	-0.222	-1.131
Q19B_3	2.57	0.096	1.205	1.451	0.345	-0.527
Q19C_3	2.03	0.097	1.217	1.482	0.708	0.137
Q19D_3	2.07	0.093	1.168	1.364	0.742	-0.166
Q19A_4	3.32	0.109	1.372	1.883	-0.404	-0.934
Q19B_4	2.72	0.094	1.18	1.393	0.114	-0.558
Q19C_4	2.13	0.078	0.985	0.971	0.706	0.317
Q19D_4	2.13	0.087	1.091	1.191	0.611	-0.181
Q19A_5	3.09	0.102	1.286	1.654	-0.129	-0.908
Q19B_5	3.52	0.094	1.183	1.4	-0.279	-0.412
Q19C_5	2.16	0.082	1.03	1.062	0.603	0.28
Q19D_5	2.36	0.093	1.175	1.381	0.497	-0.426
Q19A_6	3.48	0.109	1.378	1.898	-0.46	-0.973
Q19B_6	2.49	0.09	1.137	1.293	0.374	-0.463
Q19C_6	2.01	0.089	1.122	1.259	0.965	0.276
Q19D_6	1.42	0.079	1.001	1.003	1.038	2.39
Q19A_7	3.34	0.111	1.395	1.945	-0.441	-0.97
Q19B_7	3.85	0.088	1.104	1.219	-0.708	-0.25
Q19C_7	2.76	0.098	1.236	1.528	0.237	-0.678
Q19D_7	2.92	0.103	1.294	1.675	0.126	-0.797
Q19A_8	3.48	0.112	1.407	1.98	-0.465	-0.977
Q19B_8	3.46	0.101	1.276	1.629	-0.294	-0.845
Q19C_8	2.81	0.114	1.438	2.068	0.256	-0.869
Q19D_8	2.6	0.109	1.372	1.882	0.309	-0.881
Q19A_9	3.1	0.135	1.708	2.916	-0.218	-1.402

Descriptive Statistics

Variables	Mean	Std. Error	Std. Deviation	Variance	Skewness	Kurtosis
Q19B_9	2.3	0.109	1.375	1.89	0.781	-0.345
Q19C_9	2.7	0.111	1.4	1.959	0.229	-1.151
Q19D_9	2.51	0.111	1.399	1.956	0.438	-0.981
Q19A_10	2.14	0.107	1.347	1.814	0.282	-0.684
Q19B_10	2.33	0.098	1.237	1.529	0.468	-0.722
Q19C_10	3.46	0.102	1.281	1.641	-0.407	-0.734
Q19D_10	2.95	0.103	1.297	1.682	0.004	-0.863
Q19A_11	3.07	0.121	1.522	2.317	-0.294	-1.015
Q19B_11	2.42	0.099	1.254	1.572	0.457	-0.765
Q19C_11	1.89	0.08	1.003	1.006	0.884	0.86
Q19D_11	1.94	0.085	1.075	1.155	0.654	-0.129
Q21A_1	3.13	0.103	1.296	1.679	-0.256	-0.88
Q21B_1	3.21	0.09	1.132	1.282	-0.339	-0.436
Q21C_1	2.56	0.087	1.102	1.214	0.505	-0.184
Q21D_1	2.75	0.102	1.283	1.645	0.207	-0.785
Q21A_2	2.26	0.115	1.45	2.102	0.745	-0.651
Q21B_2	1.86	0.084	1.062	1.128	1.232	1.174
Q21C_2	1.47	0.09	1.14	1.299	1.287	2.209
Q21D_2	1.6	0.089	1.12	1.255	1.067	1.211
Q21A_3	2.25	0.102	1.288	1.658	0.666	-0.514
Q21B_3	2.1	0.092	1.156	1.336	0.652	-0.177
Q21C_3	1.63	0.08	1.012	1.024	1.035	1.704
Q21D_3	1.59	0.085	1.075	1.155	1.253	1.765
Q21A_4	2.7	0.103	1.303	1.697	0.064	-0.744
Q21B_4	2.33	0.09	1.134	1.286	0.432	-0.279
Q21C_4	1.92	0.083	1.046	1.095	0.969	0.672
Q21D_4	2.16	0.094	1.18	1.392	0.64	-0.188
Q21A_5	2.52	0.113	1.427	2.036	0.159	-1.042
Q21B_5	1.96	0.098	1.23	1.513	0.704	-0.163
Q21C_5	1.63	0.098	1.242	1.541	0.961	0.849
Q21D_5	2	0.108	1.365	1.864	0.903	-0.014
Q21A_6	3.46	0.101	1.275	1.626	-0.602	-0.325
Q21B_6	3.39	0.089	1.128	1.271	-0.316	-0.609
Q21C_6	2.5	0.107	1.343	1.804	0.366	-0.808
Q21D_6	2.79	0.115	1.447	2.094	0.164	-0.917
Q21A_7	2.56	0.106	1.342	1.8	0.382	-0.801
Q21B_7	2.21	0.093	1.179	1.389	0.56	-0.214
Q21C_7	1.85	0.078	0.987	0.974	0.969	0.462
Q21D_7	1.91	0.094	1.182	1.396	0.901	0.231
Q21A_8	2.47	0.119	1.497	2.242	0.505	-0.674
Q21B_8	2.14	0.095	1.203	1.448	0.379	-0.287
Q21C_8	1.76	0.079	0.995	0.989	1.064	1.355
Q21D_8	1.91	0.08	1.011	1.022	0.768	0.517
Q22_1	3.49	0.064	0.807	0.651	-0.506	0.676
Q22_2	3.22	0.089	1.123	1.26	-0.367	-0.746
Q22_3	2.81	0.084	1.062	1.128	0.077	-0.66
Q22_4	2.2	0.081	1.027	1.055	0.406	-0.448
Q22_5	2.86	0.096	1.217	1.48	-0.017	-1.077
Q22_6	1.89	0.071	0.897	0.805	0.882	0.687
Q22_7	2.45	0.079	0.997	0.993	0.28	0.556

Descriptive Statistics

Variables	Mean	Std. Error	Std. Deviation	Variance	Skewness	Kurtosis
Q22_8	3.45	0.071	0.897	0.804	-0.468	0.309
Q22_9	2.92	0.078	0.983	0.966	-0.124	-0.238
Q22_10	2.73	0.075	0.95	0.902	-0.104	-0.459
Q22_11	2.5	0.077	0.972	0.944	0.148	-0.187
Q22_12	2.1	0.074	0.928	0.862	0.377	-0.053
Q31_1	4.14	0.064	0.806	0.649	-1.012	1.209
Q31_2	3.89	0.064	0.806	0.65	-0.507	0.359
Q31_3	3.94	0.071	0.899	0.808	-0.353	-0.708
Q31_4	3.04	0.075	0.947	0.896	-0.011	-0.055
Q31_5	3.67	0.074	0.929	0.863	-0.467	-0.057
Q31_6	3.27	0.083	1.05	1.103	-0.172	-0.544
Q31_7	4.57	0.052	0.653	0.427	-1.383	2.319
Q31_8	4.27	0.056	0.701	0.492	-0.813	0.772
Q31_9	3.47	0.082	1.028	1.057	-0.142	-0.676
Q31_10	3.72	0.066	0.836	0.699	-0.184	-0.026
Q31_11	3.99	0.067	0.846	0.716	-0.376	0.038
Q31_12	3.76	0.065	0.82	0.672	-0.306	-0.547
Q31_13	3.91	0.067	0.842	0.709	-0.735	0.412
Q31_14	3.38	0.086	1.082	1.171	-0.051	-0.598
Q31_15	2.34	0.077	0.976	0.953	0.688	0.261
Q31_16	3.17	0.074	0.927	0.859	-0.03	-0.094
Q31_17	3.35	0.067	0.843	0.71	-0.056	-0.339
Q31_18	4.45	0.058	0.729	0.531	-1.509	3.284
Q31_19	3.81	0.066	0.832	0.692	-0.359	0.106
Q31_20	3.99	0.065	0.82	0.673	-0.594	0.442
Q31_21	3.2	0.067	0.841	0.707	-0.183	-0.211
Q32_1	4.28	0.059	0.745	0.555	-0.928	1.731
Q32_2	4.29	0.061	0.764	0.583	-0.782	1.375
Q32_3	4.36	0.055	0.692	0.479	-1.177	2.526
Q32_4	4.46	0.054	0.683	0.467	-1.334	3.222
Q32_5	4.35	0.054	0.678	0.46	-1.255	2.838
Q32_6	4	0.064	0.804	0.646	-0.75	0.593
Q32_7	4.4	0.056	0.706	0.499	-1.238	3.081
Q32_8	4.31	0.056	0.709	0.503	-0.692	0.325
Q32_9	3.49	0.059	0.75	0.562	-0.143	0.247
Q32_10	3.83	0.056	0.705	0.497	-0.169	0.014
Q32_11	4.25	0.06	0.754	0.568	-0.609	0.122
Q32_12	4.11	0.063	0.796	0.634	-0.409	0.253
Q33_1	3.72	0.075	0.941	0.885	-0.021	-0.098
Q33_2	3.71	0.078	0.99	0.98	-0.258	-0.567
Q33_3	3.92	0.075	0.944	0.892	-0.266	0.205
Q33_4	4.11	0.071	0.897	0.805	-0.2	0.771
Q33_5	3.93	0.085	1.076	1.157	-0.396	0.088
Q33_6	4.03	0.076	0.96	0.922	-0.433	0.632
Q33_7	3.92	0.064	0.812	0.659	-0.364	0.618
Q33_8	4.29	0.067	0.841	0.708	-0.907	2.023
Q33_9	2.85	0.087	1.096	1.202	0.122	-0.49
Q33_10	4.29	0.065	0.825	0.68	-1	2.389
Q34_1	4.35	0.057	0.725	0.525	-0.717	0.872
Q34_2	4.05	0.058	0.729	0.531	-0.215	-0.402

Descriptive Statistics

Variables	Mean	Std. Error	Std. Deviation	Variance	Skewness	Kurtosis
Q34_3	3.99	0.062	0.782	0.611	-0.268	-0.384
Q34_4	3.94	0.066	0.832	0.692	-0.559	0.317
Q34_5	4.2	0.073	0.916	0.839	-0.285	0.403
Q34_6	4.16	0.053	0.664	0.441	-0.516	0.255
Q34_7	3.32	0.072	0.905	0.819	-0.371	0.359
Q34_8	2.56	0.08	1.014	1.027	0.104	-0.099
Q34_9	3.12	0.066	0.832	0.691	0.247	-0.323
Q34_10	3.61	0.063	0.79	0.625	-0.095	0.328
Q34_11	3.87	0.063	0.792	0.627	-0.276	0.338
Q34_12	4.08	0.066	0.835	0.698	-0.294	0.637
Q34_13	3.04	0.069	0.873	0.762	0.173	0.31
Q34_14	3.1	0.082	1.033	1.068	0.118	-0.32
Q34_15	3.27	0.072	0.904	0.818	0.15	-0.492
Q34_16	3.31	0.068	0.853	0.727	-0.054	0.286
Q34_17	3.96	0.068	0.863	0.745	-0.555	-0.007
Q34_18	3.87	0.068	0.864	0.746	-0.326	0.218
Q34_19	3.88	0.073	0.924	0.854	-0.106	-0.321
Q34_20	3.09	0.075	0.948	0.898	0.055	-0.392
Q34_21	3.02	0.078	0.986	0.972	0.064	-0.061
Q34_22	3.1	0.074	0.929	0.862	0.302	-0.242
Q34_23	2.75	0.071	0.897	0.804	-0.092	0.237
Q37_1	3.41	0.096	1.215	1.475	0.028	0.423
Q37_2	2.98	0.092	1.164	1.355	0.117	-0.474
Q37_3	2.96	0.093	1.17	1.369	0.221	0.189
Q37_4	3.58	0.088	1.105	1.22	-0.512	0.215
Q37_5	4.29	0.057	0.715	0.511	-0.918	1.039
Q37A_1	60.79	2.426	30.588	935.637	0.041	1.568
Q37A_2	50.88	2.653	33.449	1118.827	-0.01	0.029
Q37A_3	57.17	2.896	36.517	1333.502	0.206	0.965
Q37A_4	64.1	2.637	33.257	1106.003	0.123	0.808
Q37A_5	76.35	1.613	20.339	413.68	-0.854	0.923
Q37_6	4.07	0.073	0.922	0.851	-0.705	-0.006
Q37_7	4.13	0.072	0.908	0.824	-0.435	0.63
Q37_8	2.85	0.089	1.119	1.252	0.104	-0.597
Q37_9	3.54	0.082	1.031	1.062	-0.251	-0.043
Q37_10	3.03	0.092	1.164	1.355	0.208	0.336
Q37_11	3.4	0.092	1.162	1.351	-0.377	-0.331
Q37A_6	75.65	2.158	27.213	740.545	-0.389	-0.077
Q37A_7	62.18	2.316	29.207	853.051	-0.634	0.661
Q37A_8	48.16	2.914	36.739	1349.767	0.077	1.017
Q37A_9	57.85	2.761	34.819	1212.328	-0.296	0.014
Q37A_10	45.41	3.02	38.08	1450.07	-0.105	0.394
Q37A_11	59.54	2.654	33.464	1119.843	0.283	0.682
Q37_12	3.48	0.089	1.12	1.255	-0.298	-0.583
Q37_13	3.73	0.098	1.236	1.527	-0.225	-0.274
Q37_14	3.45	0.087	1.095	1.199	-0.337	-0.251
Q37_15	4.08	0.076	0.953	0.909	-1.177	1.734
Q37_16	3.23	0.093	1.168	1.364	-0.236	-0.703
Q37A_12	69.37	2.612	32.938	1084.914	0.266	0.506
Q37A_13	69.93	2.53	31.899	1017.52	-0.467	1.135

Descriptive Statistics

Variables	Mean	Std. Error	Std. Deviation	Variance	Skewness	Kurtosis
Q37A_14	73.2	1.846	23.271	541.545	-0.283	0.764
Q37A_15	80.39	1.879	23.69	561.223	0.051	1.866
Q37A_16	66.85	2.895	36.5	1332.279	0.308	1.236
Q37_17	3.76	0.09	1.13	1.277	-0.534	-0.139
Q37_18	4.45	0.057	0.723	0.522	-0.838	0.709
Q37_19	2.92	0.094	1.186	1.406	0.079	0.204
Q37_20	3.59	0.087	1.101	1.212	-0.017	0.495
Q37_21	4.27	0.058	0.726	0.528	-0.508	0.569
Q37_22	4.08	0.071	0.901	0.811	-0.464	0.409
Q37A_17	65.68	2.215	27.931	780.138	-0.702	0.93
Q37A_18	77.77	1.853	23.361	545.736	-0.911	2.002
Q37A_19	52.1	3.445	43.442	1887.222	0.571	2.488
Q37A_20	65.54	1.903	23.994	575.719	-0.256	-0.131
Q37A_21	72.7	1.781	22.46	504.458	-0.517	0.486
Q37A_22	68.06	1.711	21.581	465.725	-0.551	0.079

Appendix L

Final Version of the Survey

Toward Increased Understanding of Innovation Intermediaries

The study aims to understand various types of innovation intermediaries and their dominant commercialization paths by focusing on commercialization of research results. In particular, this research aims to answer the questions as to how innovation intermediaries interact with their stakeholders, and how those stakeholders influence innovation intermediaries' strategies, services and innovation readiness in a commercialization context.

Innovation intermediary is defined as "an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties;" Innovation intermediaries exist worldwide; they are referred to by various names, and they use a range of business models.

Completing the following questions and submitting the survey implies your consent to participate in this study.

…Read More

By participating in this study, you are asked to take part in a 35-45 minute, online, unidentified survey. The survey includes questions about your organization as an innovation intermediary. If you think that any of the information in the survey may be confidential for you organization and thus you need approval to release it on behalf of the organization, and if your organization requires that you obtain approval from a gatekeeper (e.g. direct supervisor who approves task assignment, institutional research approval committee, business owner), we recommend that you do so before answering the survey. You may decline to answer any of the questions you do not wish to answer. Further, you may decide to withdraw from this study at any time by closing your browser, and without any negative consequences. All of the data will be summarized and no individual can be identified from these summarized results. Moreover, the data collected will be kept in a secure location and confidentially destroyed after three years. This survey uses SurveyGizmo™ which is a United States of America company. Consequently, USA authorities under provisions of the PATRIOT Act may access this survey data. If you prefer not to submit your data through SurveyGizmo™, please contact one of the researchers so you can participate using an alternative method such as through an email or paper-based questionnaire. The alternate method may decrease anonymity but confidentiality

will be maintained.
If you have any questions regarding this study, or would like additional information about participation, please contact me by email at mbatouk@uwaterloo.ca or by telephone at 1-519-888-4567 ext 33368. You may also contact my supervisor Dr. Paul D. Guild by email at guild@uwaterloo.ca or by telephone at 1-519-888-4802.

I assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision to participate is yours. If you have any comments or concerns resulting from you participation in this study, please contact Dr. Maureen Nummelin of this office at 1-519-888-4567 ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you in advance for your interest and assistance with this research.
Yours truly,

M. A. Batouk
PhD. Candidate

Innovation Intermediary — Commercialization

1. For each of the following statements, please select the appropriate answer for each statement that describes your organization as an innovation intermediary

	Yes	No
In the past, we helped commercialize at least one idea that emerged from research.	○	○
We provide clients with free commercialization related services.	○	○
We charge clients for commercialization related services.	○	○
Our organization is open to facilitating the commercialization of ideas of multiple sectors and/or disciplines.	○	○
Our organization focuses on facilitating the commercialization of ideas in a particular sector or discipline.	○	○

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2. Please select the one statement that best describes you. *

- ○ I am from a **technology transfer office** (or equivalent) that is associated with an educational institution (university, college).

- I am from a **business incubator** that is associated with an educational institution (university, college).
- I am from a **business incubator** that is supported by the government.
- I am from a **private business incubator**.
- I am from a **business accelerator** that is associated with an educational institution (university, college).
- I am from a **business accelerator** that is supported by the government.
- I am from a **private business accelerator**.
- I am from a **consulting** company.
- I am from a unit or a department that is **part of a firm**.
- I am from an **angel investor** group.
- I am from a **venture capital investor** firm.
- I am from another **lending organization**.
- Other (please specify) _____

It seems that your office/department is associated with an educational institution (University, or College), therefore, to correctly complete the survey, **please address all of the following questions as if you were an arm's length stand-alone organization.**

***For example,** if you receive support from a university, then consider this support as if it comes from a separate budget allocation, or for a cost center, rather than from an internal source. In addition, any question about your organization means your office/department not the university.
***For instance,** for the question on the next page, which reads "Our organization was established in the year," please answer by writing the year in which your **office/department** was established, not the year when the university was established.

Please confirm that you have read the above information and instructions.
*

- I confirm I have read the above information and instructions.

It seems that your department is part of a firm, therefore, to correctly complete the survey, **please address all of the following questions as if you were an arm's length stand-alone organization.**

***For example,** if you receive support from your parent firm, then consider this support as if it comes from a separate budget allocation, or for a cost center, rather than from an internal source. In addition, any question about your organization means your department but not the parent firm.
***For instance,** for the question on the next page, which reads "Our organization was established in the year," please answer by writing the year in which your **department** was established, not the year when the parent firm was established.

Please confirm that you have read the above information and instructions.
*

- ○ I confirm I have read the above information and instructions.

Please answer the following questions about your organization.

---

3. Our organization was established in the year:

---

4. Our organization is located in:

Country

Province/State

---

5. Our organization serves the following sectors (select all that apply)

- ☐ Manufacturing
- ☐ Environment
- ☐ Energy

- [ ] Medical
- [ ] Information and Communications Technology (ICT)
- [ ] Other (please specify) _____

6. The total number of employees that currently work in our organization as

Permanent employees	
Contract employees	
Volunteer contributors	
Number of analysts and/or experts in commercialization	

7. We are co-located with (select all that apply):

- [ ] A university, college or hospital
- [ ] A small- to mid-size incorporated private for-profit firm (fewer than 300 employees)
- [ ] A large incorporated private for-profit firm (more than 300 employees)
- [ ] An incorporated not-for-profit firm
- [ ] A federal government department, laboratory or agency
- [ ] A provincial government department, laboratory or agency
- [ ] A regional government department, laboratory or agency
- [ ] A municipal government department, laboratory or agency
- [ ] An incubator
- [ ] A startup
- [ ] An innovation park/research park
- [ ] Not co-located
- [ ] Other (please specify) _____

8. We are legally (select all that apply):

- [ ] A public organization
- [ ] An incorporated private for-profit firm
- [ ] An incorporated not-for-profit firm
- [ ] Part of a larger incorporated private for-profit firm
- [ ] Part of a larger incorporated public for-profit firm
- [ ] Part of a university, college or hospital
- [ ] A federally incorporated charity organization
- [ ] A private not-for profit organization
- [ ] A single-owner organization
- [ ] A multi-owner organization
- [ ] Other (please specify) _____

9. Please rate the following statements regarding your organization's commercialization strategy.

	1 Never	2 Rarely	3 Occasionally	4 Frequently	5 Always
Our organization helps create new ventures based on invention with a **purpose to sell products and/or services** that result from that invention.	○	○	○	○	○
Our organization helps create new ventures based on inventions with a **purpose to licensing inventions on a non-exclusive basis** to one or more new ventures and/or established firms.	○	○	○	○	○

Please rate the following statements regarding your organization's commercialization strategy.

	1 Never	2 Rarely	3 Occasionally	4 Frequently	5 Always
Our organization helps license inventions on an **exclusive basis to established firms** with a purpose to use that invention in established firms' business.	○	○	○	○	○
Our organization helps license inventions on an **exclusive basis to new ventures** with a purpose to sell products and/or services that result from that invention.	○	○	○	○	○
Our organization helps license inventions on a **non-exclusive basis to one or more established firms** with a purpose to use that invention in established firms' businesses.	○	○	○	○	○
Our organization helps license inventions on a **non-exclusive basis to one or more new ventures** with a purpose to sell products and/or services that result from that invention.	○	○	○	○	○

Please rate the following statements regarding your organization's commercialization strategy.

	1 Never	2 Rarely	3 Occasionally	4 Frequently	5 Always
Our organization helps inventor(s) and/or university/college to receive a **fixed license fee** as a benefit from the commercialized	○	○	○	○	○

innovation.					
Our organization helps inventor(s) and/or university/college to receive a **royalties and/or equities** as a benefit from a commercialized innovation.	○	○	○	○	○
Our organization helps **inventor(s) and/or university/college** to retain the rights to further develop the commercialized innovation.	○	○	○	○	○
Our organization helps **commercializing firms (whether established firm or new venture)** to retain the rights to further develop the commercialized innovation.	○	○	○	○	○

10. Which of the following statements best describes your organization? Please select the most appropriate option only.

- ○ **University Technology Transfer Office (UTTO),** which is a unit or department associated with educational institution (university/college) and that works on facilitating the utilization of publicly funded research by industry.
- ○ **Community Business Incubator/Accelerator (CBI),** which is not-for-profit organization that accelerates the successful development of entrepreneurial companies through an array of business support resources and services.
- ○ **Industry Facilitators of Open Innovation (IFOI),** which is a unit or department inside a firm that works on connecting the parent firm to the external knowledge by finding, acquiring, and exploiting new technologies or inventions when possible.
- ○ **Independent Innovation Intermediaries (III),** which is individual or for-profit organization who works independently to facilitate (either directly or indirectly) the commercialization of publicly funded research.
- ○ Other (please specify) _____

A stakeholder is "any group or individual who can affect or is affected by the achievement of

an organization's objectives" (*Freeman,1984*).

According to many past studies, following groups have been identified as stakeholders for innovation intermediaries, although these may vary from one innovation intermediary to another:

Government
Community
Customers/clients
Parent firm
Industry
Educational institution (university and/or college)
Financier (funding partner, shareholder)
Employees
Suppliers
Individual (mentors, coaches, trainers, consultants)
Other innovation intermediaries

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11. Based on your perception of the stakeholders in the following list, please rank-order them from most important (top) to least important (bottom) based on their role for the successful commercialization performance in your organization.

Drag items from the left-hand list into the right-hand list to order them.

- Other innovation intermediaries
- Suppliers
- Employees
- Community
- Parent firm
- Customers/clients
- Educational institution (university and/or college)
- Industry
- Individual (mentors, coaches, trainers, consultants)
- Government

Financier (funding partner, shareholder)

Part 3- Innovation Intermediary — Stakeholders Perspective

For each of the following stakeholder groups, please rate the following statements based on your interactions with these groups in the past.

In addition, in the far right column, please indicate your opinion as to whether the stakeholder group was aware of your perception of them?

12. This stakeholder group received high priority from our management team (was highly *salient* to our organization)

	1 Strongly Disagree	2	3	4	5 Strongly Agree	Stakeholder group knew our perception of them
Government	○	○	○	○	○	Yes No I don't know Not applicable
Community	○	○	○	○	○	Yes No I don't know Not applicable
Industry (and/or parent firm)	○	○	○	○	○	Yes No I don't know Not applicable
Educational institution (university, college)	○	○	○	○	○	Yes No I don't know Not applicable

Financier (funding partner, shareholder)	○	○	○	○	○	Yes No I don't know Not applicable

13. This stakeholder group had *power*, whether used or not (power meaning the ability to apply high level direct economic reward or punishment to obtain its will).

	1 Strongly Disagree	2	3	4	5 Strongly Agree	Stakeholder group knew our perception of them
Government	○	○	○	○	○	Yes No I don't know Not applicable
Community	○	○	○	○	○	Yes No I don't know Not applicable
Industry (and/or parent firm)	○	○	○	○	○	Yes No I don't know Not applicable
Educational institution (university, college)	○	○	○	○	○	Yes No I don't know Not applicable
Financier (funding partner, shareholder)	○	○	○	○	○	Yes No I don't know Not applicable

14. This stakeholder group exhibited *urgency* in its relationship with our organization (it was active in pursuing claims, demands, or desires that if felt were important).

						Stakeholder group

	1 Strongly Disagree	2	3	4	5 Strongly Agree	knew our perception of them
Government	○	○	○	○	○	Yes No I don't know Not applicable
Community	○	○	○	○	○	Yes No I don't know Not applicable
Industry (and/or parent firm)	○	○	○	○	○	Yes No I don't know Not applicable
Educational institution (university, college)	○	○	○	○	○	Yes No I don't know Not applicable
Financier (funding partner, shareholder)	○	○	○	○	○	Yes No I don't know Not applicable

15. The claims of this stakeholder group were viewed by our management team as *legitimate* (the claims were proper or appropriate).

	1 Strongly Disagree	2	3	4	5 Strongly Agree	Stakeholder group knew our perception of them
Government	○	○	○	○	○	Yes No I don't know Not applicable

Community	○	○	○	○	○	Yes No I don't know Not applicable
Industry (and/or parent firm)	○	○	○	○	○	Yes No I don't know Not applicable
Educational institution (university, college)	○	○	○	○	○	Yes No I don't know Not applicable
Financier (funding partner, shareholder)	○	○	○	○	○	Yes No I don't know Not applicable

16. This stakeholder group contributes to our organization's strategy for commercialization.

	1 Strongly Disagree	2	3	4	5 Strongly Agree
Government	○	○	○	○	○
Community	○	○	○	○	○
Industry (and/or parent firm)	○	○	○	○	○
Educational institution (university, college)	○	○	○	○	○
Financier (funding partner, shareholder)	○	○	○	○	○

17. This stakeholder group is able to withhold support to our organization, to thereby influence our strategy toward applying its will.

	1 Strongly Disagree	2	3	4	5 Strongly Agree
Government	○	○	○	○	○

Community	○	○	○	○	○
Industry (and/or parent firm)	○	○	○	○	○
Educational institution (university, college)	○	○	○	○	○
Financier (funding partner, shareholder)	○	○	○	○	○

18. We are required, periodically, to report our success metrics to this stakeholder group.

	1 Strongly Disagree	2	3	4	5 Strongly Agree
Government	○	○	○	○	○
Community	○	○	○	○	○
Industry (and/or parent firm)	○	○	○	○	○
Educational institution (university, college)	○	○	○	○	○
Financier (funding partner, shareholder)	○	○	○	○	○

Innovation Intermediary — Stakeholders Perspective

19. This question is about the source of the resources that your organization uses for its daily operations in performing the role of innovation intermediary.

Please rate each of the following statements for each stakeholder group:

(1 star=Never, 2 stars=Rarely, 3 stars=Occasionally, 4 stars=Frequently, 5 stars=Always)

	Associated Educational Institution (university/college)	Industry and/or Parent Firm	Government	Financier (funding partner, shareholder)
The physical space of our offices are provided by…				

We receive business administrative support from…				
To facilitate commercialization, we can access the required equipment and material through…				
To investigate theoretical information, we seek the help of…				

Please continue,

(1 star=Never, 2 stars=Rarely, 3 stars=Occasionally, 4 stars=Frequently, 5 stars=Always)

	Associated Educational Institution (university/college)	Industry and/or Parent Firm	Government	Financier (funding partner, shareholder)
To investigate practical information, we seek the help of…				
We have access to specialized laboratories through…				
To facilitate commercialization, we make use of our established network with…				
We have one or more collaboration agreement(s) with…				

Please continue,

(1 star=Never, 2 stars=Rarely, 3 stars=Occasionally, 4 stars=Frequently, 5 stars=Always)

	Associated Educational Institution (university/college)	Industry and/or Parent Firm	Government	Financier (funding partner, shareholder)
At least, part of our operational budget is provided by…				
To facilitate commercialization, we help clients in accessing loans and grants through…				
To facilitate commercialization, we have access to required human resources through…				

20. Please answer the following questions:

In your opinion, will withholding of resources that support your organization eventually affect your organization's strategy?

- Yes
- No
- I don't know

Why or why not?

Kindly answer in less than 50 words

If yes, what is your alternative plan to overcome that?

Kindly answer in less than 50 words

21. Please rate the extent to which the following stakeholder groups depend on your organization for each of the following.

(1 star=Never, 2 stars=Rarely, 3 stars=Occasionally, 4 stars=Frequently, 5 stars=Always)

	Associated Educational Institution (university/college)	Industry and/or Parent Firm	Government	Financier (funding partner, shareholder)
Knowledge resources				
Physical space resources				
Material resources				
Organizational resources				
Financial resources				
Networking resources				
Human resources				
Other				

resources					

Innovation Intermediary — Stakeholders Perspective

22. Please rate the extent to which your organization provides commercialization services to the following clients.

	Never	Rarely	Partially	Mostly	Exclusively
Entrepreneurs	○	○	○	○	○
Professors and researchers	○	○	○	○	○
Graduate students	○	○	○	○	○
Undergraduate students	○	○	○	○	○
Individual clients	○	○	○	○	○
Hospitals	○	○	○	○	○
Research centres	○	○	○	○	○
New ventures (startups)	○	○	○	○	○
Established firms and/or parent firm	○	○	○	○	○
Funding partners (angel investors, venture capital investors)	○	○	○	○	○
Other innovation intermediaries	○	○	○	○	○
Others	○	○	○	○	○

23. Please select the most appropriate answer for each statement that describes your organization as an innovation intermediary.

	Yes	No
We provide commercialization services to all clients regardless of their affiliation.	○	○
We devote our commercialization services to our internal clients only.	○	○

24. Please indicate the support at commercialization stages that:
a) The majority of your clients seek through your intermediary advice
b) Your organization provides to clients who seek your advice

(1 star=Not at all <----------> 5 stars=To a great extent)

	a) The support that the majority of our clients seek at this stage is to…	b) The support that our organization provides to our clients at this stage is to…
A. Searching Stage		
1: Conceive a unique idea for a business		
2: Identify market opportunities for a business		
B. Planning Stage		
3: Start a plan for a new business, or for collaboration with an existing business		
4: Formulate or modify a business model		
C. Financing Stage		
5: Raise initial money to start a business		
6: Convince others to invest in your business		
	a) The support that the majority of our clients seek at this stage is to…	b) The support that our organization provides to our clients at this stage is to…
D. Teambuilding Stage		
7: Solicit advice from mentors, coaches, or executives.		
8: Convince others to work in the new initiative		
E. Implementing Stage		
9: Manage the offerings of new initiative		
10: Grow a successful new or		

10. Grow a successful new or extended business		

Innovation Intermediary — Stakeholders Perspective

25. What type of governance entity does your organization have:

- A board
- A steering committee
- Other (please specify) _____
- No governance entity

26. Which of the following stakeholders are represented in your organization's board (select all that apply).

- Government
- Community
- Clients (your immediate customers)
- Industry (and/or Parent Firm)
- Educational Institution (university, college)
- Financier (funding partner, shareholder)
- Employees
- Suppliers
- Individuals (mentors, coaches, trainers and consultants)
- Other Innovation Intermediaries
- Other (please specify) _____

27. Based on your opinion, please rate the importance of the following stakeholder groups among your organization's board members.

	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Government	○	○	○	○	○
Community	○	○	○	○	○
Clients (your immediate customers)	○	○	○	○	○
Industry (and/or Parent Firm)	○	○	○	○	○
Educational institution (university, college)	○	○	○	○	○
Financier (funding partner, shareholder)	○	○	○	○	○
Employees	○	○	○	○	○
Suppliers	○	○	○	○	○
Individuals (mentors, coaches, trainers and consultants)	○	○	○	○	○
Other Innovation Intermediaries	○	○	○	○	○

Innovation evaluation, selection process, or technology assessment are all names for the related process that aims to evaluate a new invention's potential readiness for commercialization. The process varies from one innovation intermediary to another and is based on many factors, such as technology, market, entrepreneur, and new venture.

Please select the answer for each statement that best describes your organization as innovation intermediary.

28. To assess a new invention, we have a trained team that could:

	1 Not at all	2	3	4	5 To a very great extent
Access to the required **theoretical knowledge**	○	○	○	○	○

Access to the required **practical experience**	○	○	○	○	○
Access to the required **evaluation tools**	○	○	○	○	○

29. Who is/are involved in your assessment process for a new invention?

	0 people	10 people	20 people
Only manager(s)			
Committee composed of			
Team composed of			

Please rank the following from the most important (top) to the least important (bottom).

30. To assess a new invention we evaluate the following.

Drag items from the left-hand list into the right-hand list to order them.

- Idea
- Targeted Market
- Entrepreneur(s)
- New business Venture

Please rate the following **idea-related criteria** to indicate their importance in your organization's assessment process.

31. To assess a new invention, the following idea-related criteria are considered.

	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Quality of the idea	○	○	○	○	○

Scope of the idea	○	○	○	○	○
Novelty of the idea	○	○	○	○	○
Complexity of the idea	○	○	○	○	○
Development stage of the idea	○	○	○	○	○
Scientific component of the idea	○	○	○	○	○
Business value of the idea	○	○	○	○	○
	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Competitive edge of the idea	○	○	○	○	○
Patentability of the idea	○	○	○	○	○
Time needed for commercializing the idea	○	○	○	○	○
Resources needed for commercializing the idea	○	○	○	○	○
Experience needed for commercializing the idea	○	○	○	○	○
Viability to obtain funds	○	○	○	○	○
Licensing potential of the idea	○	○	○	○	○
	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Inspirational source for the idea	○	○	○	○	○
Cost reduction amount by the idea	○	○	○	○	○

Level of failure risk of the idea	○	○	○	○	○
Value proposition of the idea	○	○	○	○	○
Society's potential acceptance of the idea	○	○	○	○	○
Society's potential benefit from the idea	○	○	○	○	○
Environmental contribution by the idea	○	○	○	○	○

Please rate the following **market-related criteria** to indicate their importance in your organization's assessment process.

32. To assess a new invention, the following market-related criteria are considered.

	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Targeted market	○	○	○	○	○
Potential market	○	○	○	○	○
Market opportunities	○	○	○	○	○
Market viability	○	○	○	○	○
Market feasibility	○	○	○	○	○
Market traction process	○	○	○	○	○
Problem to be solved in the market	○	○	○	○	○
	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Fit between market need and technology	○	○	○	○	○

solution					
Policy effects on path to market	○	○	○	○	○
Regulation effects on path to market	○	○	○	○	○
Appeal of the final product to users	○	○	○	○	○
Probability of acceptance for the new product by community	○	○	○	○	○

Innovation Intermediary — Innovation Readiness

Please rate the following **entrepreneur-related criteria** to indicate their importance in your organization's assessment process.

33. To assess a new invention, the following entrepreneur-related criteria are considered.

	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Skills	○	○	○	○	○
Individual leadership **reputation**	○	○	○	○	○
Individual leadership **capacity**	○	○	○	○	○
Team quality	○	○	○	○	○
Coachability	○	○	○	○	○
Capacity to learn	○	○	○	○	○
Entrepreneurial business acumen	○	○	○	○	○
Deep commitment to start a new enterprise	○	○	○	○	○
Ability to pay the	○	○	○	○	○

services fee					
Commitment to hard work					

Please rate the following **venture-related criteria** to indicate their importance in your organization's assessment process.

34. To assess a new invention, the following venture-related criteria are considered.

	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Economic viability					
Potential cash flow from the new business venture in future					
Potential revenue					
Potential profit					
Potential return on investment (ROI)					
Potential growth					
Ability to produce equity					
Ability to produce dividend income					
	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Potential size of the new business venture					
Potential resources of the new business venture					
Potential scalability factor of the new					

business venture					
Potential sustainability of the new business venture	○	○	○	○	○
Potential commitment to research and development by the new business venture	○	○	○	○	○
Potential ability to export by the new business venture	○	○	○	○	○
Stage of development of the new business venture	○	○	○	○	○
Technology enablers of the new business venture	○	○	○	○	○
	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important
Business model of the new business venture	○	○	○	○	○
Business value of the new business venture	○	○	○	○	○
Industry interest in the new business venture	○	○	○	○	○
Potential number of jobs to be created by the new business venture	○	○	○	○	○
Contribution to building community capacity	○	○	○	○	○
Support for the region	○	○	○	○	○
Contribution to protect the environment	○	○	○	○	○

35. Please select the statement that best describes your organization.

- We follow the approach of market pull
- We follow the approach of technology push
- We maintain a balance of technology push and market pull
- I don't know

---

36. Indicate the services your organization provides to clients at your site, either by in-house resources (offered in-house) or through your network of service providers (offered externally); use the right-most column to reflect 'does not currently offer' (not offered).

	Offered In-House	Offered Externally	Not Offered
Advice and assistance with business basics (developing business models, refining business concepts)	○	○	○
Shared administrative or office services	○	○	○
General legal services	○	○	○
Marketing assistance (advertising, promotion, market research, market intelligence)	○	○	○
Accounting or financial management assistance	○	○	○
Networking activities among clients	○	○	○
Specialized equipment or facilities (e.g., computers, machines, software, tools)	○	○	○
Links to higher education resources (e.g., student interns, faculty access, specialized lab facilities)	○	○	○
	Offered In-House	Offered Externally	Not Offered
Human resources support	○	○	○
Shadow advisory board or members	○	○	○

Access to angel investors or angel networks	○	○	○
Access to venture capital investors	○	○	○
In-house investment funds	○	○	○
Accessing commercial bank loans assistance	○	○	○
Intellectual property management (e.g., patent search, patent application, patentability)	○	○	○
Prototyping assistance	○	○	○

	Offered In-House	Offered Externally	Not Offered
Manufacturing practices, processes and technologies assistance	○	○	○
Product design and development practices	○	○	○
Comprehensive business training programs (Training, coaching and mentoring programs)	○	○	○
Assistance with presentation skills	○	○	○
Assistance in licensing agreements	○	○	○
Assistance in networking with others (innovation intermediaries, industries, consultants)	○	○	○
Provide access to public funds	○	○	○
Management of idea generation/solicitation process	○	○	○

	Offered In-House	Offered Externally	Not Offered
Management of invention disclosure	○	○	○
Environmental scan of new inventions/ideas	○	○	○
Invention selection	○	○	○
Invention assessment	○	○	○
Processes and technologies assistance	○	○	○

Comments

Innovation Intermediary — Commercialization Services

37. Please rate the importance of the following objectives to your organization, and simultaneously indicate your organization's performance for the past year (for each of them, if applicable).

Our services aim to...

	Level of importance					Our or perf (Not Poo Outstan
	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important	
Create jobs in the local community (employment in established firm and in new ventures)	○	○	○	○	○	
Diversify local economies	○	○	○	○	○	
Create international partnerships	○	○	○	○	○	
Build or accelerate growth of a local industry sector	○	○	○	○	○	
Help in commercializing technologies	○	○	○	○	○	

Please continue

Our services aim to...

	Level of importance					Our orga perfor (Nothin Poor= Outstandi
	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important	
Help in creating startups	○	○	○	○	○	
Help in creating successful high growth companies	○	○	○	○	○	
Stimulate local manufacturing	○	○	○	○	○	
Increase return on investment (ROI) for clients	○	○	○	○	○	
Increase net wealth for local community	○	○	○	○	○	
Improve quality of life for all people	○	○	○	○	○	

Please continue

Our services aim to...

	Level of importance	Our

	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important	pe (N P Outsta
Generate complementary benefits for the sponsoring or partner organization (e.g., create internships or joint research opportunities)	○	○	○	○	○	
Generate income for our organization as an innovation intermediary	○	○	○	○	○	
Bring the community together to support innovation, entrepreneurship, and startups	○	○	○	○	○	
Encourage entrepreneurship, startup activity, and development	○	○	○	○	○	
Increase client learning (number of people who have gone through our program)	○	○	○	○	○	

Please continue

Our services aim to...

	Level of importance					Our organ perform (Nothing Poor=5 Outstandin
	1 Unimportant	2 Of Little Importance	3 Moderately Important	4 Important	5 Very Important	
Help companies increase their revenue	○	○	○	○	○	
Increase the likelihood for success of clients	○	○	○	○	○	
Promote job retention for local industries	○	○	○	○	○	
Promote local economic development and prosperity	○	○	○	○	○	
Help develop businesses (innovations, new processes, sustainable, competitive advantage)	○	○	○	○	○	
Create sustainable companies	○	○	○	○	○	

38. Please rate the following statements to reflect the extent of influence each has upon the operational approach of your commercialization initiatives.

	1 Very Negative Influence	2 Somewhat Negative Influence	3 Neutral	4 Somewhat Positive Influence	5 Very Positive Influence
Risks associated with the commercialization process influence our operational approach	○	○	○	○	○
University IP (intellectual property) policy influences our operational approach	○	○	○	○	○
University general policy influences our operational approach	○	○	○	○	○
Government regulations influence our operational approach	○	○	○	○	○
The strength of our country's economy influences our operational approach	○	○	○	○	○
Concerns for the natural environment influence our operational approach	○	○	○	○	○
	1 Very Negative Influence	2 Somewhat Negative Influence	3 Neutral	4 Somewhat Positive Influence	5 Very Positive Influence
Our geographic location influences our operational approach	○	○	○	○	○

Our industry sector focus influences our operational approach	○	○	○	○	○
Scarcity of early-stage (seed) risk capital influences our operational approach	○	○	○	○	○
Scarcity of venture capital influences our operational approach	○	○	○	○	○
Market size in our country influences our operational approach	○	○	○	○	○

Innovation Intermediary — Stakeholders

39. In your opinion, as an innovation intermediary, which of the following commercialization phenomena will be more likely to occur coincident with a uni-stakeholder approach versus a multi-stakeholder approach?

(1 star=Never, 2 stars=Rarely, 3 stars=Occasionally, 4 stars=Frequently, 5 stars=Always)

	Uni-stakeholder approach	Multi-stakeholder approach
Radical innovation		
Incremental innovation		
Short-term payback from innovation		
Long-term payback from innovation		
Little return on investment (ROI)		
High return on investment (ROI)		
Low transaction costs to perform commercialization		
High transaction costs to perform commercialization		
Minimal effort toward achieving commercialization		
Tremendous effort toward achieving		

Tremendous effort toward achieving commercialization		

Please continue,

(1 star=Never, 2 stars=Rarely, 3 stars=Occasionally, 4 stars=Frequently, 5 stars=Always)

	Uni-stakeholder approach	Multi-stakeholder approach
Cluster development		
Increased national economic development		
High growth new venture (startup)		
Sustainable new venture (startup)		
More benefits to community		
Support for the status quo		
Challenge to the status quo		

Comments

40. Have you met, read, or heard about another innovation intermediary that operates by maintaining balanced care for all stakeholders? (e.g., adheres to the multi-stakeholder approach) *

- No
- Yes

Innovation Intermediary — Stakeholders

You answered the previous question by selecting YES, could you please help us by sharing the information about this particular example.

41. Please answer the following questions about it:

1. What is the name of that organization?

2. Where is that organization located?

Country

Province/State

3. What evidence is there to support your answer that this organization (innovation in maintaining balanced care for all stakeholders?

Kindly answer in less than 50 words

Innovation Intermediary — Stakeholders

42. From your organization's experience:

Are innovation intermediaries able to maintain balanced care for all stakeholders?

- Yes
- No
- I don't know

Please elaborate on why or why not?

Kindly answer in less than 50 words

43. Assuming that your organization have the know-how to operate successfully with multi-stakeholders by maintaining balanced care for all stakeholders:

a) Are you likely to shift your operation toward a multi-stakeholders approach instead of uni-stakeholder approach?

- Yes
- No
- My organization is already operating based on a multi-stakeholders approach
- I don't know

b) If you answered Yes or No, please elaborate on why or why not?

Kindly answer in less than 50 words

Innovation Intermediary — Stakeholders

44. What are the barriers toward using the multi-stakeholders approach by innovation intermediary organization? (Please list as many as you can)

Kindly answer in less than 50 words.

Personal Demographic Questions for Key Informants:

Please answer the following question about yourself:

45. What is your gender?

- Male
- Female

46. What is your position in the organization?

- Owner
- Founder
- C-level Executive - Chairman, CEO, CFO, CTO, or President
- VP or Director reporting to C-level
- Other management role
- Staff
- Other (please specify)

47. What is the highest level of education you have completed?

- High school or equivalent

- Vocational/technical school (2 year)
- Some college
- Bachelor's degree
- Master's degree
- Doctoral degree
- Professional degree
- Other

The Gifts

Please indicate your interest in receiving a copy of the thesis that will emerge out of this study and to enter the draw for iTunes gift certificate worth $30, by click the following link:

http://www.surveygizmo.com/s3/1608025/The-Gifts

Thank you for your participation.

We are grateful for your participation in this study. As a reminder, the purpose of this study is to understand types of innovation intermediaries and their dominant commercialization paths by focusing on commercialization of research.

You have contributed to the study by providing your perceptions about various types of innovation intermediaries, and the measurement of their activities. Please remember that any data collected from you will be kept confidential. If you are interested in receiving more information regarding the results of this study, or if you have any questions or concerns, please contact me at the contact information listed at the bottom of the page.

… Read More

We have also shared my faculty supervisor's name and contact information at the bottom of the page as an alternative contact if there are questions about the study results or final paper.

We assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision to participate is yours. If you have any comments or concerns resulting from you participation in this study, please contact Dr. Maureen Nummelin of this office at 1-519-888-4567 ext. 36005 or maureen.nummelin@uwaterloo.ca .

Sincerely,

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Appendix M

Summary of Potential Sources of Common Method Biases

Potential cause	Definition
Common rater effects	Refer to any artifactual covariance between the predictor and criterion variable produced by the fact that the respondent providing the measure of these variables is the same.
Consistency motif	Refers to the propensity for respondents to try to maintain consistency in their responses to questions.
Implicit theories (and illusory correlations)	Refer to respondents' beliefs about the covariation among particular traits, behaviors, and/or outcomes.
Social desirability	Refers to the tendency of some people to respond to items more as a result of their social acceptability than their true feelings.
Leniency biases	Refer to the propensity for respondents to attribute socially desirable traits, attitudes, and/or behaviors to someone they know and like than to someone they dislike.
Acquiescence biases (yea-saying and nay-saying)	Refer to the propensity for respondents to agree (or disagree) with questionnaire items independent of their content.
Mood state (positive or negative affectivity; positive or negative emotionality)	Refers to the propensity of respondents to view themselves and the world around them in generally negative terms (negative affectivity) or the propensity of respondents to view themselves and the world around them in generally positive terms (positive affectivity).
Transient mood state	Refers to the impact of relatively recent mood-inducing events to influence the manner in which respondents view themselves and the world around them.
Item characteristic effects	Refer to any artifactual covariance that is caused by the influence or interpretation that a respondent might ascribe to an item solely because of specific properties or characteristics the item possesses.
Item social desirability	Refers to the fact that items may be written in such a way as to reflect more socially desirable attitudes, behaviors, or perceptions.
Item demand characteristics	Refer to the fact that items may convey hidden cues as to how to respond to them.
Item ambiguity	Refers to the fact that items that are ambiguous allow respondents to respond to them systematically using their own heuristic or respond to them randomly.
Common scale formats	Refer to artifactual covariation produced by the use of the same scale format (e.g., Likert scales, semantic differential scales, "faces" scales) on a questionnaire.

Potential cause	Definition
Common scale anchors	Refer to the repeated use of the same anchor points (e.g., extremely, always, never) on a questionnaire.
Positive and negative item wording	Refers to the fact that the use of positively (negatively) worded items may produce artifactual relationships on the questionnaire.
Item context effects	Refer to any influence or interpretation that a respondent might ascribe to an item solely because of its relation to the other items making up an instrument (Wainer & Kiely, 1987).
Item priming effects	Refer to the fact that the positioning of the predictor (or criterion) variable on the questionnaire can make that variable more salient to the respondent and imply a causal relationship with other variables.
Item embeddedness	Refers to the fact that neutral items embedded in the context of either positively or negatively worded items will take on the evaluative properties of those items.
Context-induced mood	Refers to when the first question (or set of questions) encountered on the questionnaire induces a mood for responding to the remainder of the questionnaire.
Scale length	Refers to the fact that if scales have fewer items, responses to previous items are more likely to be accessible in short-term memory and to be recalled when responding to other items.
Intermixing (or grouping) of items or constructs on the questionnaire	Refers to the fact that items from different constructs that are grouped together may decrease intraconstruct correlations and increase interconstruct correlations.
Measurement context effects	Refer to any artifactual covariation produced from the context in which the measures are obtained.
Predictor and criterion variables measured at the same point in time	Refers to the fact that measures of different constructs measured at the same point in time may produce artifactual covariance independent of the content of the constructs themselves.
Predictor and criterion variables measured in the same location	Refers to the fact that measures of different constructs measured in the same location may produce artifactual covariance independent of the content of the constructs themselves.
Predictor and criterion variables measured using the same medium	Refers to the fact that measures of different constructs measured with the same medium may produce artifactual covariance independent of the content of the constructs themselves.

Appendix N

Exploratory Study Findings

Table 5-N-1 Steps that were followed to preform content analysis:

To perform the second phase, organization through multiple steps is essential. Thus the following written instructions when analyzing the content of the collected data:

1. Create a table with multiple columns for each question so all participants' responses to the same question can be displayed together in the same place.
2. Review all data and write the participant's response to each question consistently in one row on the created table.
3. Give a temporary numerical code for each response (for each row in the created table).
4. Sort all responses based on similarities in their explicit and/or implicit meaning.
5. Group all responses that have the exact same explicit or implicit meaning (within the context of each particular question) and display these as one response by dropping all redundancies.
6. Create as many categories as necessary (based on the underlying theory for each particular question) for responses whose explicit or implicit meanings are not exactly the same.
7. Collapse all similar categories into an existing category or into a new expanded or adjusted category that can represent more than one category. The new categories and the collapsed categories should be informed by the theory for that particular question.
8. Review all categories for all questions to identify similar categories.
9. List all categories for each particular question in the first row of its particular table (see step 1), such that for each question, all responses are in one column and all categories are in one row.
10. Categorize all responses one by one, as each response could fit into more than one category.
11. Repeat step 11 by asking at least two independent individuals to categorize all questions independently.
12. Compare the three responses from steps 11 and 12 and combine these into one unique table by following steps 12 a through d:
    a. When there are two or more agreements that a particular response (construct) is part of a particular category, count that categorization in the final unique table.
    b. When there are two or more agreements that a particular response (construct) is not part of a particular category, count that categorization in the final unique table.
    c. Ask each independent individual to check the final unique table for each question and discuss any of the categorizations that do not seem logical.
    d. Repeat step (c) until full agreement has been achieved among the three parties involved in the categorization process.

However, the partial content analysis was performed on some other questions by applying the following steps:

1. Review all data and write each participant's response for each question, using consistent wording.
2. Give a temporary numerical code for each response.
3. Sort all responses based on the similarities in their explicit and implicit meanings.
4. Group all similar responses that have exactly the same explicit or implicit meaning (in the context of each particular question) into one response and eliminate redundancies.
5. Compare the list of suggested responses with the existing provided options for the same question and mark all similar options.
6. Collapse all similar responses into an existing provided option when possible.
7. Repeat steps 3 through 6 until no similarities among options remain.
8. Report additional options and track the options that are collapsed under existing options (by using the temporary numerical code that was created in step 2).

Table 5-N-2 Suggested options from the questions of commercialization paths

Suggestion	Perceived as practices and activities toward commercialization	Perceived as part of the provided options
Suggestion through the phone interview		
Patent application	√	
Joint venture, merger, spin-off		√
Partnership, and business expansion	√	√
Education, capital connections, business advice, market intelligence, and access to office/lab space for clients	√	
Sell existing company, or merger or acquisition		√
Disseminate, publish	√	
Sponsored research for industry	√	
Free (Open Source Licensing), mobilization to personal	√	
Funding groups	√	
Sponsor research contracts	√	
IP assigning	√	
Research sponsoring	√	
Access through provincial government grant	√	
Product development of idea	√	
Joint venture, strategic partnership	√	√
Facilitate knowledge transfer (lunch and learn)	√	
Co-sponsored development with industry	√	
Sell IP		√
Build product		√
Suggestion through the in-person interview		
Support by funding	√	
Collaborative research and partnering	√	
Networking	√	
Publications and student training (knowledge transfer)	√	
Support for firm grow up	√	
Funding	√	
Building of established companies		√
Build product and technology		√
Support companies	√	
Advise clients on how to build company	√	
Invent plus self-commercialize (build technology)	√	√
Build (internal development work)	√	√
Build product		√

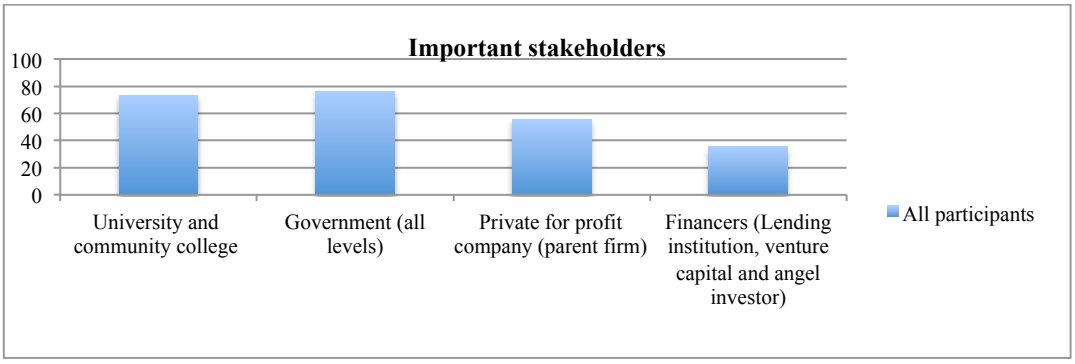
Table 5-N-3 Success performance indicators as reported by each type of IIs.

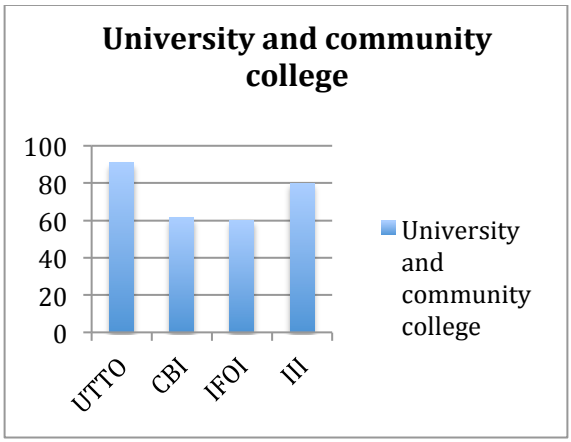
#	Success performance indicators	Direct metrics	Indirect metrics (through clients)	Indirect metrics (through impacts on community and region)
1	Number of startups formed	√		
2	Number of inventions commercialized	√		
3	Number of patents awarded	√		
4	Amount of collected fees for the services	√		
5	Sponsored research funds	√		
6	Number of licenses/options signed	√		
7	Royalties/license fees generated	√		
8	Number of job created		√	
9	Amount of client revenue growth		√	
10	Equity stake in any venture	√		
11	Amount of capital raised (Funding received) by clients		√	
12	Economic impact of the technology on region in term of ROI for the public			√
13	Amount of direct ROI for your organization	√		
14	Customer satisfaction and Reduce customer dissatisfaction	√		
15	Meeting the proposed time line for delivering the Services within the available budget target	√		
16	Supporting existing industry by adding value	√		
17	Number of product launched		√	
18	Amount of cost reduction		√	
19	Number of members (in general)	√		
20	Number of reoccurring clients (they come back for other services)	√		
21	Number of referral thatwegot from my existing clients	√		
22	Number of economic activity created			√
23	Number of development of new technology portfolios	√		
24	Number of new Business wins that are attributed to the new technology			√
25	No of invention disclosures received	√		
26	Regional economic development (in general)			√
27	Number of people using products that was licensing by your organization			√
28	Hours of mentorship	√		
29	Number of participants in provided courses	√		
30	Number of graduated clients	√		
31	Number of engaging PhD employed in industry		√	

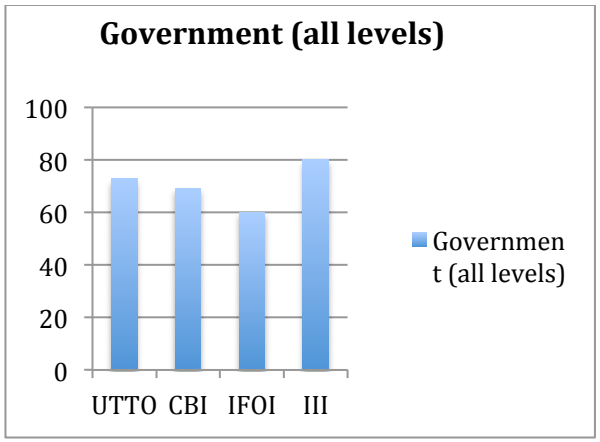
Table 5-N-4 Factors and categories for IIs' contribution toward the development of the region

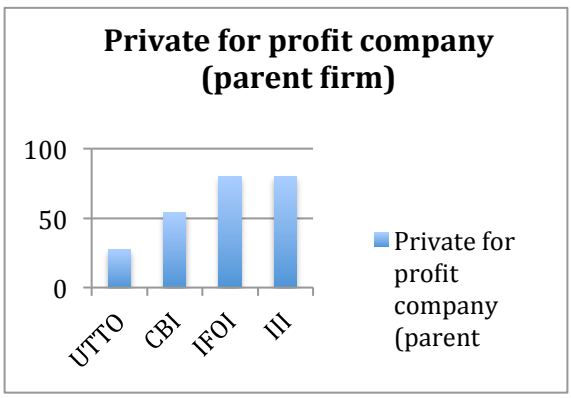
	Our organization/we/they……	Improve commercialization eco system	Help in generating Jobs	Help in region, province and national economic development	Increase revenue and wealth for individual, firms and government
1	Bring the community together around innovation entrepreneurship and startups	√		√	
2	Strengthening or creating the eco system around innovation	√			
3	Cultural contribution	√			
4	Encouraging more entrepreneurship more startup activity more development.	√		√	√
5	Satisfying region need for innovation intermediaries services	√		√	
6	Increase learning (how many people have gone through the program)	√			
7	Creating values	√	√		
8	Making sure tenants are successful				√
9	Job Creation		√		
10	Job retention		√		
11	Employment in established firms		√		
12	Development of engineering opportunities in Canada			√	√
13	Economic prosperity			√	
14	Economic development			√	√
15	Region impact			√	
16	Economic activity into the region			√	
17	Economic impact			√	√
18	Diversification of our economy			√	
19	Focus of the organization	√		√	
20	Helping businesses development (new processes, sustainable, competitive advantage)			√	√
21	Help companies in the area to grow			√	
22	Bringing new business	√		√	
23	Sustainable companies			√	
24	Creating of startups or successful high grow companies			√	√
25	Local manufacturing			√	
26	Bigger reach out to everyone whether they try to make a difference or make an impact (out of the region)			√	
27	Tax revenue (firms, startups, and individuals)				√
28	ROI				√
29	Net wealth				√
30	Increase the quality of life				
31	Wealth creation				√
32	Helping companies increase their revenue				√
Innovation intermediaries types (count for each category)					
1	UTTO (out of 10 UTTOs)	2	6	9	5
2	CBI (out of 9 CBIs)	3	6	6	3
3	IFOI (out of 5 IFOIs)	2	4	4	4
4	IIII (out of 4 IIIs)	4	3	3	3

Table 5-N-5 The four important stakeholders with details of counting for each by II Types









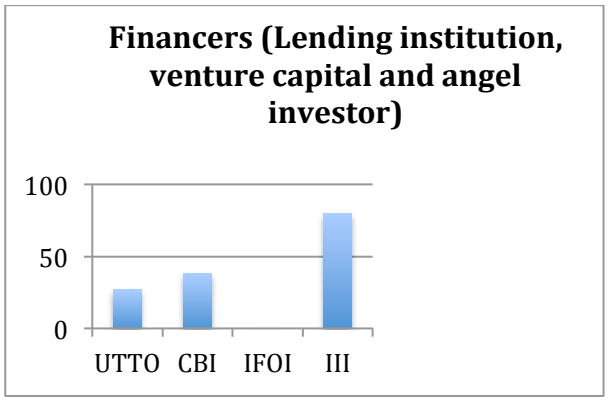


Table 5-N-6 Factors and categories on how to distinguish innovation intermediaries

#	Our organization/we/they……	Internal resources	External resources	Resources by University	Resources by Government	Resources by Parent firm	Resources by Funding partner	Resources by others	Knowledge/Technical sources	Material and physical space sources	Organization sources	Financial sources	Networking sources	Human resources	All other resources	Startup as a client	Established companies (SME and Large) as a client	Entrepreneurs as a client	Professors, researchers, and students as clients	Internal client	External client	Community and society, province, region	Narrow/particular focuses/scope	Broader/general focuses/scope	Stakeholders' characteristics
1	Mostly working with early stage companies (early stage startups)										1					1		1			1			1	
2	Serve startups exclusively															1					1				
3	Mostly working with established companies																1				1			1	
4	Deals with entrepreneurs																	1							
5	Deals with entrepreneurs and SMEs																1	1			1			1	
6	Deals with professors and researchers													1					1	1				1	
7	Focuses on faculty and students as clients													1					1	1					
8	Serve all types of companies (small, medium large and startup)															1	1	1			1			1	
9	Focuses on opportunities that will grow their parent company																1								1
10	Provides services to university and academic community only			1															1						1
11	Provides commercialization services to internal clients only (internal to you)	1																		1					
12	Provides commercialization services to external clients																				1				
13	Provides service to all those who have commercial idea regardless of their affiliation															1	1	1	1	1					
14	Focuses on clients who have invention and would like to move it to market																1		1		1				
15	Need to have a good reputation in the startups' community															1					1				
16	Think of creating profit as the most important criteria of clients																	1		1					
17	Think of social benefits as the most important criteria of clients															1	1	1	1			1			
18	Success is associated with the success of startups (entrepreneurs)															1		1			1				
19	Need to have a good reputation in the inventors' community															1			1		1				
20	Focuses on client who are seeking funding											1						1			1				
21	Focuses on commercializing IP innovation that was generated through the community (internal and external clients)															1	1			1	1	1			
22	Has stakeholder who is seeking commercialization for the purpose of research commercialization			1					1	1	1		1	1					1						1
23	Tend to focus on investigator/ researcher (academic) needs in order to commercialize	1		1						1	1								1						
24	Focuses on commercializing IP innovation that was generated through the internal clients only																			1					
25	Success is associated with the success of new products (inventors, and final customers)															1									
26	Has stakeholder who is seeking commercialization for the purpose of product development					1				1		1	1	1											1
27	Focuses on client who are seeking IP patent protection & Market Research															1	1	1		1	1				

#	Our organization/we/they……	Internal resources	External resources	Resources by University	Resources by Government	Resources by Parent firm	Resources by Funding partner	Resources by others	Knowledge/Technical sources	Material and physical space sources	Organization sources	Financial sources	Networking sources	Human resources	All other resources	Startup as a client	Established companies (SME and Large) as a client	Entrepreneurs as a client	Professors, researchers, and students as clients	Internal client	External client	Community and society, province, region	Narrow/particular focuses/scope	Broader/general focuses/scope	Stakeholders' characteristics
28	Tend to focus on industries needs in order to commercialize																				1			1	
29	Focuses on customer needs that can be satisfy by selecting the best available technology to be moved to market																								1
30	Focuses on very focused clients segment																			1	1		1		
31	Focuses on diverse clients (startups, mid sized companies, multinationals, professional services, academic institutions…etc)															1	1	1	1	1				1	
32	Focuses on opportunities that will start and grow their client's companies																				1				1
33	Focuses on opportunities that will grow their parent company		1			1			1																
34	Focuses on client success																								1
35	Is required to report to government as one of their main stakeholder				1																				
36	Need to satisfy government (external)				1																1				
37	Has obligation to support public good in order to satisfy government				1																1	1			1
38	Report to large general board (heterogeneous)																					1		1	1
39	Report to focused board of governors (homogeneous)																						1		1
40	Report our success metrics in order to satisfy shareholders	1																							
41	Report our success metrics in order to satisfy funding partner(s)						1																		
42	Is part of a corporate structure	1			1																				
43	Is not part of a corporate structure (independent)				1													1	1						
44	Private single ownership					1																			
45	Public ownership (many stakeholders)	1			1							1							1						
46	Is a public organization (has the government, people and the academic to satisfy)				1			1					1						1						
47	Receive funds from public sources		1				1					1													
48	Is funded by government		1		1		1					1													
49	Is Self funded (independent)	1					1																		
50	Is funded by external entities (many sources)		1									1													
51	Receive funds from private sources	1				1	1					1													
52	Receives support from private sectors	1				1	1		1	1	1	1													
53	Receives support from public sectors (Primarily money, other things like expertise and networks)		1	1	1							1	1	1											
54	Need to satisfy investors and mentors as they provide fund and mentorship respectively		1				1				1	1	1												
55	Need to satisfy government as they provide fund		1		1							1													
56	Receives operational fund from parent firm and government	1	1		1	1						1													
57	Has obligation to support the associate firm or organization in order to satisfy them			1		1																			
58	Mandate to satisfy one particular stakeholder	1				1																			1
59	Mandate to satisfy single stakeholder	1		1		1																	1		
60	Mandate to satisfy multiple stakeholder			1																				1	1
61	Mandate to satisfy single stakeholder (parent firm or					1																	1		1

#	Our organization/we/they……	Internal resources	External resources	Resources by University	Resources by Government	Resources by Parent firm	Resources by Funding partner	Resources by others	Knowledge/Technical sources	Material and physical space sources	Organization sources	Financial sources	Networking sources	Human resources	All other resources	Startup as a client	Established companies (SME and Large) as a client	Entrepreneurs as a client	Professors, researchers, and students as clients	Internal client	External client	Community and society, province, region	Narrow/particular focuses/scope	Broader/general focuses/scope	Stakeholders' characteristics
	organization)																								
62	Mandate to satisfy multiple stakeholder (Government and community)		1		1																	1			
63	Is required to make balance in order to satisfy multiple stakeholders (inventors and industries)	1		1																					1
64	Mandate to satisfy single stakeholder (company clients)																								1
65	Tend to have more moral stakeholders versus strategic stakeholders				1								1											1	1
66	Tend to have more strategic stakeholders versus moral stakeholders			1		1			1	1															1
67	Have more focused (homogeneous) stakeholders			1		1																	1		
68	Have more diverse (heterogeneous) stakeholders				1		1	1																1	1
69	Has limited capability to deal with and satisfy many stakeholders																								1
70	Has capability to deal with and satisfy many stakeholders																								1
71	Has individual's employees or employers who are vital for their survival					1																			1
72	Is required to satisfy many stakeholders	1	1	1	1																				1
73	Offers commercialization services																								1
74	Is required to disclose information publicly					1															1				
75	Mandate to satisfy the community				1																	1			
76	Has support that is not limited to a particular region, it is more toward province or national mandate	1																				1			
77	Support local economic prosperity																					1			
78	Aim to have good connection with broad local industry community																1					1		1	
79	Aim to have good connection with researcher community																		1	1		1	1		
80	Tend to have a closed network												1							1			1		
81	Tend to be highly networked												1								1	1		1	
82	Gives high weight for finding collaboration partners																								
83	Has less structured stakeholder network			1	1																			1	1
84	Has more structured stakeholder network			1		1					1												1		

Table 5-N-7 Factors and categories on innovation intermediaries' selection process criteria.

#	Our organization/we/they……	Focus on technology/idea/invention	Focus on Market/commercial/customers	Focus on Individual/entrepreneurs	Focus on company/startups/new venture/parent firms	Focus on funding/ money
63	No criteria					
1	Coachable individual, (are they willing to take advices)				**1**	
2	Individual trait (focus, passion, enjoy it)					
3	Quality of team			**1**	**1**	
4	Entrepreneur assessment (check his capacity to learn)			**1**		
5	People (proposed management team) (if they are cooperative)			**1**	**1**	
6	Entrepreneur Skills			**1**		
7	Ownership criteria (willing to work with us, some fund consideration)			**1**		**1**
8	Interesting in startup enterprise					
9	They should work on developing a technology	**1**		**1**		
10	Leadership reputation of individual			**1**		
11	Do they export? And do they have a strong commitment to research and development	**1**			**1**	
12	Innovation assessment	**1**				
13	Innovative	**1**			**1**	
14	Quality of idea	**1**				
15	Form of patent protection (patentability)					
16	Check if there is any existing similar invention	**1**				
17	Time to innovation to the market and complexity	**1**	**1**			
18	Strong science+ technology foundation (not service providers)	**1**				
19	Idea (Potential to work)	**1**	**1**			
20	Is it a novel process or technology	**1**	**1**			
21	Beyond R&D (late stage, i.e. not early stage)	**1**				
22	Development Stage	**1**				
23	Do financial analysis; to see how much money and energy, material it will save	**1**				**1**
24	Create more value (more then just have Job)		**1**			
25	Technology should be within the key sector that we work on	**1**				
26	Technical merit	**1**				
27	Idea (and its IP)	**1**				
28	Quality of the sciences	**1**				
29	Technology portfolio	**1**				
30	Competitive edge (to prevent Competitive from using that technology)	**1**				
31	Have licensing potential				**1**	
32	New technology, new innovation but not services	**1**				
33	Potential for helping society (society impacts)	**1**				
34	Anticipate magnitude	**1**				
35	Commercial ability (viability)		**1**			
36	Potential Market (Business idea) (Is there a customer requirement)		**1**			
37	Market viability of the innovation		**1**			
38	Commercial merit of the opportunity (Technology, target market, and what problem will be solved in the market)	**1**	**1**			

#	Our organization/we/they……	Focus on technology/idea/invention	Focus on Market/commercial/customers	Focus on Individual/entrepreneurs	Focus on company/startups/new venture/parent firms	Focus on funding/ money
39	Market opportunities (is the market significant enough?)		1			
40	Commercial promise (potential)		1			
41	Innovation based business	1			1	
42	Technology base (they have core IP)	1				
43	It has High Growth potential					
44	Scalability (company)				1	
45	It has resources (people, money and prototype)		1	1	1	
46	Stage of the company (Early-stage venture, ….)				1	
47	Sustainability				1	
48	Sustain beyond the existence of the founder (i.e. the business should be able to sustain even if the founder leave)				1	
49	It has a business model (toward a sustainable enterprise		1		1	
50	Business Value				1	
51	It has a financial production (Cash Follow)				1	1
52	Economic Sense				1	1
53	ROI				1	
54	Size, they have to have more than 15 employ's. For us to really be able to help them				1	
55	Are they incorporated? So for me if they are not incorporated then,wedon't think they really want to grow.				1	
56	Size of opportunity (at least regional, provincial level and it better if it is National & global perspective)				1	
57	Potential for helping society (society impacts)					
58	Industry interest (receptors, the vehicle which move the invention to market)	1	1		1	
59	"Will this enable the parent firm to grow the business?	1			1	
60	A new incubator, thus they accept all applicants					
61	Unofficial process					
62	Do they have SRED claims? Because if they don't files SRED claims thanweknow that they have very little investment into R and D, We `just really can't help them.				1	

Table 5-N-8 Factors and categories on distinguishing innovation intermediaries' selection process criteria.

	Our organization/we/they……	Focus on technology/idea/invention	Focus on Market/commercial/customers	Focus on Individual/entrepreneurs	Focus on company/startups/new venture/parent firms	Focus on funding/ money	Narrow/particular focuses/scope	Broader/general focuses/scope	Innovation Intermediaries characteristics toward practices	Innovation Intermediaries characteristics toward evidences	Innovation Intermediaries characteristics toward criteria	Community and society, province, region	Selection process practice	Selection process evidence
1	Care for individual and the quality of the idea regard less of the origin of the idea	1		1							1		1	
2	Focus on novelty of the idea (technology)	1											1	
3	Focus on technology maturity (development)	1											1	
4	Focus on concept potential of the idea	1											1	
5	Focus on potential opportunity	1	1					1					1	
6	Focus on the technical and science component (opportunity)	1					1						1	
7	Focus on Academic contribution of the idea	1											1	
8	Open to idea/ technology that are in research stage	1											1	
9	Focus on technology/idea that has Scientifically established criteria only	1					1			1			1	
10	Focus on Ideas that emerge from inside the university	1						1			1		1	
11	Have less focus on business model and more focus on academic idea	1											1	
12	Focus more on Radical innovation	1					1				1		1	
13	Focus on disruptive Innovation only	1						1			1		1	
14	Focus on both Incremental & disruptive Innovation	1						1					1	
15	Select an early stage of development of a product or technology	1									1		1	
16	Select more refined business plan development (prototype stage)		1				1				1		1	
17	Select invention that has high likelihood for success	1	1					1			1		1	
18	Deal with invention that has high risk (tolerance)	1											1	
19	Open to entrepreneurial ideas (patent is not necessary)	1		1									1	
20	Focus on intellectual property (patent ideas)	1					1						1	
21	Focus on technologies/ideas that are patentable	1						1					1	
22	Follow the approach of technology push	1	1					1					1	
23	Open to innovative and unproven idea (Twitter)	1			1								1	
24	Focus on idea/ technology that will solve an existing problem (clean water, you know something from the environment.) regardless its cost or amount of revenue	1			1							1	1	
25	Focus on idea/ technology that has market and will lead to reduce cost	1	1		1			1					1	
26	Focus on idea that required less fund	1				1							1	
27	Open for idea that required more fund	1				1							1	
28	Focus on technologies/ideas that aligned with parent firm scoop	1			1		1						1	
29	Check if the idea/ startup has viability to get fund				1								1	
30	Focus on how complicate is the process of commercialization the invention	1			1			1					1	
31	Focus on how it is potential to finding licensee and receptors.	1	1		1			1					1	
32	Focus on individual/startup's ability to pay the services fee (Private II)			1	1								1	
33	Select clients who have ability to pay for the services	1			1								1	
34	Care for individual being coachable, and the quality of the idea regard less their ability to pay the services fee	1		1	1								1	
35	Deal with Coachable people only			1				1					1	
36	Focus on individual skills and traits			1	1								1	
37	Serve the community regardless their affiliation (public services)			1	1			1			1	1	1	
38	Serve the University and hospital that are associated with us		1	1			1	1			1		1	
39	Clients make their own self selecting decisions to joint a particular II		1	1	1						1		1	
40	Have open criteria (client to have the commitment to have the idea and effort to work)		1		1			1					1	
41	Focus on particular market (as part of its internal requirements)		1				1						1	
42	Focus on external general market (has no internal market interest)		1					1			1		1	
43	Focus on market viability		1										1	
44	Focus on market assessment and technology fit	1	1				1						1	
45	Follow the approach of market pull		1										1	
46	Focus on idea/ technology that has proven market		1					1			1		1	
47	Open to idea/ technology that has potential market	1	1					1			1		1	
48	Select project based on its highest probability of business success		1		1			1		1			1	1
49	Focus on potential number of job creation		1					1		1		1	1	
50	Focus on how idea/startup will contribute to building community capacity									1		1	1	
51	Focus on client Growth (client learning)				1			1			1	1	1	
52	Focus on companies/startups that have potential growth and sustainability			1	1			1			1		1	
53	Focus on profitability		1		1								1	
54	Focus on profits and ROI												1	
55	Focus on ROI (revenue and sustainability.)		1										1	
56	Focus on ROI with other criteria		1		1						1		1	

57	Focus on ROI $ (Cash/Money) for the sake of client		1								1		1	
58	Focus on ROI $ (Cash/Money) for the sake of II		1		1								1	
59	Focus on idea's/startup's economic viability	1	1		1								1	
60	Focus on economic model (ready business model + financial sense)		1		1								1	
61	Focus on startup ability to produce dividend income				1						1		1	
62	Focus on startup ability to produce equity				1						1			
63	Use less evidence during the assessment of project selection												1	1
64	Use more evidence during the assessment of project selection									1				1
65	Have committee-based decisions to accept new client and invention		1		1						1		1	
66	Have the capability to assess the new idea/startup internally (people, and expertise)	1			1		1						1	
67	Need to consult with others (external) in order to assess the new idea/startup	1			1				1				1	
68	Select based on the partner selection criteria particularly when they have established processes				1				1		1		1	
69	Select based on the partner established experience level, (experience that has been communicated clearly, so II knows what they are looking for. So they have a certain skills or talent, of their leaders of their researchers.)				1						1		1	
70	Have (with other II in region) unique single intake process to select new companies	1									1		1	
71	Use their Industry specialized expertise toward assessing the new idea/technology	1			1		1		1				1	
72	Use their general expertise toward assessing the new idea/technology	1			1								1	
73	Use team based decision process								1		1		1	
74	Use Individual based decision process								1		1		1	
75	Have no selective process, introduce advisory services to all (They will serve anybody)								1				1	
76	Is open in selecting projects from a wider geographic region								1			1	1	
77	Have strict criteria (judging, rating, ranking and pitching the idea)										1			
78	Have formal processes in place to assess viability (office will be responsible for that as they need to fill a patent)								1		1		1	
79	Have less formal processes (client will be responsible about that as he will devote time, efforts and maybe money)								1				1	
80	Have very focused mandate						1		1				1	
81	Have a general mandate							1	1		1		1	
82	Focus on supporting the region										1	1	1	
83	Open to commercialization potential across multiple sectors (across multiple sectors and discipline)								1				1	
84	Select few projects (idea/technology)	1							1				1	
85	Deal with large number of projects (idea/technology)								1		1		1	
86	Deal with internal stakeholders								1				1	
87	Deal with external stakeholders								1				1	
89	Provide services for free					1								
90	Use Justification based funding (nonprofit organization, funded from the top down)					1								
91	Use Value based funding (private sector organization, funded from bottom up.)					1								
92	Focus on the technical, science and market component (opportunity)	1	1		1								1	

Table 5-N-9 Innovation Readiness Categories

#	Category	Description	Significant*
1	Focus on technology/idea/ invention	**Indicators:** Participant explicitly or implicitly mentions 'technology/idea/invention' as important criteria.	√
		For example, many innovation intermediaries mentioned that to select an idea, they focus on its patentability, quality, novelty, maturity, and origination. As well, innovation intermediaries focus on the nature of the idea - incremental, radical, or disruptive - and investigate the concept, scoop, and potential required funding for the idea. Technical, scientific, and market components of the idea are also important. Finally, IIs indicate that they assess the potential impact of the idea from academic, economical, and developmental perspectives.	
2	Focus on market/ commercial/ customers	**Indicators:** Participant explicitly or implicitly mentions that market commercialization and customers are important criteria.	Very potential
		For example, many innovation intermediaries expressed that to select an idea, they focus on its market potential opportunities, market viability, market scoop, likelihood of market success, and potential receptors (licensee). Additionally, innovation intermediaries focus on how an idea will reduce costs compared with existing product (if applicable) and how the business model will add value to potential customers. In addition, innovation intermediaries investigate the expected revenue, profitability, and return on investment (ROI). Technical, science and market components of an idea are very important and are used to assess the technology and market fit.	
3	Focus on individual/ entrepreneurs	**Indicators:** Participant explicitly or implicitly identifies people, entrepreneurs, owner/founder of startup, inventors, or characteristics as important criteria.	√
		For example, many innovation intermediaries noted that to select an idea. they assess the inventor or entrepreneur by focusing on affiliations, skills, and traits of the individual. In addition, participants state that individual coachability and in some cases individual ability to pay for the services are assessed.	
4	Focus on company/startups / new venture/ parent firms	**Indicators:** Participant explicitly or implicitly identifies business model/plan, company growth, receptors, and parent firm as important criteria. As well, participant identifies financial issues for a company such as sales, revenue, and ROI.	Very potential
		For example, many innovation intermediaries mentioned that to select a client, they focus on the company entity. Company entity could mean new venture (startups), receptors for the invention (any established companies), or parent firm. Innovation intermediary participants assess company scoop, growth, sustainability, cash flow, sales, revenue, and ROI. As well, innovation intermediaries focus on a company's ability to produce equity and dividend income and serve the community and the region. In addition, innovation intermediaries investigate the company's ability to pay for the services.	
5	Focus on funding/ money	**Indicators:** Participant explicitly or implicitly identifies money, funds, loans, or venture capital as important criteria.	√
		For example, many innovation intermediaries noted that to select an idea, they assess the required funds by focusing on amount of funds and on whether or not that amount will have potential to be accepted by a loan and venture capital organization.	
*Result shows a significant difference in means among IIs regarding that particular category.			

Table 5-N-10 Innovation Intermediary Services

Participants were asked a question that addresses some important strategies that innovation intermediaries used when providing services. It was an interrogative question that consisted of six parts.

The results show that out of the six strategies that some innovation intermediaries apply, only UTTO types differed significantly from the other innovation intermediary types in terms of collecting royalties/license fees (P = 0.001) and in receiving an equity stake in any venture that they helped to create (P = 0.003). For example, 10 out of 11 (91%) innovation intermediaries from the UTTO type claim that they collect royalties/license fees as compensation for their facilitation in commercializing innovation, while 25% or less for each of the other three types indicated that they accept such compensation. Similarly, 8 out of 10 (80%) of the UTTO type claimed that they receive an equity stake in ventures that they help to create, while 20% or less for each of the other three types indicated that they do so. No other significant differences were found.

Innovation intermediaries corresponding to categories of innovation intermediaries' services strategies

Categories		UTTO	CBI	IFOI	III	Total	Fisher's exact test
Do you collect fees for any provided services?	Yes	6	8	3	5	22	0.374
	No	5	5	2	0	12	
	Total	11	13	5	5	34	
Do you provide any type of funding to clients?	Yes	7	6	2	3	18	0.775
	No	4	7	3	2	16	
	Total	11	13	5	5	34	
Do you collect any royalties/license fees?	Yes	10	2	1	1	14	0.001*
	No	1	11	3	4	19	
	Total	11	13	4	5	33	
Do you receive an equity stake in any venture you help to create?	Yes	8	2	0	1	11	0.003*
	No	2	11	4	4	21	
	Total	10	13	4	5	32	
Do you conduct research on client inventions to create additional value in products, services or applications?	Yes	8	6	3	1	18	0.23
	No	3	7	1	4	15	
	Total	11	13	4	5	33	
Do you perform development on existing inventions to create additional value in products, services or applications?	Yes	6	3	4	1	14	0.097
	No	5	10	1	4	20	
	Total	11	13	5	5	34	
*Results indicate a significant difference in means among IIs in terms of that particular strategy							

Table 5-N-11 Factors and categories to distinguish innovation intermediaries' practices

	Our organization/we/they……	Licensing practice	Patent management practice	Selection process practice	Financial management practice	Business model/plan practice	Funding practice	Invention disclosure/ idea generation practice	Millstone process/ gate process practice	Networking practice	Benchmarking practice	Coaching, mentoring, training and education practice	Prototyping practice	Physical space and administration practice
1	Provide mentoring											**1**		
2	Create a mentorship program for each individual company (educate them the entire eco system, it is individualized and specialized (one to one))											**1**		
3	Provide business consulting, business mentoring					**1**						**1**		
4	Provide coaching											**1**		
5	Provide coaching and networking for clients to present and describe what their product is in front of investors to raise investment. (Sales and pitch coaching)						**1**			**1**		**1**		
6	Providing a commercially focused environment. (Coaching)											**1**		
7	Provide focused workshops including peer-to-peer groups (help all the sales people together, help all the marketing people together etc)											**1**		
8	Sharing expert opinion (Coaching)											**1**		
9	Provide valuable information and tool through the web (very active)									**1**		**1**		
10	Provide education training and workshops (is one to many and its more generalized help)											**1**		
11	Provide general entrepreneurship education (It is really focused on crisp education materials targeted at early stage entrepreneurs); (They learn how to raise money, how hire, to compete, some basic planning, and business model issues)				**1**	**1**	**1**		**1**			**1**		
12	Provide training through community competitions (how to attract and get fund)						**1**					**1**		
13	Provide workshops (Government funding)						**1**					**1**		
14	Help in skill development through collaborative, actual projects, and teamwork. (Learn how to talk to a customer how do I get on the phone and do sales calling, how do I develop a landing page and so on)									**1**		**1**		
15	Dedicate product development resources to move technology forward and develop them					**1**								
16	Help in pursing prototype development by writing a proposal to apply for government programs that Universities are eligible for, to get money to de-risk the opportunities and build the first prototypes; that will help in making the opportunities more tangible and will increase its likelihood of being able to license.	**1**					**1**						**1**	
17	Work with plant to implement (Prototyping)												**1**	
18	Help in building MVP (Minimum Viable Product)											**1**	**1**	
19	Validate prototypes											**1**	**1**	
20	Do market assessment			**1**										
21	Do market analysis toward intellectual property (IP) strength.		**1**										**1**	
22	Do market feasibility			**1**									**1**	
23	Creating marketing materials (report) for each invention (patent)	**1**	**1**	**1**									**1**	
24	Provide market research													
25	Provide market intelligence.												**1**	
26	Do a thorough technology assessment or assess a variety of technologies up front and try to de-risk early (market de-risk)			**1**									**1**	
27	Help in market traction process (receiving valuable feedback from their first beta customer; for example I like the speaker, I don't like the speaker, can't use it in this way or environment, need to use it whatever…etc. So client listens to the beta customer feedback and made changes in their feature or whatever to actually move the product from the beta stage to the actual commercialization stage, and the evidence would be their first real sale)			**1**					**1**				**1**	
28	Encourage customer interaction (feedback) again we don't formalize that stuff, however this practice help client to accelerate the matching of their product to their market by interact with customer and hear their feedback on their product)			**1**									**1**	
29	Have a robust selection process.			**1**										
30	Keep balance of technology push and market pull													
31	Do assessment of the opportunity (patentability, commercial viability and market assessment		**1**											
32	Do diligence with sector expertise,(well developed diligence practice)													
33	Do a thorough technology assessment or assess a variety of technologies up front and try to de-risk early (Value de-risk)			**1**									**1**	

	Our organization/we/they……	Licensing practice	Patent management practice	Selection process practice	Financial management practice	Business model/plan practice	Funding practice	Invention disclosure/ idea generation practice	Millstone process/ gate process practice	Networking practice	Benchmarking practice	Coaching, mentoring, training and education practice	Prototyping practice	Physical space and administration practice
34	Do rigorous bench marking up front (understand who the players are currently, look at adjacent technologies that can move in to that space, check what other players might move in to that space and where they fit in terms of their competencies and expertise) (environmental scan)		1	1				1			1			
35	Evaluate an idea			1										
36	Evaluation of the invention by searching patent databases		1											
37	Help in developing business planning (one-page business plan)					1								
38	Assess, review and repair the business plan (just to ensure that, based on our expertise that we feel that the business plan is complete and that it makes sense for the business.)					1								
39	Help the company develop the best possible business model					1								
40	Check the financial status (forecast)				1									
41	Provide help toward technology development and financial plans.				1		1							
42	Do patent management		1											
43	Help in patent searches		1											
44	Do patent management (protect)		1											
45	Do patent protections (patentability and protect our patenting)		1											
46	Do IP management		1											
47	Use networking to license	1								1				
48	Identify the receptors that match with invention (technology) (use business databases, find the robustness of the company, how successful it is in introducing new products and how open they are to acquiring technologies from outside their own organization)		1			1					1			
49	Introduce companies to potential customers, investors, R&D partners, potential employees (Brokering)													
50	Do coordination with the university and then coming to an agreement on a commercialization plan.					1				1				
51	Produce licensing mechanisms (negotiate licenses to our benefit and exclusive licenses)	1	1											
52	Help in licensing agreement,	1	1											
53	Do license IP.	1												
54	Providing a commercially focused environment. (Space).													1
55	Offering the environment (space)													
56	Help in idea generation process (based on marketing opportunity, based on investment requirement)			1	1		1	1				1		
57	Help in soliciting ideas from internal employee in order to do things better							1						
58	Are seeking invention disclosure							1						
59	Do evaluation of invention disclosures			1										
60	Validate the concept			1										
61	Do assessment of disclosures (have more formalized structure process to assess new disclosures)			1										
62	Leveraging public funds						1							
63	Help in finding funding to develop the idea				1		1							
64	Help in getting government fund program				1		1							
65	Help clients in getting funding by advising them how to do it (First we tell them what government funding is available for their specific IP and then we walk them through how to get the funding.)		1				1					1		
66	Provide money (Seed fund)						1							
67	Participate in proportion of fund (we strongly believe that the proponent that should be investing funds along with CRIBE and there should be equal risk taking by the two parties.)						1							
68	Help in the establishment of strategic partner for collaboration with other innovation intermediaries													
69	Link plant with innovators (networking)									1				
70	Are supporting industries sponsor research (build up the relationship to industries)													
71	Help in networking (we give them connections to industry)													
72	Establish a solid pipeline of commercialization by having face to face meetings (walking the halls program) with our researchers									1		1		
73	Connect clients to the HR									1				
74	Encourage peer collaboration (encouraging and enforcing people to collaborate with peers in the building, and with our network in terms of getting people to share and talk about their project, product, difficulty…etc)											1		

	Our organization/we/they……	Licensing practice	Patent management practice	Selection process practice	Financial management practice	Business model/plan practice	Funding practice	Invention disclosure/ idea generation practice	Millstone process/ gate process practice	Networking practice	Benchmarking practice	Coaching, mentoring, training and education practice	Prototyping practice	Physical space and administration practice
75	Bring together all the various contributors to cluster development (bringing together all of the players for the benefit of helping companies grows, we don't do commercialization on our own, we know we need other innovation intermediaries, we need private companies, we need academic research we need professional service firms, we need capital providers, we need all of these inputs to build a robust cluster) because a robust cluster produces more companies and more commercialization so it feeds itself.						**1**			**1**				
76	De-risk demonstration project. (Help in reviving the timber industry)											**1**		
77	Do collaboration on the development by working together with suppliers. (Let's make some changes. Let's improve the quality of the product and save money)													
78	Project milestones to be met (gate process timeline projects)								**1**					
79	Help in and follow up on stage gate process (which is going from the concept to the finished product.)		**1**				**1**	**1**	**1**				**1**	
80	Create new ventures													
81	Help in develop and then follow up with companies the milestones toward well established startup					**1**		**1**		**1**				**1**
82	Help toward the success of our tenants											**1**		
83	Help in the leverage of government entities, like OCE. So we use IRAP, research collaboration 0..etc								**1**			**1**		
84	Help based on business types. (There's two kind of entrepreneurs, the first is to have their business as their source of income and they are happy to make a hundred thousand dollars an year and to run their own business, but we have other businesses that hope to build it up and then sell it to somebody, you know the serial entrepreneurs that are constantly wanting to create something new and you know they work on a project they want to sell it or whatever and then start a new project and then you've got the folks who, that one business is their passion in their life and they just want to do that forever so that gives me some clarification on what kind of support they need and how we're going to move forward because they are going to need help if you want to build something to sell it)		**1**		**1**	**1**	**1**			**1**			**1**	**1**

Table 5-N-11 Factors and categories to distinguish IIs' relevant information searching

	Our organization/we/they……	Internal relevant information	External relevant information	Search information for self operation	Search information to help clients	Internal ability/capability to search for relevant information	Internal/External network	Networking events/meeting/teamwork	Usage of network to exchange information	Ability to use information itself to understand	Ability to connect the acquired information with existing information	Capability to use acquired information in practical work	Resources to develop prototype	Capability to develop prototype	Practice to search for relevant information	Narrow/particular focuses/scope	Broader/general focuses/scope
1	Has first hand knowledge of industrial applications	**1**				**1**											
2	Has indirect or third hand knowledge of industrial applications		**1**	**1**	**1**												
3	Concentrate on and have more information of Intellectual property	**1**		**1**							**1**	**1**			**1**		
4	Concentrate on and have more information of Market Knowledge	**1**		**1**		**1**					**1**	**1**					
5	Has first hand or hard knowledge of business data	**1**		**1**		**1**											
6	Has secondary or indirect or third hand knowledge of business data		**1**														
7	Depend on internal knowledge base	**1**				**1**				**1**		**1**					
8	Have and own extended Information Resources (various online databases)	**1**				**1**					**1**				**1**		
9	Relay on past experience as it is rarely business that comes along that we have not seen some similarity in the past	**1**		**1**		**1**				**1**	**1**	**1**			**1**		
10	Looks for information for startups (development stage)		**1**	**1**	**1**						**1**	**1**			**1**	**1**	
11	Look for information for early stage research (discovery stage)		**1**	**1**	**1**	**1**				**1**	**1**	**1**			**1**	**1**	
12	Focus on entrepreneurs relevant information		**1**	**1**	**1**	**1**				**1**	**1**				**1**	**1**	
13	Focus on development of the business (practical side, look for more tangible things like the potential for profit)				**1**	**1**					**1**	**1**				**1**	
14	Focus on research, technology and licensing relevant information			**1**	**1**	**1**					**1**	**1**			**1**		
15	Focuses on information that is relevant to their general mandate to support entrepreneurship				**1**	**1**									**1**		**1**
16	Focus on Intellectual property relevant information				**1**						**1**	**1**			**1**	**1**	
17	Focuses on specialized information relevant information (for example, clear patent search)				**1**	**1**					**1**	**1**			**1**	**1**	
18	Focused on the funding practice relevant information (receiver of ideas)		**1**								**1**	**1**			**1**	**1**	
19	Focuses on information that is relevant to funding Research										**1**	**1**			**1**	**1**	
20	Focused more on the research practice relevant information (Look for ideas)										**1**				**1**	**1**	
21	Focused on information that is relevant to in house ideas	**1**		**1**		**1**				**1**						**1**	
22	Focused on information that is relevant to outhouse ideas		**1**							**1**	**1**				**1**	**1**	
23	Facilitate at an initial stage by focusing on information that is relevant research, idea, technology					**1**									**1**		
24	Focuses on information that is relevant to commercialization of research				**1**					**1**	**1**	**1**			**1**		**1**
25	Focuses on general business advisory relevant information				**1**												**1**
26	Focus on information that is required by the researchers within the institution			**1**	**1**	**1**				**1**	**1**						
27	Part of university and research network (more concerned with the technology coaching and expertise)				**1**	**1**	**1**		**1**	**1**	**1**				**1**		
28	Part of business network (gives access to expertise from people, coaching programs and more concerned with the business expertise.)					**1**	**1**	**1**	**1**	**1**						**1**	
29	Focus on information to help Researching and developing products improving processes										**1**			**1**		**1**	
30	Facilitate growth by focusing on information that is relevant to market, sales, networking and finding funding, business plan …etc				**1**						**1**						**1**
31	Focuses on information that is relevant to their commercial mandate			**1**		**1**					**1**				**1**	**1**	
32	Focus on market and business relevant information				**1**	**1**					**1**					**1**	
33	Focus on academic research (more holistic view, what impact would this add to the academic field)					**1**											
34	Have more concerned about the strengths of the technology and less concerned about the strength of the business model			**1**												**1**	
35	Have less concerned about the strengths of the technology and more concerned about the strength of the business model			**1**												**1**	

	Our organization/we/they……	Internal relevant information	External relevant information	Search information for self operation	Search information to help clients	Internal ability/capability to search for relevant information	Internal/External network	Networking events/meeting/teamwork	Usage of network to exchange information	Ability to use information itself to understand	Ability to connect the acquired information with existing information	Capability to use acquired information in practical work	Resources to develop prototype	Capability to develop prototype	Practice to search for relevant information	Narrow/particular focuses/scope	Broader/general focuses/scope
36	Focuses on the academic value of the idea/project (has academic experiences)					**1**						**1**			**1**	**1**	
37	Focuses on the business value of the idea/project (has industrial experiences)										**1**	**1**				**1**	
38	Have specific and specialized scope, thus searching for relevant information is easier and manageable										**1**				**1**	**1**	
39	Have general and open scope, thus searching for relevant information is harder and unmanageable																**1**
40	Is searching for relevant information by focusing on local ecosystem aspect (network)						**1**	**1**	**1**						**1**		**1**
41	Is searching for relevant information by focusing on market aspect						**1**	**1**	**1**		**1**				**1**	**1**	
42	Have narrow and deep focus in terms of access to information and in terms of how much you understand about specific sectors					**1**									**1**	**1**	
43	Have shallow and broad focus in terms of access to information and in terms of how much you understand about specific sectors					**1**											**1**
44	Focus on broad information														**1**		**1**
45	Is narrow focused (with more expertise)														**1**	**1**	
46	Is broad focus (with less expertise)														**1**		**1**
47	Use indirect path to market due to strict regulation and policy																
48	Use direct path to market	**1**															
49	Have strong focus on obtaining relevant information																
50	Have indirect access to end user in order to collect information relevant to products (they work toward contributing products)		**1**									**1**			**1**		**1**
51	Have direct access to end user in order to collect information relevant to products (they work toward finished products)														**1**	**1**	
52	Has the capacity to investigate (market research)				**1**												**1**
53	Have limited ability to search for relevant information		**1**												**1**		**1**
54	Have internal capacity for searching for relevant information (availability of the staff and their experience and access to database.)			**1**	**1**	**1**				**1**	**1**	**1**			**1**		
55	Have external capacity for searching for relevant information (cooperation with other II and access to database.)		**1**		**1**		**1**		**1**	**1**	**1**	**1**			**1**		
56	Have good level of expertise in many fields (for example, patent agents)					**1**					**1**	**1**			**1**		**1**
57	Have the capability of high level of value chain (different organizations will have different networks or different partners that they worked with in the past or having awareness of those capabilities and because of that value chain some technologies or innovations would have easier path to commercialization than others. And that's in part why I think you choose one innovation intermediary or a collection over others because they provide a different path to the market)			**1**	**1**				**1**	**1**	**1**	**1**					
58	Looks for information through collaborative research		**1**		**1**		**1**		**1**						**1**		**1**
59	Looks for information through mentoring startups														**1**	**1**	
60	Look for relevant information through its network and relationship						**1**		**1**						**1**		
61	Have easy and direct access to regional alliance shared resources (people, information, databases, programs, funds)					**1**	**1**		**1**	**1**	**1**	**1**			**1**		**1**
62	Have difficult and indirect access to regional alliance shared resources (people, information, databases, programs, funds)		**1**				**1**		**1**						**1**		
63	Have informal network-based environment to search for relevant information (peer network)				**1**		**1**		**1**						**1**		**1**
64	Have specialized network of contacts that can offer specialized relevant information (for example, industry associations)		**1**		**1**		**1**		**1**		**1**				**1**	**1**	
65	Have broad network of contacts that can offer general wide relevant information (for example, investors, companies, people kind of all over the place)		**1**		**1**		**1**		**1**	**1**	**1**				**1**		**1**
66	Look for relevant information through access to primary databases.	**1**			**1**					**1**	**1**				**1**		**1**
67	Use contract services to search for relevant information		**1**		**1**		**1**		**1**						**1**		**1**
68	Have a defined process to search for relevant information				**1**	**1**									**1**	**1**	

	Our organization/we/they……	Internal relevant information	External relevant information	Search information for self operation	Search information to help clients	Internal ability/capability to search for relevant information	Internal/External network	Networking events/meeting/teamwork	Usage of network to exchange information	Ability to use information itself to understand	Ability to connect the acquired information with existing information	Capability to use acquired information in practical work	Resources to develop prototype	Capability to develop prototype	Practice to search for relevant information	Narrow/particular focuses/scope	Broader/general focuses/scope
69	Have formal research-based (through MaRs, paid services)		**1**	**1**	**1**		**1**		**1**		**1**				**1**		
70	Have more structured process in order to search for relevant information				**1**	**1**									**1**	**1**	
71	Is allowing creativity in order to search for relevant information					**1**									**1**		
72	Follow bureaucratic process for searching for relevant patents					**1**						**1**			**1**	**1**	
73	Have flexible process for patent search			**1**	**1**		**1**		**1**						**1**		**1**
74	Have high level of accountability to search for relevant information (depend on solid evidences)																
75	Only provides physical support (place)																
76	Does more of the science of commercialization														**1**		
77	Offer initial information through conducting workshop to attract clients who are interested in such information				**1**		**1**	**1**	**1**						**1**		
78	Is waiting for client to come to them to start searching for relevant information				**1**										**1**		
79	Have a conservative approach to education, or to communicating with client (they should come to us and have the right question!)				**1**										**1**		
80	Offer initial free information through publishing in web and through blogging to attract clients who are interested in such information					**1**			**1**						**1**		
81	Follow the facilitative approach (clients' self directed with some suggestion from II that allows clients to fail in order to learn)																
82	Follow the create approach (more directive instruction by II with more milestone driven)														**1**		
83	Does market assessment viability in order to accept the client/idea			**1**	**1**	**1**						**1**				**1**	
84	Look for relevant information through traditional market research (for ideas that have been done before)			**1**	**1**	**1**						**1**			**1**		**1**
85	Look for relevant information through customer interest and acceptance (for ideas that haven't been done before)				**1**										**1**		
86	Is searching for relevant information through choosing Early customer interaction (customer feedback)				**1**							**1**			**1**	**1**	
87	Is searching for relevant information through longer development stages (R&D, long research…etc)				**1**							**1**			**1**		
89	Serve and facilitate our clients need toward finding relevant information				**1**					**1**					**1**		
90	Serve and facilitate their own internal needs toward finding relevant information	**1**		**1**		**1**						**1**			**1**	**1**	
91	Search for relevant information for the Early stage technology to show its novelty														**1**	**1**	
92	Search for relevant information for Ideas that are closer to market				**1**										**1**		
93	Focus on information to help Earlier stage companies bringing inventions to market				**1**										**1**	**1**	
94	Use study and independent reference for novel technology														**1**	**1**	
95	Use benchmarking for pre-existing invention or technology, check how other do it and who did it														**1**	**1**	
96	Relay on searchable research as that they have not seen some similar business in the past; thus, they're going to have to rely on doing research into that business.		**1**		**1**										**1**		**1**

Table 5-N-13 Factors and categories on distinguishing innovation intermediaries' ability to support the development of prototypes

	Our organization/we/they……	Internal relevant information	External relevant information	Search information for self operation	Search information to help clients	Internal ability/capability to search for relevant information	Internal/External network	Networking events/meeting/teamwork	Usage of network to exchange information	Ability to use information itself to understand	Ability to connect the acquired information with existing information	Capability to use acquired information in practical work	Resources to develop prototype	Capability to develop prototype	Practice to support the development of prototypes	Narrow/particular focuses/scope	Broader/general focuses/scope
1	Have ability to support the theoretical level of prototypes	**1**								**1**	**1**	**1**			**1**		
2	Have ability to support the practical application of prototypes	**1**									**1**	**1**	**1**	**1**	**1**		
3	Have capability to support technical prototypes (space and money)												**1**				
4	Have technical analytical base	**1**								**1**	**1**		**1**		**1**		
5	Have capability to support development of prototype										**1**	**1**		**1**	**1**		
6	Have no capability to support the development of prototypes																
7	Do not have the ability to do it in house		**1**										**1**	**1**	**1**		
8	Use external sources to support prototype development		**1**											**1**	**1**		
9	Use third party resources		**1**											**1**	**1**		
10	Have access to engineering support (labs and knowledge)		**1**								**1**	**1**	**1**		**1**		
11	Have Laboratories capability or ability to support prototype	**1**									**1**	**1**	**1**	**1**	**1**		
12	Use out-side labs		**1**		**1**						**1**	**1**	**1**	**1**	**1**		
13	Have in-house labs										**1**		**1**		**1**		
14	Have advanced practical process (lab facilities) and capability to build prototypes	**1**		**1**									**1**		**1**		
15	Have office capability or ability to support prototype												**1**		**1**		
16	Provide incubating facility or incubator space.												**1**		**1**		
17	Provide independent work space (labs)											**1**	**1**		**1**		
18	Focus on providing specialized labs and funding												**1**		**1**		
19	Provide Finances & Physical (Laboratories, engineering facilities) Resources												**1**	**1**	**1**		
20	Have Lab resources											**1**	**1**	**1**	**1**		
21	Provide formal application resources (funding, lab and space)												**1**	**1**	**1**		
22	Provide non-financial support														**1**		
23	Have holistic resources (Human resources, expertise, money fund)									**1**		**1**	**1**		**1**		
24	Provide business mentorship									**1**			**1**		**1**		
25	Have mentor/guiding role to assist with business for prototype									**1**			**1**	**1**	**1**		
26	Provide purely business advices									**1**					**1**		
27	Active role/assistance with the implementation of prototype											**1**	**1**		**1**		
28	Provide advisory role in the development of prototypes				**1**					**1**			**1**		**1**		
29	Provide business advisory services														**1**		
30	Support prototype development by using mentorship and experience (have unique process)									**1**	**1**	**1**	**1**	**1**	**1**		
31	Support prototype development by using mentorship and coaching				**1**					**1**			**1**		**1**		
32	Focus on providing coaching and networking (no fund)						**1**	**1**		**1**	**1**				**1**		
33	Provide coaching									**1**					**1**		
34	Provide many resources (human, machinery or material and Labor)				**1**					**1**	**1**		**1**		**1**		
35	Don't have enough resources																
36	Have the capacity and resources to support the development of Prototype (resources, people, money, entrepreneurs on residence, mentors, lab capacity, help to build minimum viable product MVP).	**1**					**1**		**1**	**1**		**1**	**1**		**1**		
37	Provide extensive technical development support (specialized human resources)									**1**			**1**		**1**		
38	Have limited technical development support (no specialized human resources)																
39	Have ability to provide financial support for the purpose of prototype development														**1**		
40	Have the ability to fund and manage prototype development											**1**	**1**	**1**	**1**		
41	Have prototypes' proof of principle programs (have seed funding to develop and test prototypes, have access to resources and facilities, manage to develop prototypes, feasibility studies)	**1**									**1**		**1**	**1**	**1**		
42	Have R&D capability to build prototypes (space, laboratories, skill people,.)	**1**								**1**	**1**	**1**	**1**	**1**	**1**		
43	Have skills and infrastructure for prototype development (labs and highly expensive equipment, PhD students and post docs and researchers)	**1**								**1**			**1**	**1**	**1**		
44	Rely on internal resources (manufacturing equipment, raw material, capability and host to manufacture prototypes.)	**1**									**1**		**1**		**1**		
45	Have direct access and control over expertise and facilities												**1**	**1**	**1**		
46	Only have access to expertise and facilities	**1**								**1**			**1**		**1**	**1**	
47	Have very general expertise														**1**		**1**
48	Have sector (specific) expertise in products												**1**	**1**	**1**	**1**	
49	Have experience in funding & hiring incentives (match)												**1**		**1**		
50	Have infrastructure and expertise									**1**	**1**		**1**		**1**		
51	Support prototype development by using outsource expertise													**1**	**1**		
52	Have access to direct fund resources												**1**		**1**		
53	May have indirect access to public funds														**1**		
54	Have direct access to public funds												**1**		**1**		
55	Use publically funded													**1**	**1**		
56	Use privately funded												**1**		**1**		
57	Provide fund												**1**	**1**	**1**		
58	Provide fund internally												**1**		**1**		

	Our organization/we/they……	Internal relevant information	External relevant information	Search information for self operation	Search information to help clients	Internal ability/capability to search for relevant information	Internal/External network	Networking events/meeting/teamwork	Usage of network to exchange information	Ability to use information itself to understand	Ability to connect the acquired information with existing information	Capability to use acquired information in practical work	Resources to develop prototype	Capability to develop prototype	Practice to support the development of prototypes	Narrow/particular focuses/scope	Broader/general focuses/scope
59	Have money and facility to support prototypes												**1**	**1**	**1**		
60	Provide fund through external channel														**1**		
61	Provide access to funding														**1**		
62	Use funding partnership to develop prototypes								**1**				**1**	**1**	**1**		
63	Link clients to fund source indirectly													**1**	**1**		
64	Have disconnected networks to the business communities																
65	Have closer networks to the business communities		**1**				**1**		**1**				**1**	**1**	**1**		
66	Provide access to a broader network				**1**		**1**	**1**	**1**				**1**	**1**	**1**		
67	Provide informal networking based services						**1**		**1**					**1**	**1**		
68	Provide support through partnerships (outsources)				**1**		**1**		**1**				**1**		**1**		
69	Follow the approach of market pull (look to commercial opportunities)													**1**	**1**		
70	Have product (market) focused													**1**	**1**		
71	Focus on marketing and sales of the prototype (growing revenues, identify potential clients)													**1**	**1**		
72	Follow the approach of technology push (look early stage prototypes)													**1**	**1**		
73	Have opportunity (idea) focused														**1**		
74	Focus on development of prototype (provide funds and skills, potential research help, usage of labs, provides access to the mentors)									**1**		**1**	**1**	**1**	**1**		
75	Have focus mandate														**1**	**1**	
76	Develop the prototype to serve the associate organizational interest													**1**	**1**		
77	Have general mandate														**1**		**1**
78	Develop the prototype to serve personal (startup client) interest													**1**	**1**		
79	More toward problem solving but less aware of funding process														**1**		
80	Is less practical to build prototypes												**1**	**1**	**1**		
81	Is more of a partner in commercialization (Provide indirect support)												**1**	**1**	**1**		
82	Is more actively involved in the commercialization process (Provide direct support)												**1**	**1**	**1**		
83	Need shorter Development time to develop prototypes														**1**		
84	Need longer Development time to develop prototypes																
85	Provide support internally														**1**		
86	Use expert opinion to prove aspects that is important for a particular prototype development									**1**					**1**		
87	Use lab testing to prove aspects that is important for a particular prototype development											**1**	**1**	**1**	**1**		
89	Use case by case validation process for the idea (no unique process)												**1**	**1**	**1**		

Table 5-N-14 Category descriptions

#	Category	Description
1	Internal relevant information	Innovation intermediaries have and possess internal information/knowledge ; information/knowledge is relevant to innovation intermediaries' practices and services.
		Innovation intermediaries possess information/knowledge of intellectual property, markets, businesses, and industries relevant to their practices and services. This relevant information/knowledge is extracted internally from many sources including primary databases, staff expertise, staff qualifications, research, and experiments conducted internally.
2	External relevant information	Innovation intermediaries acquire information/knowledge from external sources or by external means.
		Participants claim that they look for information/knowledge in many sources including secondary indirect databases, third parties, network of contacts, regional alliance resources, contract services (outsource), and collaboration research.
3	Internal ability/capability to search for relevant information	Innovation intermediaries have the internal ability to search for required information using internal and external sources.
		This ability includes staff's theoretical and practical expertise, staff's qualifications and skills, availability of required resources, and the extent of focused and broad networking.
4	Internal/external networks	Participants mention the following keywords: network, connection, or collaboration with any internal or external stakeholders.
		Participants state that many approaches are used to network with research, business, and regional alliance communities. Approaches include cooperation, collaboration, partnership, networking, and contracting (outsourcing).
5	Networking events/meetings/teamwork	Innovation intermediaries hold or attend networking events or work as a team.
		Participants state that various networking events are held by IIs to facilitate information exchange. In addition, IIs facilitate connections among clients, experts in the field, coaches, advisors, investors and other IIs.
6	Use of network to exchange information	Innovation intermediaries exchange or ask for information through their network of contacts.
		Innovation intermediaries provide various general training, coaching, workshops, and website information, and they search for market reports, business trends, matching patents, etc.
7	Ability to use information for understanding	Innovation intermediaries possess experienced and skilled human capital with specific required tools that enable them to process information in order to understand it.
		Participants claim that they have the capacity to gain information through their staff and to access outside experts; a combination of internal (staff) and external expertise offers a theoretical base, a practical base or a combination of both, which enables IIs to understand information within their focus.
8	Ability to connect the acquired information with existing information	Innovation intermediaries have the ability/capability to use collected information and existing information together to make an informed decision.
		Participants stated that they assess, evaluate, check and test many aspects in the context of commercialization through the acquisition of information and connecting it with existing information, which helps them make a wise decision. For instance, they evaluate technology viability based on information gathered from inventors and from the market. This information is then processed using existing information/knowledge and possible tools such as software, programs, etc., which eventually leads to making an informed decision.
9	Capability to use acquired information in practical work	Innovation intermediaries have the ability/capability to use both collected information and existing information to provide commercialization services.
		Innovation intermediaries provide various commercialization services based on information including patent management, licensing, and advices.
10	Resources to develop prototype	Participants mention internal resources that are used for prototype development.
		Participants state that office space, funding, engineering facility, laboratory, research and development department (R&D), networking, material, and processes are essential resources required to develop a prototype.
11	Capability to develop prototype	Innovation intermediaries have the ability/capability to use both collected information and existing information to provide physical services (prototype).
		Participants suggest that practical knowledge, skills and expertise of internal human resources and possession of direct, cheap and easy access to external professional people define the capability of innovation intermediaries for developing a prototype. Nevertheless, having the capability of manufacturing and having the machinery itself are preferred to developing and building a prototype.

Table 5-N-15 Differences among II Types with respect to absorptive capacity

#	Constructs	Categories	Significant category	Significant construct	Findings
1	Practices used as a proxy to capture AC	Practice to search for relevant information	√	N/A	IFOI types search for relevant information more often than CBI and III types.
		Practice to develop prototype	√		IFOI types search for relevant information more often than III and CBI types.
2	Focus on scope	Narrow/specific focus/scope	√	N/A	IFOI types have a narrower focused scope to commercialize an invention compared with CBI, UTTO and III types.
		Broad/general focus/scope	√		
3	The purpose of searching for relevant information	Search information for self-operation	No	N/A	N/A
		Search information to help clients	No		
4	**Acquisition** (first construct of absorptive capacity)	Internal relevant information	√	√*	IFOI types use internal information more so than CBI and III types.
		External relevant information	Potential P = 0.007		CBI types use external sources of information more so than IFOI types.
		Internal ability/capability to search for relevant information	No		N/A
* Combining the above three categories allows us to calculate the acquiring construct of absorptive capacity. It indicates that IFOI is significantly different than CBI with respect to this particular construct.					
5	**Assimilation** (the second construct of absorptive capacity)	Internal/External network	No	No+	N/A
		Networking events/meetings/teamwork	√		CBI and III types are more active in terms of holding and attending networking events for commercialization purpose more than IFOI and UTTO.
		Use of networks to exchange information	No		N/A
+Combining the three categories above allows us to calculate the assimilating construct of absorptive capacity for each II type, however, there is no significant difference in means among IIs in terms of assimilating information.					
Both acquiring and assimilating constructs are called potential absorptive capacity (Zahara & Gorge, 2002). Accordingly, it is possible to investigate it; however, there is no significant difference in means among IIs in terms of potential absorptive capacity.					
6	**Transformation** (the third construct of absorptive capacity)	Ability to use information for understanding	No	√**	N/A
		Ability to connect acquired information with existing information	√		IFOI types have better ability to combine both acquired and existing information and then use the information to make decisions compared to III types.
		Capability to use acquired information in practical work	√		IFOI types have a better capability to use the acquired information toward practical services or action compared to III, UTTO and CBI types.
**Combining the above three categories allows us to calculate the transforming construct of absorptive capacity for each II type. Accordingly, it is possible to investigate if there is any difference among innovation intermediaries in terms of this transforming construct. As a result, the IFOI type has greater ability/capability to transform relevant information into practical services or actions for the purpose of invention commercialization compared to CBI and III types.					
7	**Exploitation** (the fourth construct of absorptive capacity)	Resources to develop prototype	√	√++	IFOI types have more resources that enable them to develop prototypes for the purpose of invention commercialization compared to CBI and III types.
		Capability to develop prototype	No		N/A
++Combining the above two categories allows us to calculate the exploiting construct of absorptive capacity for each II type. The IFOI type has more ability/capability to exploit relevant information toward building a prototype for the purpose of invention commercialization.					
Both transforming and exploiting constructs constitute realized absorptive capacity (Zahara & Gorge, 2002). Accordingly, by combining them, it is possible to investigate them. IIs have significant differences in means among IIs in terms of having potential absorptive capacity. IFOI types possess more realized absorptive capacity, which gives them more ability/capability to transform relevant information toward practical services or actions and more ability/capability to exploit relevant information toward building prototypes for the purpose of invention commercialization compared to III and CBI types.					
The absorptive capacity concept is a combination of potential and realized absorptive capacity (Zahara & Gorge, 2002), which means that by combining the two, it is possible to investigate it. IIs have significant differences in terms of absorptive capacity toward commercialization practices and services. As IFOI types, compared to III and CBI types, have higher absorptive capacity, they are more able/capable of acquiring, digesting and transforming relevant information and then exploiting it for commercial use with the purpose of invention commercialization.					

Appendix O
Principal Components Analysis

Appendix 6-O-1

The requirements and assumptions are necessary to run PCA (Hair et al., 2010; Leard statistics, 2014):

1) The existence of multiple continuous variables (although ordinal data are very frequently used);

2) All variables should have linear relationship between each other;

3) A minimum sample size of 150 cases or 5 to 10 cases per variable;

4) No outliers for any variable.

To assess the suitability of conducting PCA for each concept, five main tests were performed considering the SPSS output:

1. Check SPSS output (Correlation Matrix table in particular); it should show that all variables have at least one correlation above r = 0.3.
2. Check that the Cronbach's alpha values for each aspect are 0.6 and above; this indicate that items have low uniqueness and are inter-related (Cortina, 1993).
3. Check SPSS output (KMO and Bartlett's Test table in particular, that must has 0.5 or above in KMO test (Kaiser, 1974); and the Bartlett's Test of Sphericity should be significant ($p < 0.05$).
4. Check SPSS output (Anti-image Matrices table in particular, the section of "Anti-image Correlation" has 0.5 or above for all diagonal values for all variables (Kaiser, 1974).
5. Check SPSS output (Communalities table in particular); it should show 0.5 or above for all communalities values for all variables.

When the above criteria were met, they indicate the factorability of the data; in other words, it suggested the usefulness of running PCA on any particular set of variables and data. Consequently, PCA was then conducted for each concept that met the above criteria.

To decide the number of components to be retained in a PCA procedure, four criteria were considered and examined in general:

1. The eigenvalue-one criterion: that suggests to not retaining any component that has less than one eigenvalue (Kaiser, 1960)
2. The proportion/percentage of total variance explained by each component should be 5% or more and all components cumulative percentage preferred to be 60% or more to be retained.
3. All component before the inflection point in the scree plot should be retained (Cattell, 1966).
4. Interpretability criterion: it emphasizes the concept of "simple structure;" thus, all components that will lead to simple structure are retained (Thurstone, 1947).

To select rotation to be employed; we need to understand that:

Rotation is "a procedure in which the eigenvectors are rotated in an attempt to achieve simple structure" (Bryant & Yarnold, 1995, p. 132); in other words, rotation is used to analyze "initial PCA results with the goal of making the pattern of loadings clearer, or more pronounced" (Brown, 2009, p.20). There are two types of rotations: oblique and orthogonal, where each of them have various methods to achieve (Gorsuch, 1983; Brown, 2009); however, the former is used when the resulted components is correlated; while the later is used for uncorrelated factors/components (Vogt, 1993). Out of the various methods that is suggested for both rotation types, only five of them are included in the package of SPSS-21. Researchers tend to use Varimax and Oblimin method for orthogonal and oblique rotations respectively; Vogt (1993, p. 91) suggested that selection of the rotation "is done differently depending upon whether the factors are believed to be correlated (oblique) or uncorrelated (orthogonal)."

Appendix 6-O-2

Correlation Matrix

		Q16_1	Q16_2	Q16_3	Q16_4	Q16_5	Q17_1	Q17_2	Q17_3	Q17_4	Q17_5	Q18_1	Q18_2	Q18_3	Q18_4	Q18_5
Correlation	Q16_1	1.000	.279	.259	.329	.066	.414	.178	.038	.148	-.048	.456	.153	.018	.160	-.133
	Q16_2	.279	1.000	.196	.342	.053	.126	.499	-.008	.244	-.036	.219	.350	-.060	.196	-.126
	Q16_3	.259	.196	1.000	.284	.294	.076	.041	.533	.130	.061	.145	.074	.345	.209	-.038
	Q16_4	.329	.342	.284	1.000	-.029	.034	.124	.102	.719	-.180	.105	.149	.079	.612	-.276
	Q16_5	.066	.053	.294	-.029	1.000	-.146	-.109	.036	-.134	.609	-.116	.003	.029	-.169	.546
	Q17_1	.414	.126	.076	.034	-.146	1.000	.274	.302	.197	.016	.573	.197	.128	.159	-.063
	Q17_2	.178	.499	.041	.124	-.109	.274	1.000	.155	.249	.172	.092	.470	.028	.161	.016
	Q17_3	.038	-.008	.533	.102	.036	.302	.155	1.000	.280	.225	.111	.153	.574	.262	.059
	Q17_4	.148	.244	.130	.719	-.134	.197	.249	.280	1.000	-.106	.114	.233	.103	.735	-.240
	Q17_5	-.048	-.036	.061	-.180	.609	.016	.172	.225	-.106	1.000	-.174	-.030	.024	-.147	.674
	Q18_1	.456	.219	.145	.105	-.116	.573	.092	.111	.114	-.174	1.000	.421	.223	.309	-.031
	Q18_2	.153	.350	.074	.149	.003	.197	.470	.153	.233	-.030	.421	1.000	.253	.321	.058
	Q18_3	.018	-.060	.345	.079	.029	.128	.028	.574	.103	.024	.223	.253	1.000	.262	.176
	Q18_4	.160	.196	.209	.612	-.169	.159	.161	.262	.735	-.147	.309	.321	.262	1.000	-.160
	Q18_5	-.133	-.126	-.038	-.276	.546	-.063	.016	.059	-.240	.674	-.031	.058	.176	-.160	1.000
Sig. (1-tailed)	Q16_1		.000	.000	.000	.205	.000	.013	.318	.032	.276	.000	.027	.408	.022	.048
	Q16_2	.000		.007	.000	.254	.056	.000	.463	.001	.326	.003	.000	.226	.007	.056
	Q16_3	.000	.007		.000	.000	.172	.302	.000	.052	.222	.034	.178	.000	.004	.318
	Q16_4	.000	.000	.000		.360	.335	.060	.101	.000	.011	.093	.031	.161	.000	.000
	Q16_5	.205	.254	.000	.360		.033	.086	.326	.046	.000	.073	.483	.358	.017	.000
	Q17_1	.000	.056	.172	.335	.033		.000	.000	.006	.419	.000	.006	.054	.023	.215
	Q17_2	.013	.000	.302	.060	.086	.000		.025	.001	.015	.125	.000	.361	.021	.422
	Q17_3	.318	.463	.000	.101	.326	.000	.025		.000	.002	.081	.027	.000	.000	.231
	Q17_4	.032	.001	.052	.000	.046	.006	.001	.000		.091	.076	.002	.097	.000	.001
	Q17_5	.276	.326	.222	.011	.000	.419	.015	.002	.091		.014	.352	.383	.032	.000
	Q18_1	.000	.003	.034	.093	.073	.000	.125	.081	.076	.014		.000	.002	.000	.350
	Q18_2	.027	.000	.178	.031	.483	.006	.000	.027	.002	.352	.000		.001	.000	.233
	Q18_3	.408	.226	.000	.161	.358	.054	.361	.000	.097	.383	.002	.001		.000	.013
	Q18_4	.022	.007	.004	.000	.017	.023	.021	.000	.000	.032	.000	.000	.000		.022
	Q18_5	.048	.056	.318	.000	.000	.215	.422	.231	.001	.000	.350	.233	.013	.022	

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.598
Bartlett's Test of Sphericity	Approx. Chi-Square	1113.896
	df	105
	Sig.	.000

Inverse of Correlation Matrix

	Q16_1	Q16_2	Q16_3	Q16_4	Q16_5	Q17_1	Q17_2	Q17_3	Q17_4	Q17_5	Q18_1	Q18_2	Q18_3	Q18_4	Q18_5
Q16_1	1.770	.020	-.251	-.733	-.258	-.479	-.258	.237	.330	-.102	-.615	.135	.039	.148	.265
Q16_2	.020	1.768	-.197	-.470	-.345	.155	-.901	.126	.065	.147	-.389	-.107	.194	.117	.189
Q16_3	-.251	-.197	2.332	-.573	-1.096	.315	-.235	-1.506	.815	.566	-.253	.331	.010	-.358	.311
Q16_4	-.733	-.470	-.573	3.157	-.027	.343	.289	.605	-1.916	.053	.296	.087	-.260	-.477	.166
Q16_5	-.258	-.345	-1.096	-.027	2.767	.071	.928	.754	-.427	-1.442	.308	-.522	-.066	.547	-.684
Q17_1	-.479	.155	.315	.343	.071	2.193	-.482	-.684	-.544	-.130	-1.263	.345	.149	.333	.135
Q17_2	-.258	-.901	-.235	.289	.928	-.482	2.272	.198	-.398	-.829	.729	-.953	-.017	.146	-.094
Q17_3	.237	.126	-1.506	.605	.754	-.684	.198	3.059	-1.038	-1.169	.362	-.209	-1.226	.205	.330
Q17_4	.330	.065	.815	-1.916	-.427	-.544	-.398	-1.038	3.956	.233	.388	-.040	.487	-1.778	.259
Q17_5	-.102	.147	.566	.053	-1.442	-.130	-.829	-1.169	.233	3.232	.293	.446	.595	-.253	-1.383
Q18_1	-.615	-.389	-.253	.296	.308	-1.263	.729	.362	.388	.293	2.632	-.833	-.192	-.714	-.395
Q18_2	.135	-.107	.331	.087	-.522	.345	-.953	-.209	-.040	.446	-.833	1.916	-.232	-.272	-.074
Q18_3	.039	.194	.010	-.260	-.066	.149	-.017	-1.226	.487	.595	-.192	-.232	1.946	-.340	-.597
Q18_4	.148	.117	-.358	-.477	.547	.333	.146	.205	-1.778	-.253	-.714	-.272	-.340	2.927	-.138
Q18_5	.265	.189	.311	.166	-.684	.135	-.094	.330	.259	-1.383	-.395	-.074	-.597	-.138	2.551

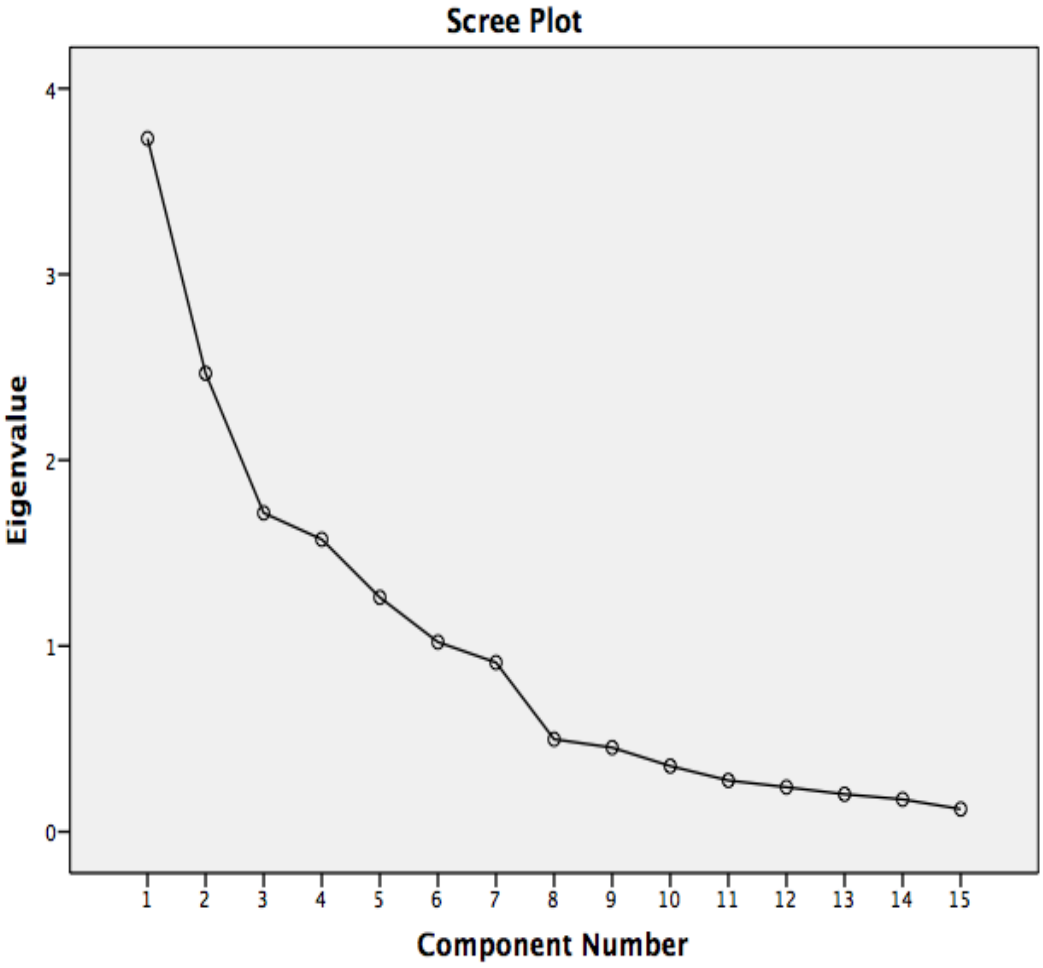
Anti-image Matrices

		Q16_1	Q16_2	Q16_3	Q16_4	Q16_5	Q17_1	Q17_2	Q17_3	Q17_4	Q17_5	Q18_1	Q18_2	Q18_3	Q18_4	Q18_5
Anti-image Covariance	Q16_1	.565	.006	-.061	-.131	-.053	-.123	-.064	.044	.047	-.018	-.132	.040	.011	.029	.059
	Q16_2	.006	.566	-.048	-.084	-.071	.040	-.224	.023	.009	.026	-.084	-.031	.056	.023	.042
	Q16_3	-.061	-.048	.429	-.078	-.170	.062	-.044	-.211	.088	.075	-.041	.074	.002	-.052	.052
	Q16_4	-.131	-.084	-.078	.317	-.003	.050	.040	.063	-.153	.005	.036	.014	-.042	-.052	.021
	Q16_5	-.053	-.071	-.170	-.003	.361	.012	.148	.089	-.039	-.161	.042	-.099	-.012	.068	-.097
	Q17_1	-.123	.040	.062	.050	.012	.456	-.097	-.102	-.063	-.018	-.219	.082	.035	.052	.024
	Q17_2	-.064	-.224	-.044	.040	.148	-.097	.440	.028	-.044	-.113	.122	-.219	-.004	.022	-.016
	Q17_3	.044	.023	-.211	.063	.089	-.102	.028	.327	-.086	-.118	.045	-.036	-.206	.023	.042
	Q17_4	.047	.009	.088	-.153	-.039	-.063	-.044	-.086	.253	.018	.037	-.005	.063	-.154	.026
	Q17_5	-.018	.026	.075	.005	-.161	-.018	-.113	-.118	.018	.309	.034	.072	.095	-.027	-.168
	Q18_1	-.132	-.084	-.041	.036	.042	-.219	.122	.045	.037	.034	.380	-.165	-.037	-.093	-.059
	Q18_2	.040	-.031	.074	.014	-.099	.082	-.219	-.036	-.005	.072	-.165	.522	-.062	-.048	-.015
	Q18_3	.011	.056	.002	-.042	-.012	.035	-.004	-.206	.063	.095	-.037	-.062	.514	-.060	-.120
	Q18_4	.029	.023	-.052	-.052	.068	.052	.022	.023	-.154	-.027	-.093	-.048	-.060	.342	-.019
	Q18_5	.059	.042	.052	.021	-.097	.024	-.016	.042	.026	-.168	-.059	-.015	-.120	-.019	.392
Anti-image Correlation	Q16_1	.694[a]	.011	-.124	-.310	-.117	-.243	-.129	.102	.125	-.043	-.285	.074	.021	.065	.125
	Q16_2	.011	.695[a]	-.097	-.199	-.156	.078	-.450	.054	.025	.062	-.180	-.058	.104	.051	.089
	Q16_3	-.124	-.097	.496[a]	-.211	-.431	.139	-.102	-.564	.268	.206	-.102	.157	.005	-.137	.127
	Q16_4	-.310	-.199	-.211	.699[a]	-.009	.130	.108	.195	-.542	.016	.103	.035	-.105	-.157	.059
	Q16_5	-.117	-.156	-.431	-.009	.503[a]	.029	.370	.259	-.129	-.482	.114	-.227	-.028	.192	-.257
	Q17_1	-.243	.078	.139	.130	.029	.587[a]	-.216	-.264	-.185	-.049	-.526	.168	.072	.131	.057
	Q17_2	-.129	-.450	-.102	.108	.370	-.216	.473[a]	.075	-.133	-.306	.298	-.457	-.008	.057	-.039
	Q17_3	.102	.054	-.564	.195	.259	-.264	.075	.486[a]	-.298	-.372	.128	-.086	-.503	.069	.118
	Q17_4	.125	.025	.268	-.542	-.129	-.185	-.133	-.298	.633[a]	.065	.120	-.014	.175	-.523	.082
	Q17_5	-.043	.062	.206	.016	-.482	-.049	-.306	-.372	.065	.541[a]	.100	.179	.237	-.082	-.482
	Q18_1	-.285	-.180	-.102	.103	.114	-.526	.298	.128	.120	.100	.564[a]	-.371	-.085	-.257	-.152
	Q18_2	.074	-.058	.157	.035	-.227	.168	-.457	-.086	-.014	.179	-.371	.619[a]	-.120	-.115	-.034
	Q18_3	.021	.104	.005	-.105	-.028	.072	-.008	-.503	.175	.237	-.085	-.120	.593[a]	-.142	-.268
	Q18_4	.065	.051	-.137	-.157	.192	.131	.057	.069	-.523	-.082	-.257	-.115	-.142	.750[a]	-.051
	Q18_5	.125	.089	.127	.059	-.257	.057	-.039	.118	.082	-.482	-.152	-.034	-.268	-.051	.680[a]

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total
1	3.731	24.875	24.875	2.881
2	2.467	16.449	41.324	2.321
3	1.716	11.439	52.763	2.448
4	1.574	10.491	63.253	2.059
5	1.261	8.408	71.662	1.977
6	1.021	6.806	78.468	
7	.911	6.072	84.540	
8	.498	3.319	87.859	
9	.453	3.020	90.879	
10	.354	2.358	93.237	
11	.276	1.841	95.078	
12	.240	1.600	96.678	
13	.202	1.347	98.025	
14	.174	1.162	99.187	
15	.122	.813	100.000	

Extraction Method: Principal Component Analysis.


Scree Plot
Eigenvalue
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1
2
3
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5
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7
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9
10
11
12
13
14
15
Component Number

Appendix 6-O-3

Variables	Variables Name
Q12_2	Community received high priority from our management team
Q15_2	The claims of community were viewed by our management team as legitimate
Q13_2	Community had power, whether used or not
Q14_2	Community exhibited urgency in its relationship with our organization
Q12_5	Financier (funding partner, shareholder) received high priority from our management team
Q15_5	The claims of financier (funding partner, shareholder) were viewed by our management team as legitimate
Q13_5	Financier (funding partner, shareholder) had power, whether used or not
Q14_5	Financier (funding partner, shareholder) exhibited urgency in its relationship with our organization
Q15_3	The claims of industry (and/or parent firm) were viewed by our management team as legitimate
Q13_3	Industry (and/or parent firm) had power, whether used or not
Q14_3	Industry (and/or parent firm) exhibited urgency in its relationship with our organization
Q12_3	Industry (and/or parent firm) received high priority from our management team
Q13_1	Government had power, whether used or not
Q12_1	Government received high priority from our management team
Q15_1	The claims of government were viewed by our management team as legitimate
Q14_1	Government exhibited urgency in its relationship with our organization
Q12_4	Educational institution (university, college) received high priority from our management team
Q14_4	Educational institution (university, college) exhibited urgency in its relationship with our organization
Q13_4	Educational institution (university, college) had power, whether used or not
Q15_4	The claims of educational institution (university, college) were viewed by our management team as legitimate
Q16_4	Educational institution (university, college) contributes to our organization's strategy for commercialization.
Q17_4	Educational institution (university, college) is able to withhold support to our organization, to thereby influence our strategy toward applying its will.
Q18_4	We are required, periodically, to report our success metrics to educational institution (university, college)
Q16_3	Industry (and/or parent firm) contributes to our organization's strategy for commercialization.
Q16_5	Financier (funding partner, shareholder) contributes to our organization's strategy for commercialization.
Q17_5	financier (funding partner, shareholder) is able to withhold support to our organization, to thereby influence our strategy toward applying its will.
Q18_5	We are required, periodically, to report our success metrics to financier (funding partner, shareholder)
Q16_1	Government contributes to our organization's strategy for commercialization.
Q18_1	We are required, periodically, to report our success metrics to government.
Q17_1	Government is able to withhold support to our organization, to thereby influence our strategy toward applying its will.
Q18_3	We are required, periodically, to report our success metrics to industry (and/or parent firm).
Q17_3	Industry (and/or parent firm) is able to withhold support to our organization, to thereby influence our strategy toward applying its will.
Q17_2	Community is able to withhold support to our organization, to thereby influence our strategy toward applying its will.
Q18_2	We are required, periodically, to report our success metrics to community.
Q16_2	Community contributes to our organization's strategy for commercialization.
Q21A_4N	Educational Institution (university/college): Organizational resources
Q21A_8N	Educational Institution (university/college): Other resources
Q21A_3N	Educational Institution (university/college): Material resources
Q21A_7N	Educational Institution (university/college): Human resources
Q21A_2N	Educational Institution (university/college): Physical space resources
Q21A_1N	Educational Institution (university/college): Knowledge resources
Q21A_5N	Educational Institution (university/college): Financial resources
Q21A_6N	Educational Institution (university/college): Networking resources
Q21C_5N	Government: Financial resources
Q21C_4N	Government: Organizational resources
Q21C_6N	Government: Networking resources
Q21C_1N	Government: Knowledge resources
Q21C_7N	Government: Human resources
Q21C_3N	Government: Material resources
Q21C_2N	Government: Physical space resources
Q21C_8N	Government: Other resources
Q21D_4N	Financier (funding partner, shareholder): Organizational resources
Q21D_7N	Financier (funding partner, shareholder): Human resources
Q21D_1N	Financier (funding partner, shareholder): Knowledge resources
Q21D_3N	Financier (funding partner, shareholder): Material resources
Q21D_2N	Financier (funding partner, shareholder): Physical space resources
Q21D_5N	Financier (funding partner, shareholder): Financial resources
Q21D_6N	Financier (funding partner, shareholder): Networking resources
Q21D_8N	Financier (funding partner, shareholder): Other resources
Q21B_4N	Industry and/or Parent Firm: Organizational resources
Q21B_3N	Industry and/or Parent Firm: Material resources
Q21B_2N	Industry and/or Parent Firm: Physical space resources
Q21B_5N	Industry and/or Parent Firm: Financial resources
Q21B_7N	Industry and/or Parent Firm: Human resources
Q21B_1N	Industry and/or Parent Firm: Knowledge resources
Q21B_6N	Industry and/or Parent Firm: Networking resources
Q21B_8N	Industry and/or Parent Firm: Other resources
Q19A_2	We receive business administrative support from Educational Institution (university/college)
Q19A_1	The physical space of our offices are provided by Educational Institution (university/college)

Variables	Variables Name
Q19A_9	At least, part of our operational budget is provided by Educational Institution (university/college)
Q19A_3	To facilitate commercialization, we can access the required equipment and material through Educational Institution (university/college)
Q19A_11	To facilitate commercialization, we have access to required human resources through Educational Institution (university/college)
Q19A_6	We have access to specialized laboratories through Educational Institution (university/college)
Q19A_5	To investigate practical information, we seek the help of Educational Institution (university/college)
Q19A_4	To investigate theoretical information, we seek the help of Educational Institution (university/college)
Q19A_7	To facilitate commercialization, we make use of our established network with Educational Institution (university/college)
Q19A_10	To facilitate commercialization, we help clients in accessing loans and grants through Educational Institution (university/college)
Q19A_8	We have one or more collaboration agreement(s) with Educational Institution (university/college)
Q19B_10	To facilitate commercialization, we help clients in accessing loans and grants through Industry (and/or Parent Firm)
Q19B_6	We have access to specialized laboratories through Industry (and/or Parent Firm)
Q19B_9	At least, part of our operational budget is provided by Industry (and/or Parent Firm)
Q19B_5	To investigate practical information, we seek the help of Industry (and/or Parent Firm)
Q19B_11	To facilitate commercialization, we have access to required human resources through Industry (and/or Parent Firm)
Q19B_2	We receive business administrative support from Industry (and/or Parent Firm)
Q19B_3	To facilitate commercialization, we can access the required equipment and material through Industry (and/or Parent Firm)
Q19B_1	The physical space of our offices are provided by Industry (and/or Parent Firm)
Q19B_4	To investigate theoretical information, we seek the help of Industry (and/or Parent Firm)
Q19B_7	To facilitate commercialization, we make use of our established network with Industry (and/or Parent Firm)
Q19B_8	We have one or more collaboration agreement(s) with Industry (and/or Parent Firm)
Q19D_9	At least, part of our operational budget is provided by Financier (funding partner, shareholder)
Q19C_11	To facilitate commercialization, we have access to required human resources through Government
Q19C_3	To facilitate commercialization, we can access the required equipment and material through Government
Q19C_7	To facilitate commercialization, we make use of our established network with Government
Q19C_6	We have access to specialized laboratories through Government
Q19C_9	At least, part of our operational budget is provided by Government
Q19C_2	We receive business administrative support from Government
Q19C_8	We have one or more collaboration agreement(s) with Government
Q19C_5	To investigate practical information, we seek the help of Government
Q19C_1	The physical space of our offices are provided by Government
Q19C_4	To investigate theoretical information, we seek the help of Government
Q19C_10	To facilitate commercialization, we help clients in accessing loans and grants through Government
Q19D_3	To facilitate commercialization, we can access the required equipment and material through Financier (funding partner, shareholder)
Q19D_6	We have access to specialized laboratories through Financier (funding partner, shareholder)
Q19D_4	To investigate theoretical information, we seek the help of Financier (funding partner, shareholder)
Q19D_2	We receive business administrative support from Financier (funding partner, shareholder)
Q19D_1	The physical space of our offices are provided by Financier (funding partner, shareholder)
Q19D_5	To investigate practical information, we seek the help of Financier (funding partner, shareholder)
Q19D_11	To facilitate commercialization, we have access to required human resources through Financier (funding partner, shareholder)
Q19D_8	We have one or more collaboration agreement(s) with Financier (funding partner, shareholder)
Q19D_7	To facilitate commercialization, we make use of our established network with Financier (funding partner, shareholder)
Q19D_10	To facilitate commercialization, we help clients in accessing loans and grants through Financier (funding partner, shareholder)
Q9_3	Our organization helps license inventions on an exclusive basis to established firms with a purpose to use that invention in established firms' business
Q9_4	Our organization helps license inventions on an exclusive basis to new ventures with a purpose to sell products and/or services that result from that invention
Q9_7	Our organization helps inventor(s) and/or university/college to receive a fixed license fee as a benefit from the commercialized innovation
Q9_10	Our organization helps commercializing firms (whether established firm or new venture) to retain the rights to further develop the commercialized innovation.
Q9_5	Our organization helps license inventions on a non-exclusive basis to one or more established firms with a purpose to use that invention in established firms' businesses
Q9_6	Our organization helps license inventions on a non-exclusive basis to one or more new ventures with a purpose to sell products and/or services that result from that invention
Q9_8	Our organization helps inventor(s) and/or university/college to receive a royalties and/or equities as a benefit from a commercialized innovation
Q9_9	Our organization helps inventor(s) and/or university/college to retain the rights to further develop the commercialized innovation
Q9_2	Our organization helps create new ventures based on inventions with a purpose to licensing inventions on a non-exclusive basis to one or more new ventures and/or established firms
Q9_8	Our organization helps inventor(s) and/or university/college to receive a royalties and/or equities as a benefit from a commercialized innovation
Q9_9	Our organization helps inventor(s) and/or university/college to retain the rights to further develop the commercialized innovation
Q9_1	Our organization helps create new ventures based on invention with a purpose to sell products and/or services that result from that invention

Appendix 6-O-4

Table 6-O-1 Rotated Component Matrix for PCA of stakeholders' level of importance (with oblimin rotation)

	Component					Communalities
	1	2	3	4	5	
Q12_2	0.835	0.042	0.100	0.008	0.174	0.775
Q15_2	0.829	0.096	-0.029	0.026	-0.024	0.711
Q13_2	0.804	0.007	-0.133	0.002	-0.136	0.659
Q14_2	0.785	-0.135	0.057	0.020	0.055	0.653
Q12_5	-0.050	0.908	0.077	-0.016	0.046	0.804
Q15_5	-0.025	0.887	-0.051	0.029	-0.046	0.812
Q13_5	-0.038	0.874	-0.049	0.060	-0.021	0.780
Q14_5	0.118	0.801	-0.028	-0.059	0.005	0.671
Q15_3	0.033	0.075	-0.895⊥	-0.010	-0.095	0.807
Q13_3	-0.053	0.036	-0.803⊥	-0.004	0.029	0.654
Q14_3	0.124	-0.161	-0.772⊥	0.021	0.127	0.705
Q12_3	-0.049	0.065	-0.764⊥	0.007	0.079	0.621
Q13_1	0.011	-0.061	-0.066	0.852	-0.197	0.710
Q12_1	-0.061	0.017	0.049	0.840	0.087	0.713
Q15_1	0.035	0.035	-0.058	0.751	-0.001	0.589
Q14_1	0.058	0.023	0.082	0.653	0.158	0.509
Q12_4	0.052	0.084	0.035	-0.051	0.907	0.802
Q14_4	0.080	0.027	0.017	0.063	0.800	0.690
Q13_4	-0.085	-0.158	-0.058	0.045	0.789	0.695
Q15_4	0.001	-0.007	-0.166	0.012	0.758	0.660

Rotation converged in 8 iterations.

Table 6-O-2 Rotated Component Matrix for PCA of stakeholders' level of influence (with oblimin rotation)

	Component					Communalities
	1	2	3	4	5	
Q16_4	0.911	-0.031	0.032	0.084	0.054	0.833
Q17_4	0.820	-0.141	-0.135	-0.137	-0.208	0.775
Q18_4	0.706	-0.185	-0.041	-0.287	-0.181	0.706
Q16_3	0.389	0.326	0.319	-0.362	0.346	0.643
Q16_5	0.059	0.888	0.051	0.082	0.162	0.814
Q17_5	-0.124	0.829	-0.131	-0.089	-0.193	0.771
Q18_5	-0.309	0.713	-0.127	-0.174	-0.201	0.710
Q16_1	0.163	0.106	0.829	0.229	0.118	0.759
Q18_1	-0.137	-0.178	0.778	-0.157	-0.158	0.722
Q17_1	-0.194	-0.135	0.694	-0.202	-0.213	0.634
Q18_3	0.029	0.020	0.040	-0.827⊥	-0.020	0.705
Q17_3	0.171	0.131	0.056	-0.803⊥	-0.003	0.745
Q17_2	0.124	0.111	0.041	0.075	-0.808⊥	0.709
Q18_2	0.076	0.003	0.153	-0.163	-0.695⊥	0.616
Q16_2	0.381	0.165	0.254	0.359	-0.445⊥	0.605

Rotation converged in 16 iterations.

⊥ symbols indicate negative component.

Table 6-O-3 Rotated Component Matrix for PCA of stakeholders' level of dependency by IIs (with oblimin rotation)

	Component				
	1	2	3	4	Communalities
Q19A_2	0.914	-0.127	-0.117	0.128	0.780
Q19A_1	0.897	-0.157	-0.006	0.092	0.784
Q19A_9	0.875	-0.106	-0.011	0.013	0.752
Q19A_3	0.874	0.024	-0.065	-0.041	0.759
Q19A_11	0.790	0.042	0.056	-0.021	0.659
Q19A_6	0.764	0.013	0.077	0.021	0.614
Q19A_5	0.751	-0.029	0.144	0.065	0.621
Q19A_4	0.739	0.101	0.070	-0.046	0.606
Q19A_7	0.702	-0.087	0.216	0.024	0.590
Q19A_10	0.645	0.065	0.018	-0.109	0.459
Q19A_8	0.497	-0.023	0.278	-0.234	0.438
Q19B_10	0.415	0.340	-0.123	0.010	0.288
Q19B_6	-0.039	0.753	0.028	0.013	0.578
Q19B_9	-0.187	0.751	0.118	-0.245	0.564
Q19B_5	0.172	0.712	-0.105	-0.069	0.515
Q19B_11	-0.101	0.646	0.065	0.269	0.608
Q19B_2	-0.071	0.636	0.038	0.235	0.549
Q19B_3	-0.112	0.624	-0.012	0.271	0.550
Q19B_1	-0.136	0.621	0.063	0.126	0.468
Q19B_4	0.088	0.601	-0.077	0.154	0.423
Q19B_7	0.311	0.563	0.145	0.042	0.535
Q19B_8	0.431	0.516	0.003	-0.221	0.509
Q19D_9	-0.259	0.319	0.126	0.185	0.258
Q19C_11	-0.128	0.065	0.726	0.128	0.589
Q19C_3	0.026	-0.089	0.707	0.130	0.534
Q19C_7	0.140	0.155	0.699	-0.003	0.625
Q19C_6	0.043	0.042	0.667	0.070	0.498
Q19C_9	-0.200	0.135	0.666	-0.292	0.455
Q19C_2	0.038	-0.131	0.654	0.065	0.434
Q19C_8	0.297	-0.005	0.620	-0.118	0.544
Q19C_5	0.105	-0.133	0.583	0.172	0.412
Q19C_1	0.010	0.041	0.582	0.072	0.377
Q19C_4	0.033	-0.032	0.516	0.118	0.303
Q19C_10	0.322	0.256	0.402	-0.215	0.448
Q19D_3	-0.024	-0.092	0.072	0.825	0.683
Q19D_6	0.097	-0.044	0.158	0.760	0.630
Q19D_4	0.071	0.091	-0.010	0.734	0.571
Q19D_2	-0.121	0.068	0.055	0.714	0.590
Q19D_1	-0.151	-0.080	-0.011	0.619	0.411
Q19D_5	0.034	0.128	0.058	0.618	0.457
Q19D_11	-0.108	0.280	0.140	0.613	0.626
Q19D_8	0.251	0.287	0.068	0.495	0.477
Q19D_7	0.091	0.398	0.167	0.455	0.553
Q19D_10	-0.025	0.328	0.035	0.403	0.348

Rotation converged in 13 iterations.

Table 6-O-4 Rotated Component Matrix for PCA of stakeholders' level of dependency on IIs (with oblimin rotation)

	Component				Communalities
	1	2	3	4	
Q21A_4N	0.831	0.057	-0.100	0.028	0.705
Q21A_8N	0.825	0.022	0.022	0.018	0.678
Q21A_3N	0.821	-0.080	0.086	-0.025	0.679
Q21A_7N	0.817	-0.119	-0.102	0.041	0.671
Q21A_2N	0.810	-0.015	0.016	0.000	0.653
Q21A_1N	0.805	-0.053	0.012	0.042	0.629
Q21A_5N	0.746	-0.003	-0.023	-0.047	0.577
Q21A_6N	0.711	0.104	-0.065	-0.158	0.621
Q21C_5N	0.212	0.136	0.211	-0.174	0.193
Q21C_4N	-0.094	0.896	0.024	0.026	0.790
Q21C_6N	0.002	0.840	0.012	0.003	0.708
Q21C_1N	0.023	0.796	-0.066	0.151	0.573
Q21C_7N	-0.140	0.788	0.003	-0.030	0.634
Q21C_3N	-0.063	0.725	0.031	-0.114	0.592
Q21C_2N	0.036	0.523	0.167	-0.120	0.396
Q21C_8N	0.323	0.496	-0.088	-0.070	0.412
Q21D_4N	-0.013	0.048	0.874	-0.052	0.796
Q21D_7N	-0.133	-0.071	0.803	-0.019	0.658
Q21D_1N	-0.146	-0.044	0.773	0.141	0.622
Q21D_3N	-0.204	0.120	0.736	-0.078	0.649
Q21D_2N	-0.124	0.018	0.682	0.042	0.485
Q21D_5N	0.062	-0.151	0.680	-0.055	0.459
Q21D_6N	0.159	0.120	0.646	-0.007	0.485
Q21D_8N	0.198	0.056	0.489	0.040	0.280
Q21B_4N	0.050	-0.160	0.068	-0.799⊥	0.619
Q21B_3N	-0.145	0.085	0.123	-0.764⊥	0.640
Q21B_2N	-0.185	0.074	-0.144	-0.706⊥	0.496
Q21B_5N	0.020	-0.014	-0.087	-0.691⊥	0.472
Q21B_7N	-0.052	0.017	0.012	-0.685⊥	0.464
Q21B_1N	0.128	-0.076	-0.016	-0.659⊥	0.462
Q21B_6N	0.163	0.072	0.058	-0.605⊥	0.488
Q21B_8N	0.218	0.181	0.041	-0.460⊥	0.407

Rotation converged in 9 iterations.

Table 6-O-5 Rotated Component Matrix for PCA of clients with oblimin rotation

Variables	Variables name	Components	Component 1	2	3	Communalities
Q22_1_N	Entrepreneurs	External clients (Individual, Entrepreneurs, new venture, establish firms, partners and other IIs)	0.853	-0.001	0.121	0.805
Q22_8_N	New ventures (startups)		0.781	0.12	0.129	0.714
Q22_11_N	Other innovation intermediaries		0.756	-0.025	-0.576	0.777
Q22_10_N	Funding partners (angel investors, venture capital investors)		0.701	0.124	-0.387	0.577
Q22_12_N	Others		0.659	0.098	-0.616	0.697
Q22_5_N	Individual clients		0.626	-0.53	-0.088	0.654
Q22_9_N	Established firms and/or parent firm		0.56	-0.247	-0.385	0.469
Q22_3_N	Graduate students	University clients (internal clients, professors, students)	0.089	0.922	-0.133	0.864
Q22_2_N	Professors and researchers		-0.207	0.828	-0.25	0.757
Q22_4_N	Undergraduate students		0.314	0.753	-0.191	0.684
Q22_7_N	Research centers	Clients from hospitals and research center	0.138	0.255	-0.819⊥	0.7
Q22_6_N	Hospitals		-0.004	0.159	-0.791⊥	0.651

Rotation converged in 34 iterations.

Table 6-O-6 Rotated Component Matrix for PCA of objectives with oblimin rotation

Variables	Variables name	Components	Component 1	2	3	4	5	6	Communalities
Q37_4_N	Build or accelerate growth of a local industry sector	Improve the economic performance of the local community	0.743	0.163	-0.187	0.27	0.036	-0.073	0.696
Q37_11_N	Improve quality of life for all people		0.729	-0.07	0.204	0.083	-0.091	0.027	0.653
Q37_1_N	Create jobs in the local community (employment in established firm and in new ventures)		0.687	-0.18	0.133	-0.181	0.185	0.312	0.769
Q37_3_N	Create international partnerships		0.678	0.186	0.164	0.095	-0.122	-0.025	0.624
Q37_2_N	Diversify local economies		0.649	-0.155	0.134	-0.02	0.231	0.294	0.756
Q37_10_N	Increase net wealth for local community		0.58	0.184	0.199	0.074	0.233	0.06	0.714
Q37_9_N	Increase return on investment (ROI) for clients	Increase the financial success for companies	0.01	0.885	0.033	0.045	0.012	-0.103	0.751
Q37_17_N	Help companies increase their revenue		0.037	0.714	-0.189	0.082	0.175	0.263	0.745
Q37_7_N	Help in creating successful high growth companies		-0.051	0.713	0.316	-0.223	0.02	0.101	0.703
Q37_15_N	Encourage entrepreneurship, startup activity, and development	Support entrepreneurs/start-ups activity	0.138	0.015	0.769	0.185	0.058	-0.344	0.767
Q37_6_N	Help in creating startups		-0.02	0.234	0.713	-0.225	-0.188	0.224	0.736
Q37_16_N	Increase client learning (number of people who have gone through our program)		0.08	0.004	0.706	0.057	0.022	0.09	0.599
Q37_14_N	Bring the community together to support innovation, entrepreneurship, and startups		0.159	-0.217	0.456	0.347	0.349	0.123	0.698
Q37_12_N	Generate complementary benefits for the sponsoring or partner organization (e.g., create internships or joint research opportunities)	Generate benefits to self and other partners	0.189	-0.01	0.002	0.799	-0.028	-0.104	0.714
Q37_13_N	Generate income for our organization as an innovation intermediary		-0.531	0.014	0.18	0.569	-0.045	0.448	0.72
Q37_5_N	Help in commercializing technologies	Promote local industry by commercializing technologies	0.24	0.002	0.158	0.116	-0.707	0.119	0.537
Q37_20_N	Promote local economic development and prosperity		0.259	-0.001	0.208	-0.04	0.667	0.235	0.801
Q37_8_N	Stimulate local manufacturing		0.175	0.148	0.213	0.26	0.615	-0.159	0.696
Q37_19_N	Promote job retention for local industries		0.38	0.201	-0.092	0.044	0.549	0.211	0.711
Q37_21_N	Help develop businesses (innovations, new processes, sustainable, competitive advantage)	Increase the sustainability of success for companies	0.13	0.055	-0.013	-0.094	0.045	0.849	0.803
Q37_22_N	Create sustainable companies		0.022	0.301	0.173	0.028	-0.077	0.638	0.723
Q37_18_N	Increase the likelihood for success of clients		0.157	0.397	-0.187	0.212	-0.177	0.503	0.66

Table 6-O-7 Rotated Component Matrix for PCA of Commercialization paths

Commercialization paths/components	Variables	Loading on Component	Communalities	Components Explaining
SELL	Q9_3	0.888	0.788	61.358
	Q9_4	0.872	0.760	
	Q9_7	0.697	0.486	
	Q9_10	0.648	0.420	
RENT	Q9_5	0.832	0.693	61.781
	Q9_6	0.786	0.618	
	Q9_8	0.765	0.585	
	Q9_9	0.759	0.576	
RENT_nv	Q9_9	0.883	0.779	65.386
	Q9_8	0.869	0.756	
	Q9_2	0.653	0.426	

Table 6-O-8 Rotated Component Matrix for the idea/technology construct (using PCA with Varimax rotation)

Variables	Variables name	Factor name	Components						Communalities
			1	2	3	4	5	6	
Q31_12_N	Experience needed for commercializing the idea	Synergy between capability of IIs and the proposed idea	0.805	0.091	-0.095	0.055	-0.072	0.197	0.712
Q31_11_N	Resources needed for commercializing the idea		0.784	-0.038	-0.01	-0.012	0.057	0.015	0.621
Q31_10_N	Time needed for commercializing the idea		0.755	-0.127	0.265	0.039	-0.004	0.084	0.665
Q31_7_N	Business value of the idea		0.593	0.036	-0.054	0.221	0.227	-0.169	0.485
Q31_17_N	Level of failure risk of the idea		0.583	0.164	0.111	0.194	0.328	0.225	0.575
Q31_18_N	Value proposition of the idea		0.553	0.455	-0.042	0.162	0.231	-0.259	0.662
Q31_5_N	Development stage of the idea		0.488	0.1	0.427	0.012	-0.1	0.449	0.642
Q31_20_N	Society's potential benefit from the idea	Potential societal and environmental benefits from the idea	0.05	0.874	0.152	0.054	0.143	0.058	0.816
Q31_19_N	Society's potential acceptance of the idea		0.182	0.841	-0.095	0.06	0.101	0.009	0.764
Q31_21_N	Environmental contribution by the idea		-0.113	0.751	0.048	0.064	-0.084	-0.023	0.591
Q31_9_N	Patentability of the idea	Originality of the idea	0.026	0.009	0.867	-0.054	0.149	-0.007	0.778
Q31_14_N	Licensing potential of the idea		-0.072	0.1	0.785	0.102	0.209	-0.216	0.732
Q31_6_N	Scientific component of the idea		0.109	-0.061	0.771	0.107	-0.172	0.237	0.706
Q31_3_N	Novelty of the idea		0.191	0.218	0.485	0.486	-0.348	0.131	0.694
Q31_2_N	Scope of the idea	Innovation level of the idea (radical vs. incremental)	0.153	0.066	0.056	0.837	-0.126	0.188	0.782
Q31_1_N	Quality of the idea		0	0.037	-0.002	0.757	0.365	0.034	0.709
Q31_8_N	Competitive edge of the idea		0.226	0.305	0.224	0.52	0.264	-0.418	0.709
Q31_16_N	Cost reduction amount by the idea	Financial aspects related to the idea	0.109	0.102	0.031	0.139	0.759	0.211	0.663
Q31_13_N	Viability to obtain funds		0.419	0.087	0.136	-0.033	0.496	-0.034	0.45
Q31_4_N	Complexity of the idea	Uniqueness of the idea	0.313	-0.248	0.055	0.247	0.187	0.632	0.657
Q31_15_N	Inspirational source for the idea		-0.076	0.423	-0.015	0.098	0.303	0.624	0.676

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization; a Rotation converged in 7 iterations.

Therefore, the 21 items/criteria were reduced to six main criteria for the idea/technology construct; in other words, to assess the idea/technology, IIs evaluated the following six criteria:

1. The synergy between capability of IIs and the proposed idea;
2. The potential societal and environmental benefits of the idea;
3. The originality of the idea;
4. The innovation level of the idea (radical vs. incremental);
5. The financial aspects related to the idea; and
6. The uniqueness of the idea.

Therefore, the 12 items/criteria were reduced to three main criteria for the market construct; in other words, to assess the market, IIs tended to evaluate the following three criteria:

1. The level of the expected fit between market need and the proposed solution;
2. The path to market; and
3. The potential opportunities in the targeted market.

Table 6-O-9 Rotated Component Matrix for the market construct (using PCA with Varimax rotation)

Variables	Variables name	Factor name	Components			Communalities
			1	2	3	
Q32_11_N	Appeal of the final product to users.	Expected fit between market need and the proposed solution	0.864	0.085	0.084	0.761
Q32_4_N	Market viability.		0.726	0.348	0.258	0.715
Q32_12_N	Probability of acceptance for the new product by community.		0.699	0.214	0.187	0.57
Q32_5_N	Market feasibility.		0.675	0.343	0.259	0.641
Q32_7_N	Problem to be solved in the market.		0.656	0.113	0.326	0.55
Q32_8_N	Fit between market need and technology solution.		0.552	0.309	0.46	0.611
Q32_10_N	Regulation effects on path to market.	Path to market	0.244	0.864	0.137	0.825
Q32_9_N	Policy effects on path to market.		0.136	0.847	0.169	0.765
Q32_6_N	Market traction process.		0.559	0.604	0.18	0.71
Q32_2_N	Potential market.	Potential opportunities in the targeted market	0.165	0.095	0.913	0.869
Q32_3_N	Market opportunities.		0.3	0.217	0.836	0.835
Q32_1_N	Targeted market		0.443	0.441	0.51	0.65

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization; a Rotation converged in 5 iterations.

Table 6-O-10 Rotated Component Matrix for the entrepreneur construct (using PCA with Varimax rotation)

Variables	Variables name	Factors name	Components		Communalities
			1	2	
Q33_6_N	Capacity to learn	Entrepreneur engagement	0.898	0.246	0.868
Q33_5_N	Coachability		0.88	0.18	0.807
Q33_4_N	Team quality		0.694	0.465	0.697
Q33_10_N	Commitment to hard work		0.642	0.386	0.562
Q33_1_N	Skills	Entrepreneur capabilities	0.311	0.779	0.703
Q33_7_N	Entrepreneurial business acumen		0.122	0.77	0.608
Q33_2_N	Individual leadership reputation		0.265	0.755	0.64
Q33_8_N	Deep commitment to start a new enterprise		0.426	0.626	0.574
Q33_3_N	Individual leadership capacity		0.511	0.618	0.643
Q33_9_N	Ability to pay the services fee		-0.503	0.517	0.52

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization; a Rotation converged in 3 iterations.

Therefore, the 10 items/criteria were reduced to two main criteria for the entrepreneur construct; in other words, to assess the entrepreneur, IIs evaluated the following two criteria:

1. The level of entrepreneur engagement; and
2. The individual entrepreneur capabilities.

Table 6-O-11 Rotated Component Matrix for the new business venture construct (using PCA with Varimax rotation)

Variables	Variables name	Factors name	Component						Communalities
			1	2	3	4	5	6	
Q34_4_N	Potential profit	Viability of the new business venture	0.822	0.073	0.068	0.203	0.107	0.188	0.775
Q34_3_N	Potential revenue		0.784	0.282	0.115	0.025	0.281	0.046	0.79
Q34_5_N	Potential return on investment (ROI)		0.732	0.105	-0.134	0.238	-0.034	0.313	0.721
Q34_2_N	Potential cash flow from the new business venture in future		0.686	0.31	0.024	0.097	-0.076	0.145	0.603
Q34_6_N	Potential growth		0.548	0.49	-0.008	0.293	-0.099	0.137	0.655
Q34_19_N	Industry interest in the new business venture		0.493	0.224	0.347	0.326	0.245	-0.05	0.583
Q34_11_N	Potential scalability factor of the new business venture	Potential successful growth of the new business venture	0.235	0.822	0.09	0.128	0.038	0.072	0.762
Q34_9_N	Potential size of the new business venture		0.113	0.78	0.152	-0.02	0.15	0.142	0.687
Q34_10_N	Potential resources of the new business venture		0.191	0.774	0.111	0.231	0.071	0.012	0.707
Q34_12_N	Potential sustainability of the new business venture		0.431	0.662	0.206	0.157	0.247	-0.119	0.766
Q34_1_N	Economic viability		0.485	0.492	-0.028	0.334	-0.055	0.034	0.594
Q34_21_N	Contribution to building community capacity	Potential contribution to local societal and environment	-0.039	0.126	0.88	0.079	-0.026	0.139	0.817
Q34_22_N	Support for the region		-0.092	0.085	0.841	0.026	0.235	-0.121	0.794
Q34_23_N	Contribution to protect the environment		0.065	0.076	0.822	0.247	0.022	0.123	0.762
Q34_20_N	Potential number of jobs to be created by the new business venture		0.231	0.093	0.753	-0.129	0.2	-0.137	0.704
Q34_17_N	Business model of the new business venture	Scope of the new business venture	0.298	0.121	0.138	0.805	0.011	0.056	0.773
Q34_18_N	Business value of the new business venture		0.391	0.185	0.155	0.735	0.098	0.011	0.761
Q34_14_N	Potential ability to export by the new business venture		-0.005	0.348	-0.081	0.524	0.136	0.366	0.556
Q34_13_N	Potential commitment to research and development by the new business venture	Scientific and technology foundation of the new business venture	-0.005	0.009	0.24	-0.084	0.826	-0.009	0.747
Q34_16_N	Technology enablers of the new business venture		0.194	0.286	0.081	0.318	0.718	0.165	0.77
Q34_15_N	Stage of development of the new business venture		0.08	0.415	0.047	0.188	0.432	0.399	0.561
Q34_8_N	Ability to produce dividend income	Payback potential of the new business venture	0.257	-0.119	0.222	0.029	0.178	0.769	0.754
Q34_7_N	Ability to produce equity		0.231	0.243	-0.175	0.089	-0.066	0.768	0.745

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization; a Rotation converged in 7 iterations.

Therefore, the 23 items/criteria were reduced to six main criteria for the new venture construct; in other words, to assess the new business venture, IIs tended to evaluate the following six criteria:

1. The viability of the new business venture;
2. The potential successful growth of the new business venture;
3. The potential contribution to local society and environment;
4. The scope of the new business venture;
5. The scientific and technological foundation of the new business venture; and
6. The Payback potential of the new business venture.

Appendix P

Reliability and Validity

Table 6-P-1 Reliability Coefficient for Stakeholders Related Constructs

Constructs	Components	Items	Cronbach's Alpha	# Items
Stakeholders' Salience Level	Community Salience Level	Q12_2, Q13_2, Q14_2, Q15_2	0.849	4
	Financier Salience Level	Q12_5, Q13_5, Q14_5, Q15_5	0.901	4
	Industry Salience Level	Q12_3, Q13_3, Q14_3, Q15_3	0.848	4
	Government level of importance	Q12_1, Q13_1, Q14_1, Q15_1	0.800	4
	Educational Institution Salience Level	Q12_4, Q13_4, Q14_4, Q15_4	0.866	4
	Overall		**0.817**	**20**
Stakeholders' Level of Influence	Educational Institution Level of Influence	Q16_4, Q17_4, Q18_4	0.867	3
	Financier Level of Influence	Q16_5, Q17_5, Q18_5	0.828	3
	Industry Level of Influence	Q16_3, Q17_3, Q18_3	0.751	3
	Government Level of Influence	Q16_1, Q17_1, Q18_1	0.744	3
	Community Level of Influence	Q16_2, Q17_2, Q18_2	0.707	3
	Overall		**0.755**	**15**
Dependency on Stakeholders	Dependency on Educational Institution	Q19A_1--Q19A_11, **[Q19B_10]**	0.941**	11
	Dependency on Industry	Q19B_1--Q19B_9, Q19B_11, **[Q19D_9]**	0.880**	10
	Dependency on Government	Q19C_1--Q19C_11,	0.863	11
	Dependency on Financier	Q19D_1--Q19D_8, Q19D_10,Q19D_11	0.886	10
	Overall		**0.907**	**44**
Stakeholders Dependency on IIs	Educational Institution Dependency on IIs	Q21A_1--Q21A_8	0.924	8
	Government Dependency on IIs	Q21C_1--Q21C_8	0.853*	8
	Financier Dependency on IIs	Q21D_1--Q21D_8	0.843*	8
	Industry Dependency on IIs	Q21B_1--Q21B_8,	0.865*	8
	Overall		**0.867**	**32**

*These can be improved if item 8 was removed from each, however, the overall construct coefficient does not support the decision to remove them.

**These values improved after deleting Q19B_10, and Q19D_9 from first and second constructs respectively.

Table 6-P-2 Reliability Coefficient for Operational Strategy Constructs

Constructs	Components	Items	Cronbach's Alpha	# Items
Clients	External clients (Individual, Entrepreneurs, New Venture, Establish Firms, Partners and Other IIs)	Q22_1, Q22_5, Q22_8, Q22_9, Q22_10, Q22_11, Q22_12	0.831	7
	University Clients (Internal Clients, Professors, Students)	Q22_2, Q22_3, Q22_4	0.830	3
	Clients from Hospitals and Research Center	Q22_6, Q22_7	0.718	2
	Overall		0.774	12
IIs Objectives	Improve the Economic Performance of the Local Community	Q37_1, Q37_2, Q37_3 Q37_4, Q37_10, Q37_11	0.896	6
	Increase the Financial Success for Companies	Q37_7, Q37_9, Q37_17	0.784	3
	Support Entrepreneurs/Start-ups Activity	Q37_6, Q37_14, Q37_15, Q37_16	0.746	4
	Generate Benefits to Self and other Partners	Q37_12, Q37_13	0.280***	2
	Promote Local Industry by Commercializing Technologies	**[Q37_5],** Q37_8, Q37_19, Q37_20	0.822**	4
	Increase the Sustainability of Success for Companies	Q37_18, Q37_21, Q37_22	0.827	3
	Overall		0.900	22
Commercialization Paths	Sell	Q9_3, Q9_4, Q9_7, Q9_10	0.766	4
	Rent	Q9_5, Q9_6, Q9_8, Q9_9	0.777	4
	Rent_nv	Q9_2, Q9_8, Q9_10	0.612	3
	Overall		0.860	10
Idea/Technology Construct of Innovation Readiness	Synergy between capability of IIs and the proposed idea	Q31_5, Q31_7,Q31_10, Q31_11, Q31_12, Q31_17, Q31_18	0.816	7
	Potential societal and environmental benefits from the idea	Q31_19, Q31_20, **[Q31_21]**	0.811**	3
	Originality of the idea	**[Q31_3],** Q31_6, Q31_9, Q31_14	0.767**	4
	Innovation level of the idea (radical vs. incremental)	Q31_1, Q31_2, Q31_8	0.690	3
	Financial aspects related to the idea	Q31_13, Q31_16	0.334***	2
	Uniqueness of the idea	Q31_4, Q31_15	0.367 ***	2
	Overall		0.823	21
Market Construct of Innovation Readiness	Expected fit between market need and the proposed solution	Q32_4, Q32_5, Q32_7, Q32_8, Q32_11, Q32_12	0.876	6
	Path to market	Q32_6, Q32_9, Q32_10	0.819	3
	Potential opportunities in the targeted market	Q32_2, Q32_3, Q32_1	0.846	3
	Overall		0.916	12
Entrepreneur Construct of Innovation Readiness	Entrepreneur engagement	Q33_4, Q33_5, Q33_6, Q33_10	0.896	4
	Entrepreneur capabilities	Q33_1, Q33_2, Q33_3, Q33_7, Q33_8, **[Q33_9]**	0.872**	6
	Overall		0.876	10
New Business Venture Construct of Innovation Readiness	Viability of the new business venture	Q34_2, Q34_3, Q34_4, Q34_5, Q34_6, Q34_19	0.865	6
	Potential successful growth of the new business venture	Q34_1, Q34_9, Q34_10, Q34_11, Q34_12	0.874	5
	Potential contribution to local societal and environment	Q34_20, Q34_21, Q34_22, Q34_23	0.868	4
	Scope of the new business venture	Q34_14, Q34_17, Q34_18	0.708	3
	Scientific and technology foundation of the new business venture	Q34_13, Q34_15, Q34_16	0.641	3
	Payback potential of the new business venture	Q34_7, Q34_8	0.620	2
	Overall		0.901	23

**These values improved after removing Q37_5, Q31_21, Q31_3 and Q33D_9 from the corresponding components/factors.

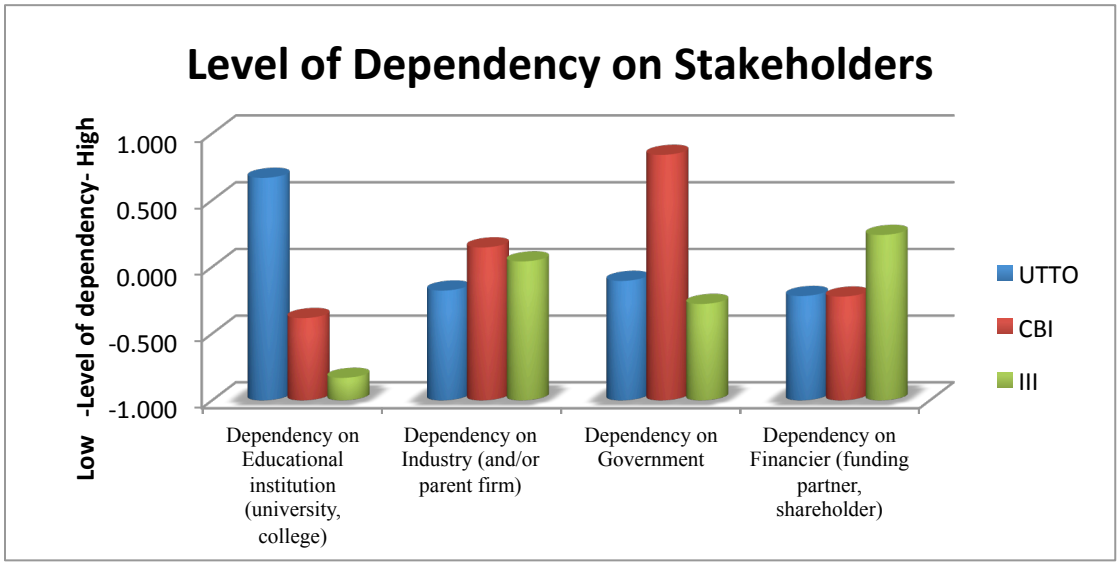
*** These components/factors were deleted from the research model

Appendix Q

Relation with Stakeholders, H1 Through H6 (Self-Groups)

Results (Table 6-Q-3-C) for MANOVA test for Dependency Levels on Stakeholders

Means for the Level of Dependency on Stakeholders



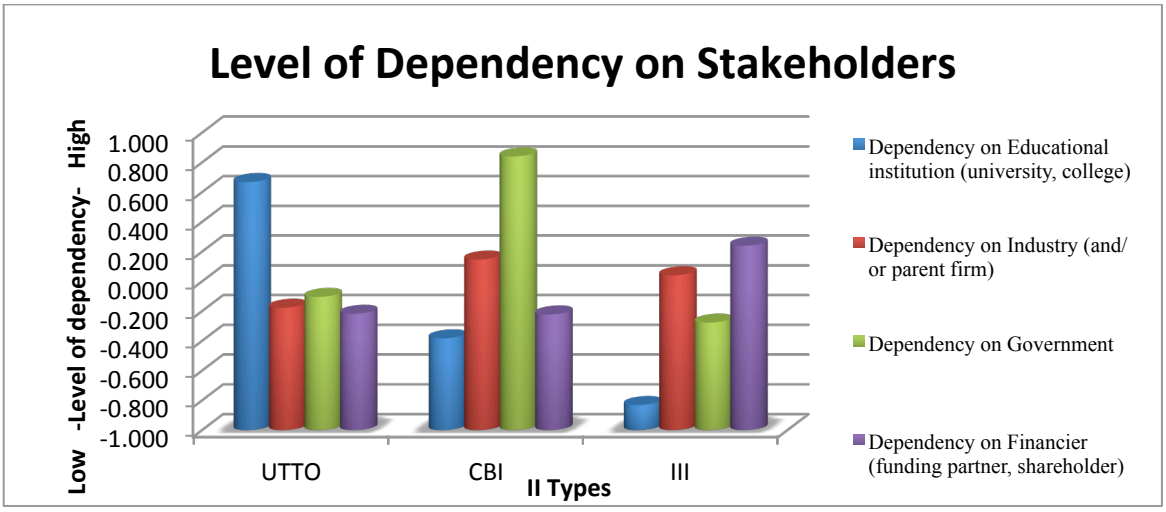
Post-hoc Result for the Level of Dependency on Stakeholders

Dependent Variable	(I) II Types	(J) II Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
Dependency on Educational institution (university, college)	UTTO	CBI	1.051*	0.221	0.000	0.477	1.626
		III	1.499*	0.128	0.000	1.166	1.833
Dependency on Financier (funding partner, shareholder)	III	UTTO	.458*	0.169	0.037	0.020	0.896
		CBI	0.462	0.300	0.417	-0.318	1.243

*Supplementary Appendixes that include results for some assumption tests, are available on https://drive.google.com/file/d/0B6rUGYkmrfMpRzZpUVJoUUptd0U/view?usp=sharing

Results (Table 6-Q-3-D) for one way repeat ANOVA test for Dependency Levels on Stakeholders:

The Means for the Level of Dependency on Stakeholders for Each IIs Type



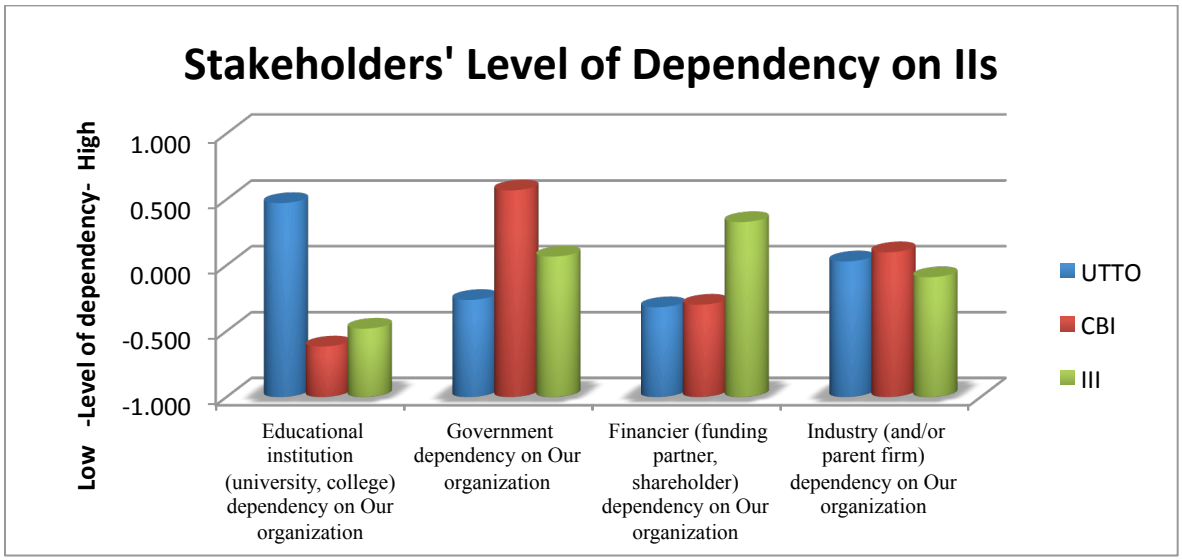
Pairwise Comparisons Result for the Level of Dependency on Stakeholders

II Types	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Dependency on Educational Institution (university, college)	Industry	.845*	0.106	0.000	0.559	1.131
		Government	.773*	0.110	0.000	0.473	1.072
		Financier	.886*	0.131	0.000	0.531	1.240
CBI[192]	Dependency on Government	Educational Institution	1.223*	0.382	0.008	0.382	2.065
		Industry	0.694	0.558	0.239	-0.534	1.922
		Financier	1.063*	0.405	0.024	0.171	1.954
III	Dependency on Educational Institution (university, college)	Industry	-.873*	0.142	0.000	-1.264	-0.481
		Government	-.554*	0.126	0.000	-0.901	-0.207
		Financier	-1.071*	0.175	0.000	-1.552	-0.590
	Dependency on Financier (funding partner, shareholder)	Educational Institution	1.071*	0.175	0.000	0.590	1.552
		Industry	0.199	0.188	1.000	-0.317	0.714
		Government	.517*	0.169	0.021	0.054	0.981

[192] LSD adjustment was used for this comparison.

Results (Table 6-Q-4-C) for MANOVA test for Dependency Levels by Stakeholders:

Means for the Level of Dependency by Stakeholders

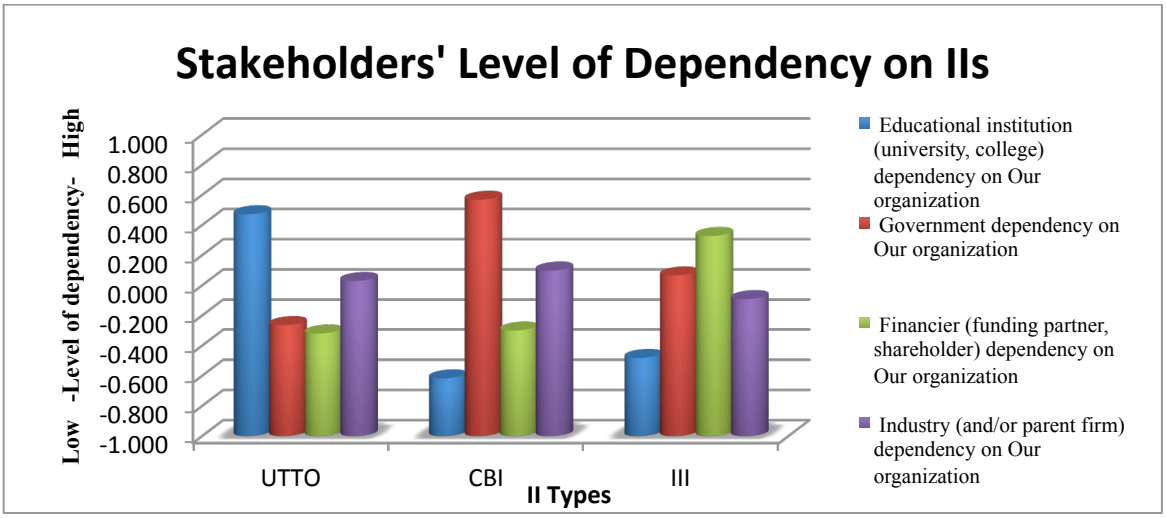


Post-hoc Result for the Level of Dependency by Stakeholders

Dependent Variable	(I) II Types	(J) II Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
Educational institution (university, college) dependency on our organization	UTTO	CBI	1.089*	0.276	0.001	0.371	1.807
		III	.953*	0.160	0.000	0.536	1.370

Results (Table 6-Q-4-D) for one way repeat ANOVA test for Dependency Levels by Stakeholders:

The Means for the Level of Dependency by Stakeholders on Each IIs Type

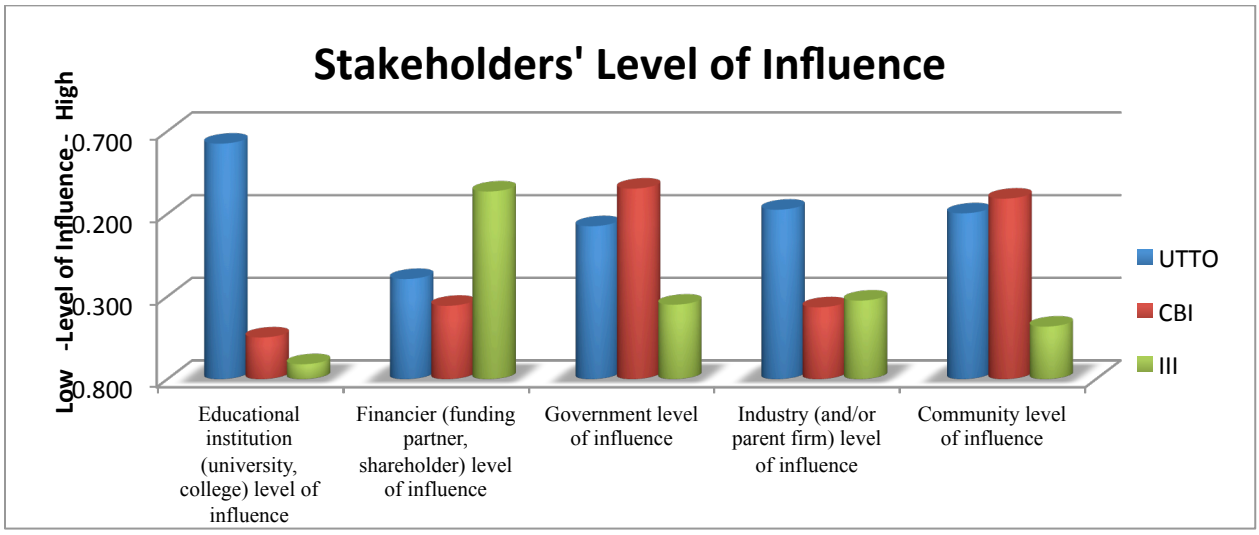


Pairwise Comparisons Result for the Level of Dependency by Stakeholders

II Types	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Educational Institution (university, college) dependency on our organization	Government	.736*	0.115	0.000	0.425	1.046
		Financier	.791*	0.130	0.000	0.439	1.143
		Industry	.443*	0.134	0.008	0.081	0.804
	Industry (and/or parent firm) dependency on our organization	Educational Institution	-.443*	0.134	0.008	-0.804	-0.081
		Government	0.293	0.110	0.057	-0.005	0.591
		Financier	.348*	0.125	0.040	0.010	0.686
CBI	Government dependency on Our organization	Educational Institution	1.185*	0.401	0.049	-0.102	2.472
		Financier	0.868	0.458	0.507	-0.601	2.336
		Industry	0.470	0.369	1.000	-0.713	1.652
III	Educational Institution (university, college) dependency on our organization	Government	-.547*	0.163	0.009	-0.996	-0.099
		Financier	-.809*	0.181	0.000	-1.307	-0.311
		Industry	-.390*	0.141	0.048	-0.779	-0.002
	Financier (funding partner, shareholder) dependency on our organization	Educational Institution	.809*	0.181	0.000	0.311	1.307
		Government	0.262	0.198	1.000	-0.283	0.806
		Industry	0.419	0.191	0.201	-0.107	0.945

Results (Table 6-Q-5-C) for MANOVA test for the level of influence by stakeholders:

Means for the Stakeholders Level of Influence



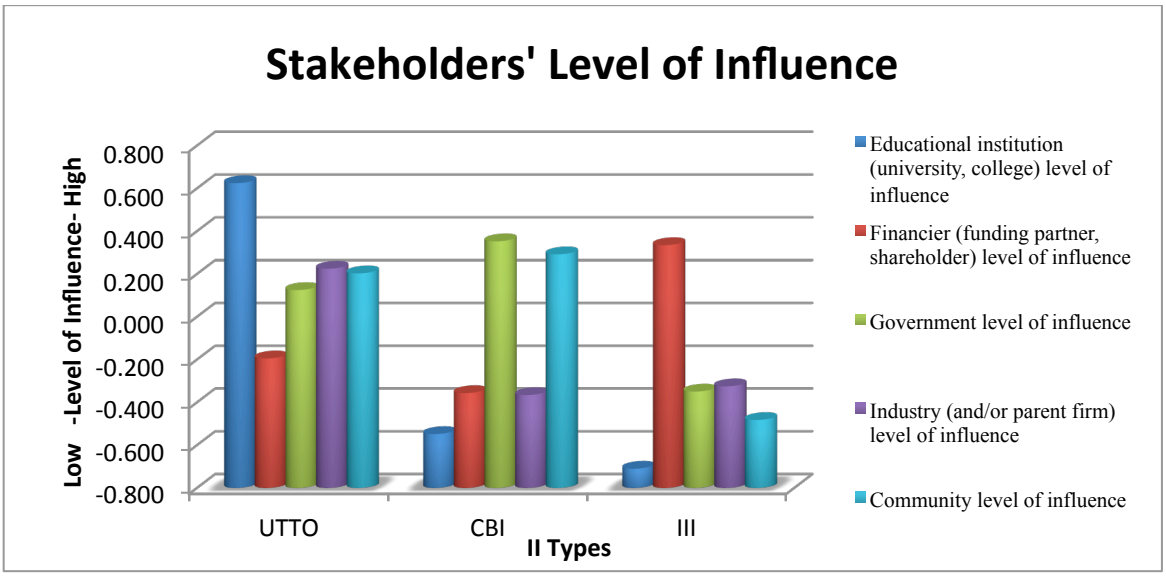
Post-hoc Result for the Level of Stakeholders Influence

Dependent Variable	(I) II Types	(J) II Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
Educational Institution (university, college) Level of Influence	UTTO ¥	CBI	1.173*	0.237	0.001	0.481	1.864
		III	1.334*	0.149	0.000	0.944	1.725
Financier (funding partner, shareholder) Level of Influence	III ¥	UTTO	.529*	0.159	0.006	0.116	0.943
		CBI	0.692	0.335	0.214	-0.288	1.671
Government Level of Influence	UTTO	CBI	-0.228	0.303	0.454	-0.827	0.371
		III	.475*	0.176	0.008	0.127	0.822
	CBI	UTTO	0.228	0.303	0.454	-0.371	0.827
		III	.702*	0.313	0.027	0.083	1.322
Industry (and/or parent firm) Level of Influence	UTTO	CBI	0.590	0.301	0.208	-0.193	1.374
		III	.55*	0.175	0.011	0.095	1.005
Community Level of Influence	UTTO	CBI	-0.089	0.286	0.989	-0.832	0.654
		III	.685*	0.166	0.000	0.254	1.117
	CBI	UTTO	0.089	0.286	0.989	-0.654	0.832
		III	.7742*	0.295	0.048	0.006	1.543

* The mean difference is significant at the 0.05 level; ¥ Based on Games-Howell post hoc as the homogeneity of variances was violated

Results (Table 6-Q-5-D) for one way repeat ANOVA test the level of influence by stakeholders:

The Means of Stakeholders' Level of Influence for Each II type



Pairwise Comparisons Result for Stakeholders' Level of Influence

II Types	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Educational Institution (university, college) Level of Influence	Financier	.819*	0.138	0	0.42	1.218
		Government	.500*	0.128	0.002	0.131	0.868
		Industry	0.4	0.145	0.071	-0.018	0.818
		Community	.422*	0.137	0.029	0.026	0.817
	Industry (and/or parent firm) Level of Influence	Educational Institution	-0.4	0.145	0.071	-0.818	0.018
		Financier	.419*	0.143	0.045	0.005	0.833
		Government	0.1	0.133	1	-0.285	0.485
		Community	0.022	0.141	1	-0.385	0.428
CBI[193]	Government Level of Influence	Educational Institution	.901*	0.311	0.014	0.217	1.584
		Financier	0.709	0.380	0.089	-0.127	1.545
		Industry	0.718	0.383	0.088	-0.126	1.562
		Community	0.061	0.371	0.873	-0.756	0.878
III	Financier (funding partner, shareholder) Level of Influence	Educational Institution	1.045*	0.15	0	0.604	1.486
		Government	.685*	0.182	0.004	0.151	1.218
		Industry	.660*	0.179	0.006	0.134	1.186
		Community	.817*	0.172	0	0.313	1.322

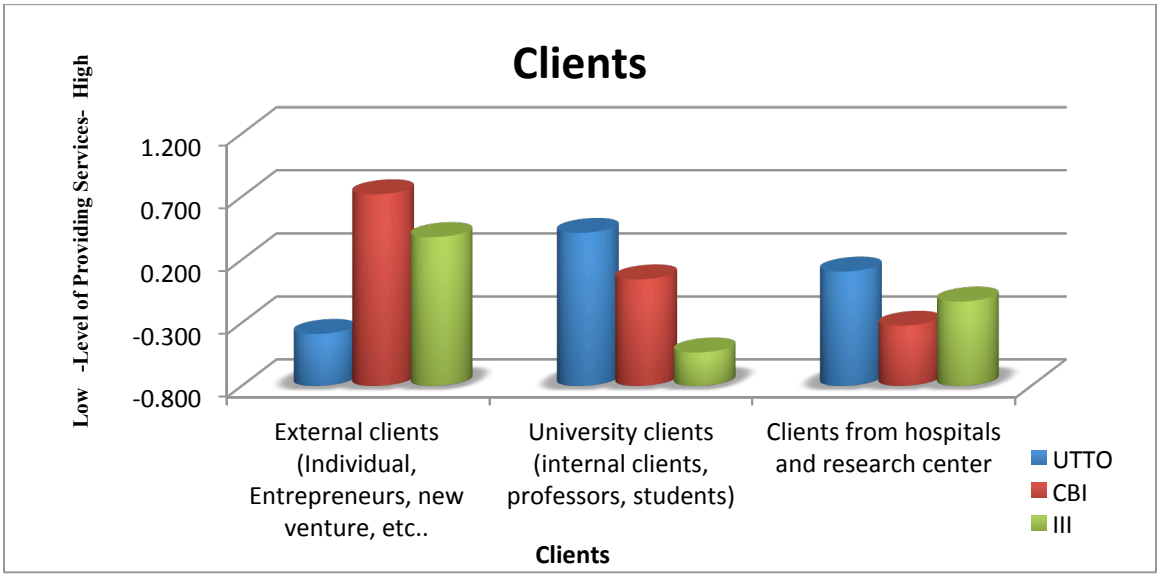
[193] LSD adjustment was used for this comparison.

Appendix R

Relation with Operational Strategies (Self-Groups)

Results (Table-6-R-1B) for MANOVA test for Clients:

Means for the Three Main Clients



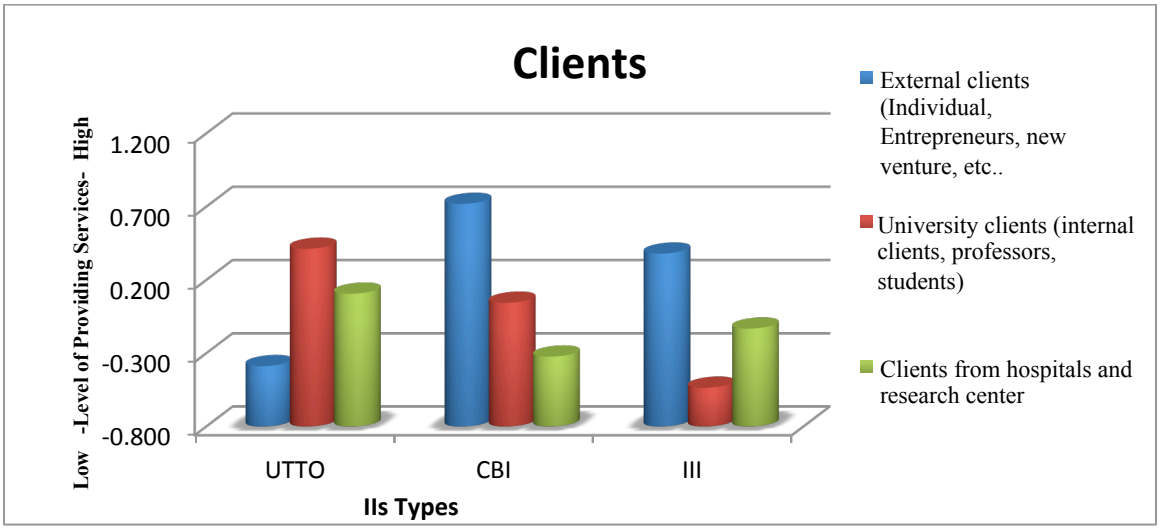
Post-hoc Result for Clients Differences Between IIs Types

Dependent Variable	(I) II Types	(J) II Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
External Clients (individual, entrepreneurs, new venture, establish firms, partners and other IIs)	CBI	UTTO	1.107*	0.265	0.000	0.479	1.735
		III	0.339	0.275	0.435	-0.311	0.990
	III	UTTO	.768*	0.160	0.000	0.390	1.146
		CBI	-0.339	0.275	0.435	-0.990	0.311
University Clients (internal clients, professors, students)	UTTO	CBI	0.369	0.259	0.331	-0.244	0.981
		III	.948*	0.156	0.000	0.580	1.317

*Supplementary Appendixes that include results for some assumption tests, are available on https://drive.google.com/file/d/0B6rUGYkmrfMpRzZpUVJoUUptd0U/view?usp=sharing

Results (Table-6-R-1D) for One Way Repeat ANOVA Test for Clients:

Means for Clients for Each Cluster

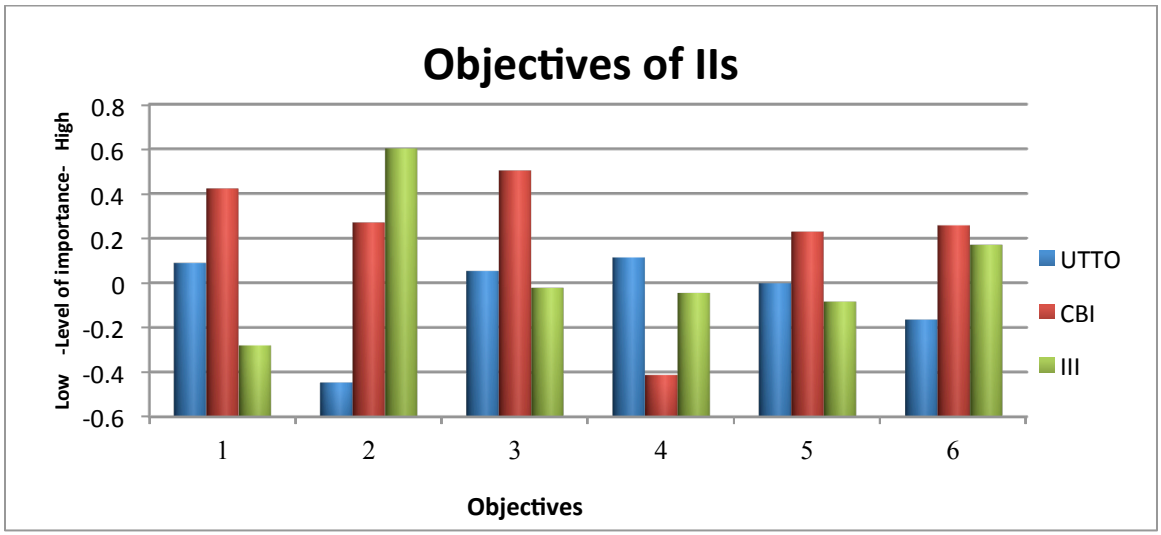


Post-hoc Result for Providing Services to Clients Within Each IIs type

II Types	(I) Clients	(J) Clients	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	University Clients (internal clients, professors, students)	External clients	.801*	0.131	0.000	0.480	1.122
		Clients from hospitals and research center	0.307	0.141	0.097	-0.038	0.652
	Clients from hospitals and research center	External clients	.494*	0.130	0.001	0.177	0.811
		University clients	-0.307	0.141	0.097	-0.652	0.038
CBI	External Clients (individual, entrepreneurs, new venture, establish firms, partners and other IIs)	University clients	0.674	0.347	0.222	-0.279	1.628
		Clients from hospitals and research center	1.042*	0.329	0.022	0.138	1.947
III	External Clients (individual, entrepreneurs, new venture, establish firms, partners and other IIs)	University clients	.915*	0.150	0.000	0.544	1.285
		Clients from hospitals and research center	.511*	0.152	0.004	0.136	0.886
	Clients from hospitals and research center	External clients	-.511*	0.152	0.004	-0.886	-0.136
		University clients	.404*	0.159	0.041	0.012	0.795

Results (Table-6-R-2B) for MANOVA Test for Performance and Goals:

Means for the Six Main Objectives



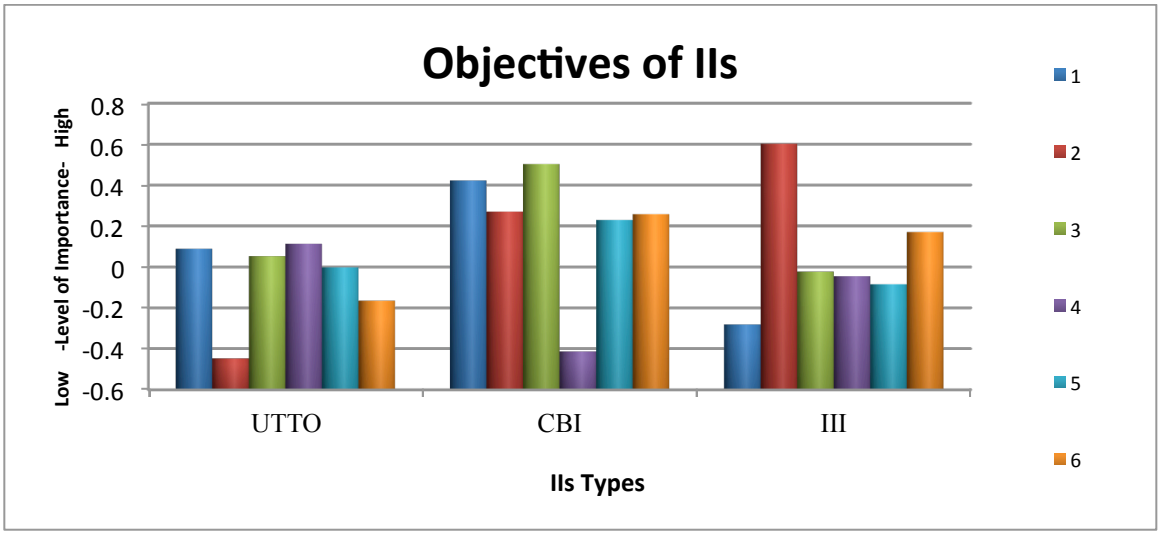
Post-hoc Result for Objectives Differences Between Clusters

Dependent Variable	(I) II Types	(J) II Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Boun	Upper Bound
Improve the economic of the local community	UTTO	CBI	-0.333	0.284	0.243	-0.896	0.229
		III	.37*	0.167	0.028	0.040	0.699
	CBI	UTTO	0.333	0.284	0.243	-0.229	0.896
		III	.703*	0.295	0.018	0.121	1.286
Increase the financial success for companies	III ¥	UTTO	1.049*	0.135	0.000	0.730	1.368
		CBI	0.332	0.290	0.504	-0.428	1.091

¥ Based on Games-Howell post-hoc as the homogeneity of variances was violated

Results (Table-6-R-2D) for One Way Repeat ANOVA Test for Performance and Goals:

Means for Objectives for Each Cluster

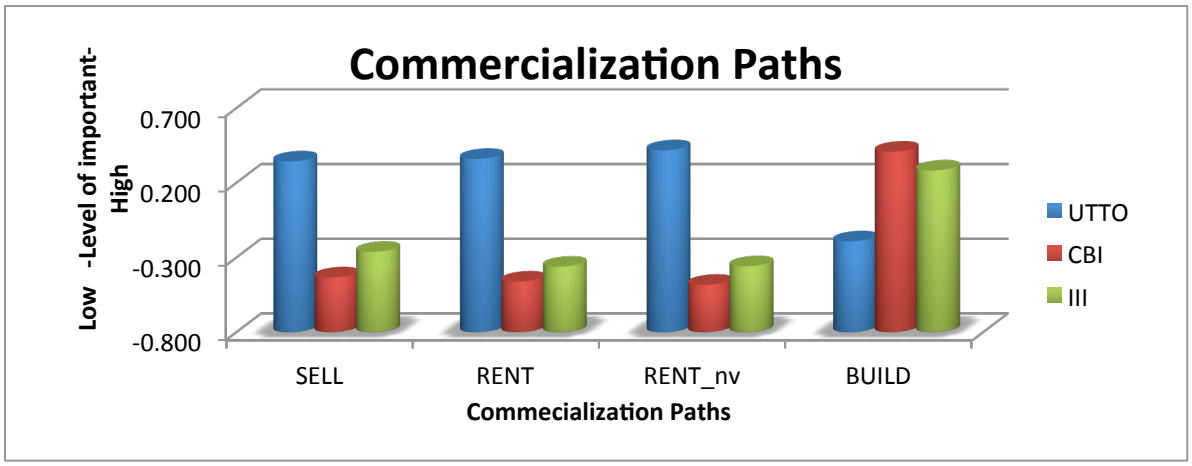


Post-hoc Result for Objectives Within Each Cluster

II Types	(I) Objectives	(J) Objectives	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	Increase the financial success for companies	Improve the economic performance of the local community	-.536*	0.114	0.000	-0.880	-0.193
		Support entrepreneurs/start-ups activity	-.500*	0.123	0.002	-0.873	-0.126
		Promote local industry by commercializing technologies	-.445*	0.140	0.031	-0.867	-0.022
		Increase the sustainability of success for companies	-0.282	0.121	0.332	-0.648	0.084
III	Increase the financial success for companies	Improve the economic performance of the local community	.883*	0.174	0.000	0.347	1.418
		Support entrepreneurs/start-ups activity	.625*	0.152	0.002	0.158	1.091
		Promote local industry by commercializing technologies	.686*	0.180	0.005	0.133	1.239
		Increase the sustainability of success for companies	0.432	0.158	0.130	-0.055	0.919

Results (Table-6-R-3B) for MANOVA Test for Commercialization Paths:

Means for the Four Constructs of Commercialization paths

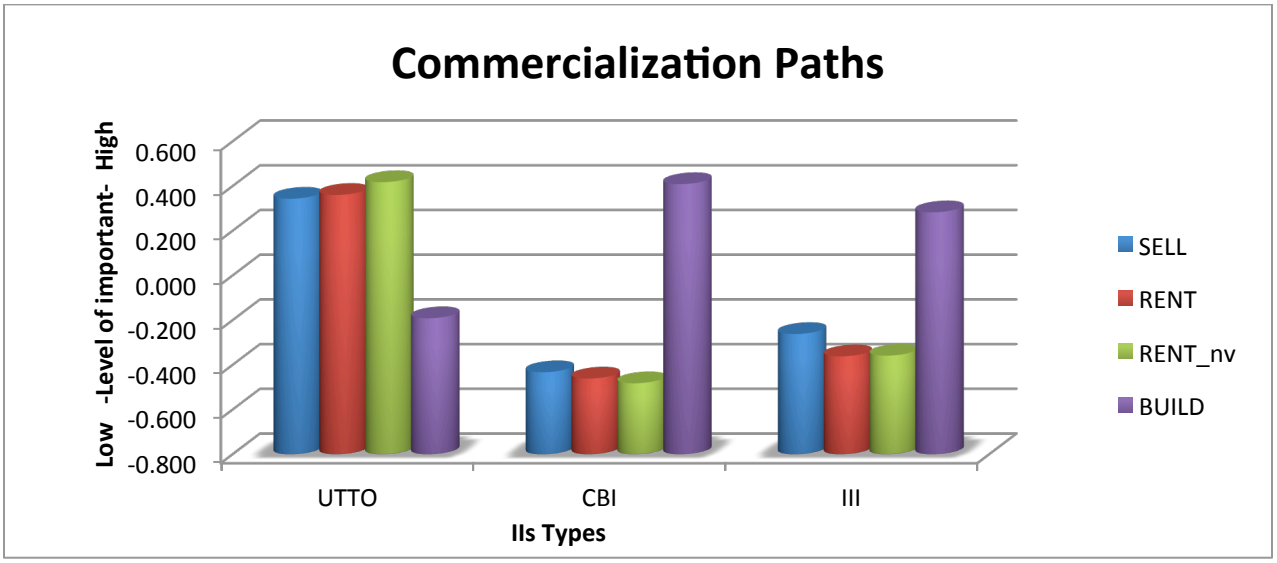


Post-hoc Result for Commercialization Paths' Level of Importance Between IIs Types

Dependent Variable	(I) IIs Types	(J) IIs Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
SELL	UTTO	CBI	.776*	0.268	0.012	0.142	1.411
		III	.605*	0.161	0.001	0.224	0.987
RENT	UTTO	CBI	.821*	0.265	0.007	0.194	1.449
		III	.722*	0.160	0.000	0.344	1.100
RENT_nv	UTTO	CBI	.900*	0.260	0.002	0.284	1.516
		III	.776*	0.157	0.000	0.405	1.147
BUILD	CBI	UTTO	.600*	0.273	0.029	0.062	1.139
		III	0.126	0.282	0.656	-0.432	0.684
	III	UTTO	.474*	0.164	0.004	0.150	0.798
		CBI	-0.126	0.282	0.656	-0.684	0.432

Results (Table-6-R-3D) for One Way Repeat ANOVA Test for Commercialization Paths:

Means for the commercialization paths



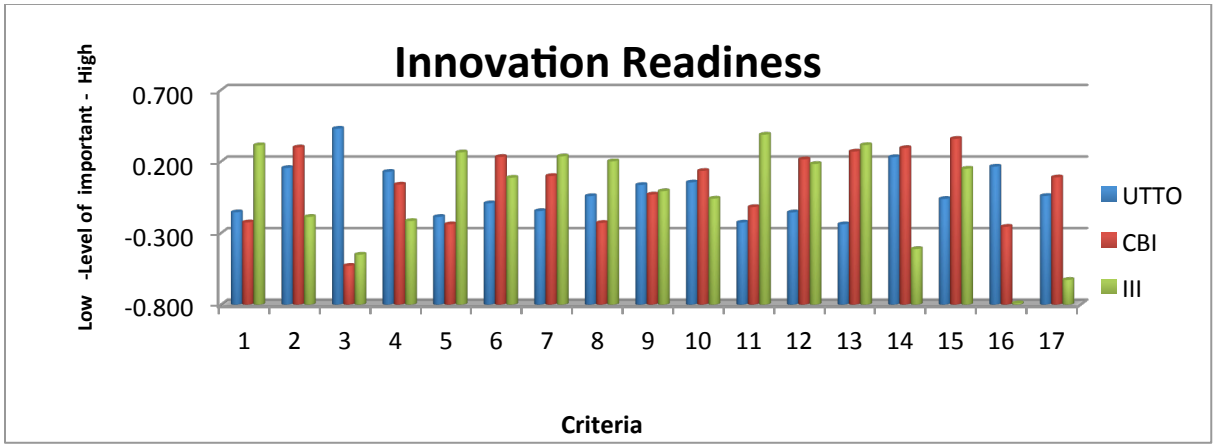
Post-hoc Result for Commercialization Paths' Level of Importance Within Each IIs Types

IIs Types	(I) CP	(J) CP	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	SELL	RENT	-0.017	0.077	1.000	-0.224	0.190
		RENT_nv	-0.074	0.079	1.000	-0.287	0.139
		BUILD	.535*	0.132	0.001	0.177	0.893
	RENT	SELL	0.017	0.077	1.000	-0.190	0.224
		RENT_nv	-0.057	0.055	1.000	-0.207	0.093
		BUILD	.552*	0.132	0.000	0.195	0.909
	RENT_nv	SELL	0.074	0.079	1.000	-0.139	0.287
		RENT	0.057	0.055	1.000	-0.093	0.207
		BUILD	.609*	0.140	0.000	0.229	0.989
CBI[194]	BUILD	SELL	.842*	0.345	0.03	0.097	1.586
		RENT	0.87	0.408	0.053	-0.012	1.752
		RENT_nv	.891*	0.331	0.018	0.176	1.606
III	BUILD	SELL	.545*	0.119	0.000	0.218	0.871
		RENT	.644*	0.136	0.000	0.272	1.017
		RENT_nv	.641*	0.137	0.000	0.265	1.018

[194] LSD adjustment was used instead of Bonferroni adjustment; as the later does not detect the differences.

Results (Table-6-R-4B) for MANOVA Test for Innovation Readiness Criteria:

Means of Criteria for the Four Constructs of Innovation Readiness

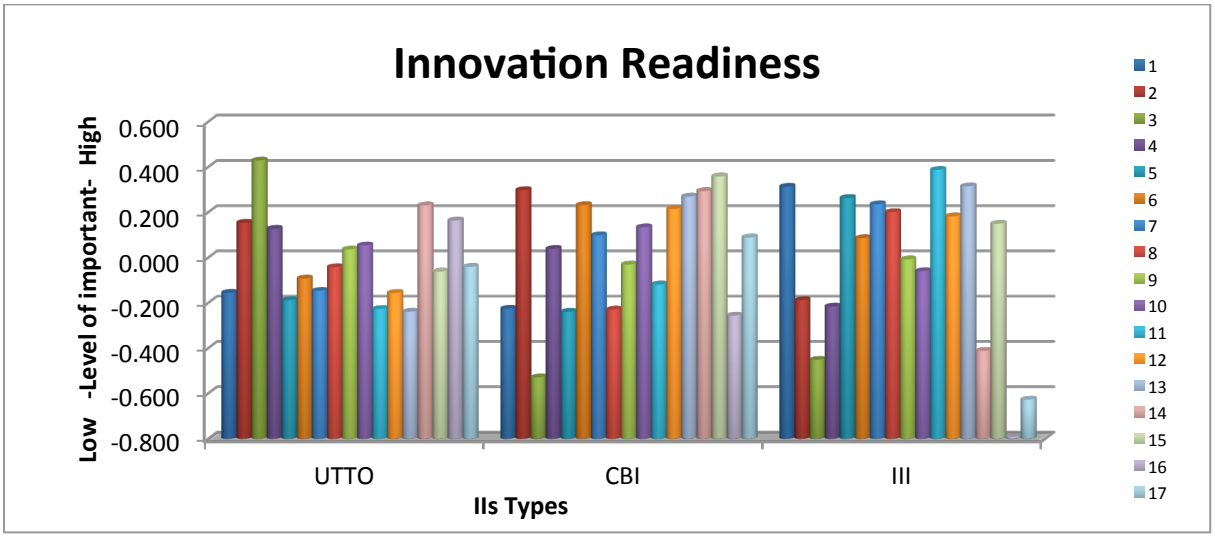


Post-hoc Result for Criteria Level of Importance Between IIs Types

Dependent Variable	(I) II Types	(J) II Types	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
Synergy between capability of IIs and the proposed idea	III	UTTO	.468*	0.173	0.037	0.020	0.917
		CBI	0.539	0.296	0.269	-0.231	1.309
Originality of the idea	UTTO	CBI	.958*	0.258	0.002	0.288	1.628
		III	.880*	0.155	0.000	0.476	1.284
Entrepreneur capabilities	III	UTTO	.614*	0.168	0.002	0.177	1.052
		CBI	0.506	0.289	0.303	-0.246	1.258
Potential successful growth of the new business venture	III	UTTO	.554*	0.171	0.008	0.110	0.997
		CBI	0.045	0.293	0.999	-0.716	0.807
Potential contribution to local societal and environment	UTTO	CBI	-0.064	0.281	0.996	-0.794	0.667
		III	.642*	0.169	0.001	0.202	1.082
Scientific and technology foundation of the new business venture	UTTO	CBI	0.420	0.277	0.131	-0.127	0.967
		III	.414*	0.167	0.014	0.084	0.744

Results (Table-6-R-3D) for One Way Repeat ANOVA Test for Innovation Readiness Criteria:

Criteria for the Four Constructs of Innovation Readiness



Post-hoc Result for Criteria Level of Importance Within Each IIs Types

II Types	(I) Criteria	(J) Criteria	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
UTTO	3	1	.584*	0.148	0.024	0.032	1.136
		11	.656*	0.138	0.001	0.142	1.169
		12	.585*	0.145	0.018	0.044	1.126
		13	.668*	0.126	0.000	0.201	1.135
		17	.470*	0.125	0.045	0.004	0.936
	14	11	.457*	0.121	0.040	0.008	0.907
III	3	1	-.764*	0.147	0.000	-1.324	-0.205
		7	-.687*	0.180	0.047	-1.370	-0.004
		8	-.652*	0.166	0.032	-1.282	-0.023
		11	-.839*	0.172	0.001	-1.491	-0.186
		17	-.605*	0.129	0.003	-1.095	-0.115
	11	2	.575*	0.137	0.014	0.054	1.096
		3	.839*	0.172	0.001	0.186	1.491
		14	.799*	0.165	0.002	0.172	1.427
	14	7	-.648*	0.169	0.046	-1.291	-0.004
		11	-.799*	0.165	0.002	-1.427	-0.172
		13	-.727*	0.173	0.014	-1.386	-0.068

Appendix S

Clustering Procedures (Profiling)

			Description	Versus all other clusters				Versus the other two clusters	
				Cluster#1	Cluster#2	Cluster#3	Cluster#4	Cluster#1&3	Cluster#2&4
1		Q1_2	Our organization provides clients with free commercialization related services	↑2.48	-	↑2.67	↓4.77	↑4.76	-
2		Q1_4	Our organization is open to facilitating the commercialization of ideas of multiple sectors and/or disciplines	↑10	-	-	-	-	-
3	Sectors	Q5_4	Our organization serves the manufacturing sectors	-	-	-	↓3	↑1.89	-
4	Sectors	Q5_5	Our organization serves the environment sectors	-	-	-	↓4	↑2.06	-
5	Co-located	Q7_1	We are co-located with a university, college or hospital	↑6.54	↑3.3	↑2.27	↓16.58	↑13.16	-
6	Co-located	Q7_10	We are co-located with a startup	↑7.6	-	-	-	-	-
7	Co-located	Q7_12	We are not co-located.	↓4.6	↑2.4	↓13.37	↑20.8	-	↑17.407
8	Legal status	Q8_1	We are legally a public organization	↑2.7	-	-	-	↑6.49	-
9	Legal status	Q8_2	We are legally an incorporated private for-profit firm	↓7	↑2.19	↓3.55	↑8.93	-	↑9.886
10	Legal status	Q8_6	We are legally part of a university, college or hospital	↑5.44	↓10.3	-	↓14.55	↑17.86	-
11	Legal status	Q8_9	We are legally a single-owner organization	-	-	-	↑5.5	-	↑2.7
12	Groups	Q2_1	I am from a technology transfer office (or equivalent) that is associated with an Educational Institution	52%		39%			
13	Groups	Q2_1	I am from an angel investor group.				100%		
14	Groups	Q2_1	I am from a venture capital investor firm.				87%		
15	Groups	Q2_1	I am from another lending organization.		100%				
16	Groups	Q2_1	Other (please specify)	-	-	-	-		
17	Groups	Q2_1	I am from a business incubator that is associated with an Educational Institution (university, college).	36.5%		36.5%			
18	Groups	Q2_1	I am from a business incubator that is supported by the Government.	43%	43%				
19	Groups	Q2_1	I am from a private business incubator.		50%	25%	25%		
20	Groups	Q2_1	I am from a business accelerator that is associated with an Educational Institution (university, college).	20%	20%	40%	20%		
21	Groups	Q2_1	I am from a business accelerator that is supported by the Government.		40%	60%			
22	Groups	Q2_1	I am from a private business accelerator.		27%	27%	36%		
23	Groups	Q2_1	I am from a consulting company.		48%		36%		
24	Groups	Q10_1	UTTO	55%		36%			
25	Groups	Q10_1	CBI	31%	33%	28%			
26	Groups	Q10_1	IFOI	-	-	-	-		
27	Groups	Q10_1	III		32%	24%	40%		

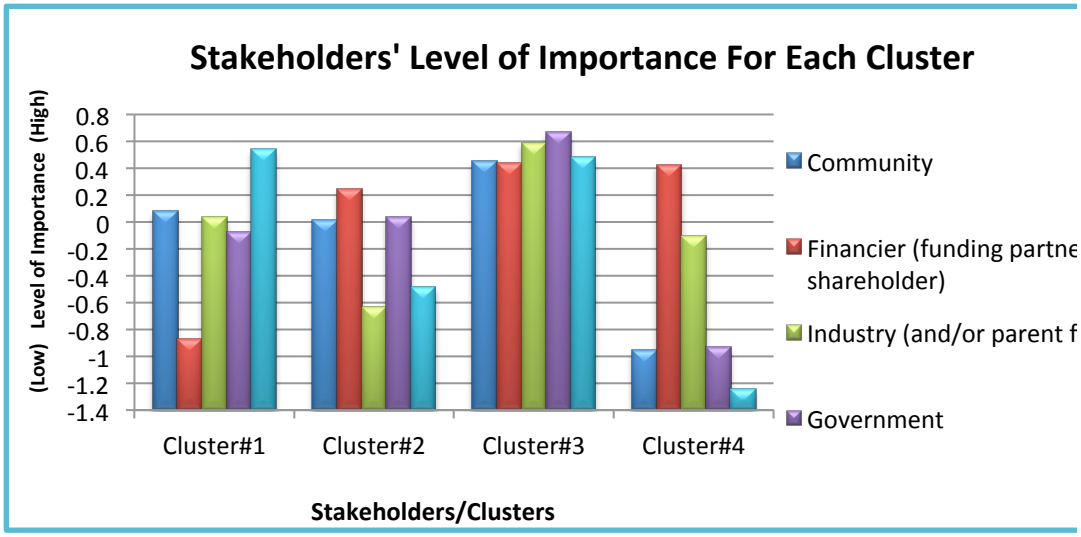
Table B-1: Summary for all significant demographics variables: ↑Means have higher likelihood for a particular characteristic comparing with others; while ↓ means the opposite

Appendix T

Relation with Stakeholders H1 Through H6 (Clusters)

(Table-6-T-2B) Level of Importance for Stakeholders:

The Means of Stakeholders' Level of Importance for Each Cluster

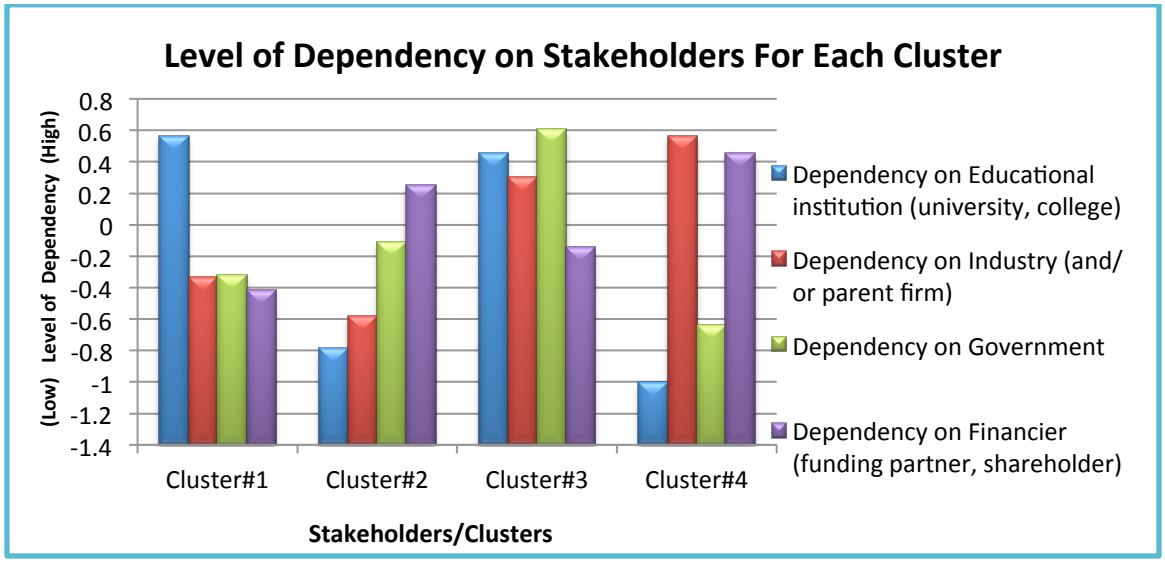


Post-hoc Result for Stakeholders' Level of Importance

Clusters	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	Sig	95% Confi D Lower Bound
1	Educational Institution (university, college)	Community	.457*	0.150	0.038	0.015
		Financier (funding partner, shareholder)	1.409*	0.174	0.000	0.894
		Industry (and/or parent firm)	.504*	0.164	0.036	0.020
		Government	.612*	0.159	0.004	0.141
2	Financier (funding partner, shareholder)	Community	0.227	0.203	1.000	-0.386
		Industry (and/or parent firm)	.877*	0.215	0.003	0.229
		Government	0.209	0.193	1.000	-0.372
		Educational institution (university, college)	.727*	0.180	0.003	0.185
4	Financier (funding partner, shareholder)	Community	1.377*	0.206	0.000	0.744
		Industry (and/or parent firm)	0.530	0.241	0.374	-0.212
		Government	1.359*	0.241	0.000	0.617
		Educational institution (university, college)	1.667*	0.218	0.000	0.995
	Industry (and/or parent firm)	Community	.847*	0.225	0.009	0.156
		Financier (funding partner, shareholder)	-0.530	0.241	0.374	-1.272
		Government	0.829	0.314	0.141	-0.137
		Educational institution (university, college)	1.137*	0.232	0.000	0.425

(Table-6-T-3B) Level of Dependency on Stakeholders

The Means for the Level of Dependency on Stakeholders for Each Cluster



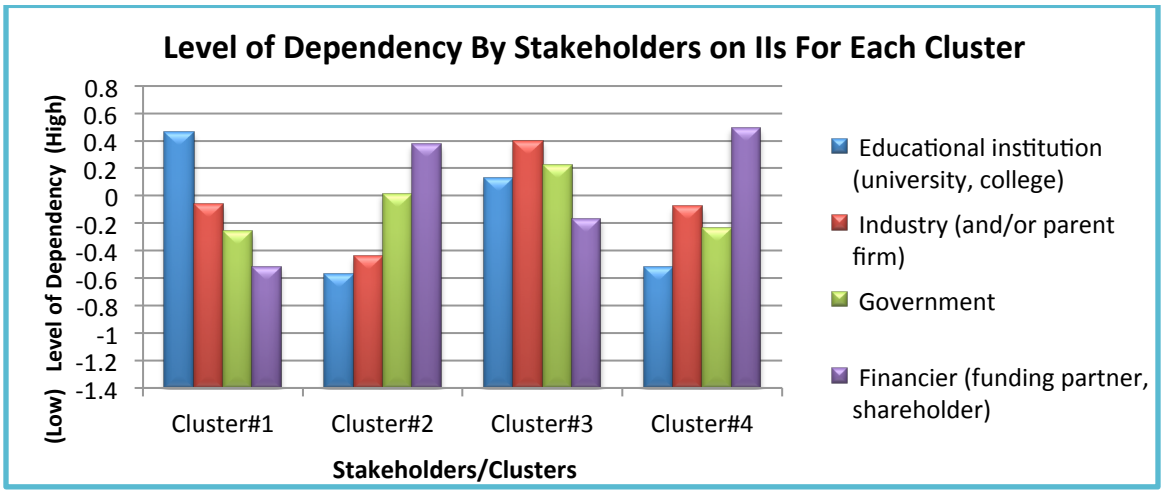
Post-hoc Result for the Level of Dependency on Stakeholders

Clusters	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	Educational Institution	Industry	.894*	0.158	0.000	0.457	1.331
		Government	.885*	0.159	0.000	0.446	1.323
		Financier	.981*	0.149	0.000	0.570	1.391
#2	Government	Educational Institution	.673*	0.151	0.001	0.249	1.097
		Industry	.472*	0.147	0.018	0.059	0.885
		Financier	-0.363	0.184	0.341	-0.879	0.153
	Financier	Educational Institution	1.036*	0.160	0.000	0.587	1.486
		Industry	.835*	0.178	0.000	0.336	1.334
		Government	0.363	0.184	0.341	-0.153	0.879
#3	Educational Institution	Industry	0.153	0.189	1.000	-0.369	0.675
		Government	-0.152	0.202	1.000	-0.713	0.408
		Financier	.597*	0.169	0.006	0.130	1.065
	Government	Educational Institution	0.152	0.202	1.000	-0.408	0.713
		Industry	0.306	0.175	0.527	-0.179	0.790
		Financier	.750*	0.156	0.000	0.318	1.181
#4	Industry	Educational Institution	1.565*	0.201	0.000	0.990	2.139
		Government	1.201*	0.197	0.000	0.638	1.764
		Financier	0.105	0.296	1.000	-0.742	0.952
	Financier	Educational Institution	1.459*	0.278	0.000	0.664	2.254
		Industry	-0.105	0.296	1.000	-0.952	0.742
		Government	1.096*	0.229	0.000	0.440	1.751

*Supplementary Appendixes that include results for some assumption tests, are available on https://drive.google.com/file/d/0B6rUGYkmrfMpRzZpUVJoUUptd0U/view?usp=sharing

(Table-6-T-4B) Level of Stakeholder's Dependency on IIs:

The Means for the Level of Stakeholder's Dependency on IIs for Each Cluster

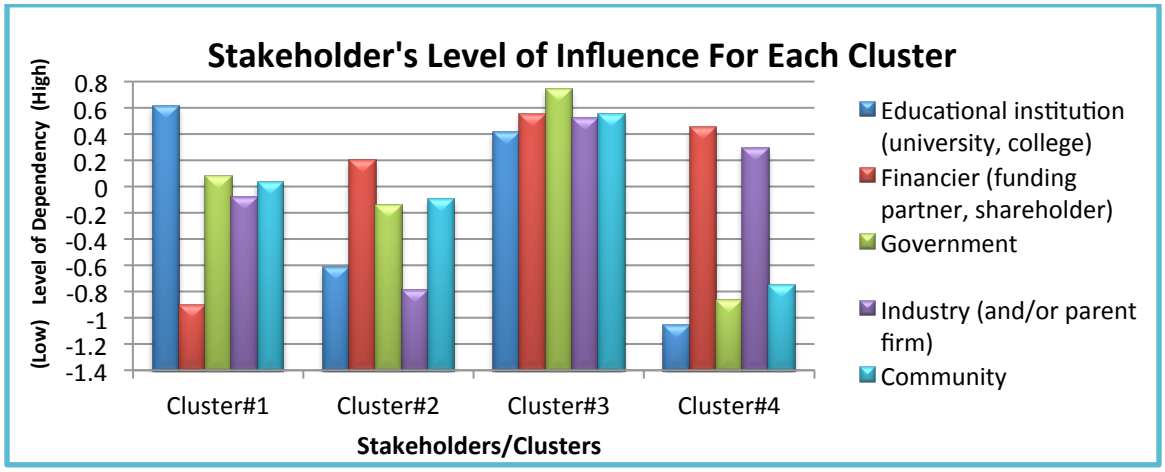


Post-hoc Result for the Level of Stakeholder's Dependency on IIs

Clusters	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	Educational Institution	Government	.718*	0.157	0.000	0.284	1.151
		Financier	.979*	0.156	0.000	0.547	1.411
		Industry	0.524	0.213	0.107	-0.064	1.113
	Industry	Educational Institution	-0.524	0.213	0.107	-1.113	0.064
		Government	0.193	0.136	0.963	-0.181	0.568
		Financier	.455*	0.147	0.021	0.048	0.861
#2	Government	Educational Institution	.583*	0.171	0.011	0.102	1.063
		Financier	-0.358	0.235	0.824	-1.017	0.302
		Industry	0.459	0.203	0.183	-0.111	1.028
	Financier	Educational Institution	.941*	0.213	0.001	0.343	1.538
		Government	0.358	0.235	0.824	-0.302	1.017
		Industry	.816*	0.207	0.002	0.234	1.399
#3	Industry	Educational Institution	0.269	0.185	0.914	-0.242	0.78
		Government	0.174	0.176	1	-0.312	0.661
		Financier	.566*	0.174	0.013	0.085	1.047
#4	Financier	Educational Institution	1.015*	0.253	0.003	0.29	1.739
		Government	0.731	0.256	0.051	-0.003	1.464
		Industry	0.572	0.261	0.226	-0.175	1.319

(Table-6-T-5B) Level of Influence on IIs by Stakeholders:

The Means of the Level of Influence on IIs by Stakeholders for Each Cluster



Post-hoc Result for the Level of Influence on IIs by Stakeholders

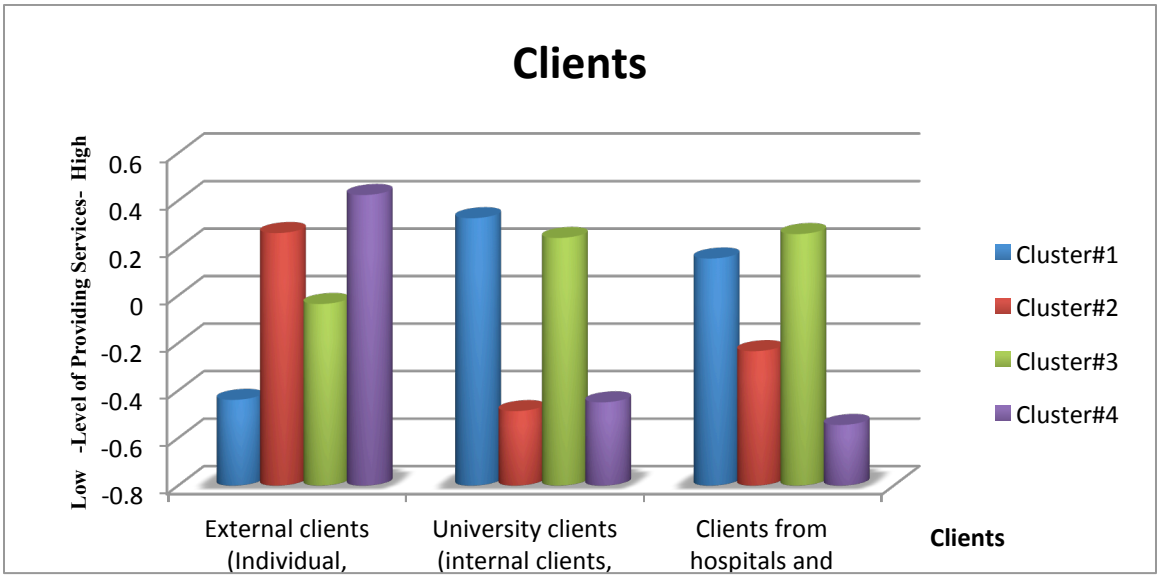
Clusters	(I) Stakeholders	(J) Stakeholders	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	Educational Institution	Financier	1.516*	0.134	0.000	1.121	1.910
		Government	.533*	0.150	0.010	0.088	0.978
		Industry	.695*	0.179	0.003	0.166	1.225
		Community	.577*	0.150	0.004	0.134	1.019
	Financier	Educational Institution	-1.516*	0.134	0.000	-1.910	-1.121
		Government	-.983*	0.195	0.000	-1.558	-0.408
		Industry	-.820*	0.191	0.001	-1.384	-0.256
		Community	-.939*	0.205	0.000	-1.544	-0.334
#2	Financier	Educational Institution	.821*	0.167	0.000	0.319	1.324
		Government	0.349	0.182	0.637	-0.198	0.896
		Industry	.993*	0.203	0.000	0.383	1.603
		Community	0.304	0.213	1.000	-0.336	0.943
	Community	Educational Institution	0.518	0.254	0.497	-0.247	1.282
		Financier	-0.304	0.213	1.000	-0.943	0.336
		Government	0.045	0.260	1.000	-0.738	0.828
		Industry	.689*	0.187	0.008	0.128	1.250
#4	Financier	Educational Institution	1.506*	0.172	0.000	0.977	2.036
		Government	1.314*	0.258	0.000	0.520	2.107
		Industry	0.160	0.243	1.000	-0.587	0.907
		Community	1.201*	0.221	0.000	0.520	1.882
	Industry	Educational Institution	1.346*	0.215	0.000	0.685	2.007
		Financier	-0.160	0.243	1.000	-0.907	0.587
		Government	1.154*	0.181	0.000	0.595	1.712
		Community	1.041*	0.288	0.013	0.154	1.928

Appendix U

Relation with Operational Strategies (Clusters)

Results (Table-6-U-1B) for MANOVA Test for Clients:

Means for the Three Main Clients



Post-hoc Result for Clients Differences between Clusters

Dependent Variable	(I) Clusters	(J) Clusters	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval	
						Lower Bound	Upper Bound
External clients (Individual, Entrepreneurs, new venture, establish firms, partners and other IIs)	#1	#2	-.703*	0.207	0.005	-1.241	-0.164
		#3	-0.404	0.191	0.154	-0.900	0.093
		#4	-.863*	0.224	0.001	-1.446	-0.280
University clients (internal clients, professors, students)	#1	#2	.812*	0.206	0.001	0.278	1.347
		#3	0.083	0.190	0.972	-0.410	0.576
		#4	.775*	0.223	0.004	0.196	1.354
	#3	#1	-0.083	0.190	0.972	-0.576	0.410
		#2	.729*	0.208	0.003	0.190	1.269
		#4	.692*	0.225	0.013	0.109	1.276
Clients from hospitals and research center	#1	#2	0.390	0.207	0.238	-0.147	0.927
		#3	-0.103	0.191	0.949	-0.598	0.392
		#4	.701*	0.224	0.011	0.119	1.283
	#3	#1	0.103	0.191	0.949	-0.392	0.598
		#2	0.493	0.209	0.088	-0.049	1.035
		#4	.804*	0.226	0.003	0.218	1.390

*Supplementary Appendixes that include results for some assumption tests, are available on

https://drive.google.com/file/d/0B6rUGYkmrfMpRzZpUVJoUUptd0U/view?usp=sharing

Results (Table-6-U-1D) for One Way Repeat ANOVA Test for Clients:

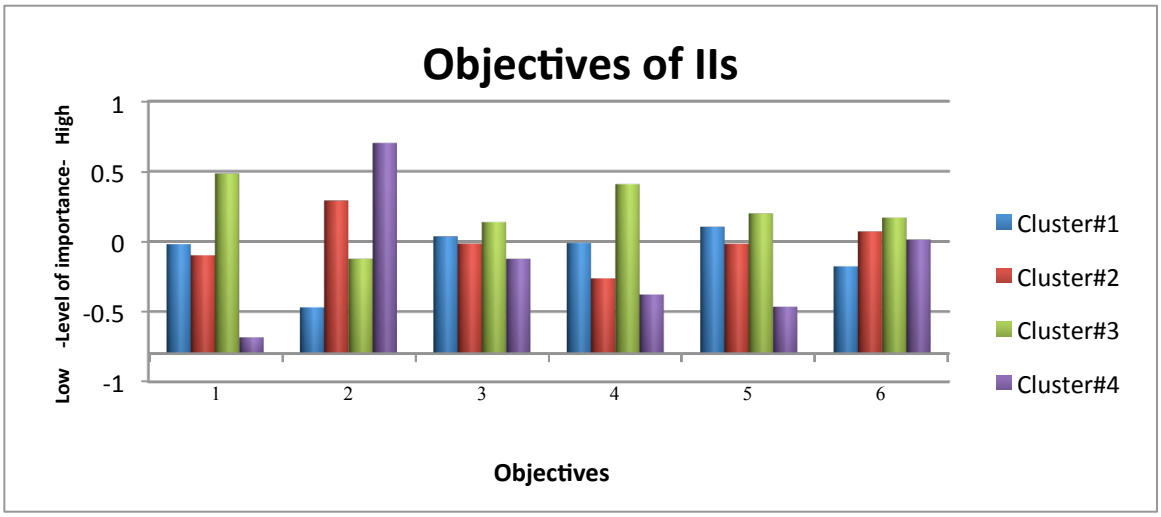
Means for Clients for Each Cluster

Post-hoc Result for Providing Services to Clients Within Each Cluster

Clusters	(I) Clients	(J) Clients	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	1	2	-.765*	0.160	0.000	-1.162	-0.368
		3	-.595*	0.157	0.001	-0.985	-0.206
#2	1	2	.750*	0.205	0.003	0.233	1.266
		3	0.497	0.213	0.077	-0.040	1.035
#4	1	2	.873*	0.271	0.010	0.180	1.566
		3	.969*	0.195	0.000	0.469	1.468

Results (Table-6-U-2B) for MANOVA Test for Performance and Goals:

Means for the Six Main Objectives

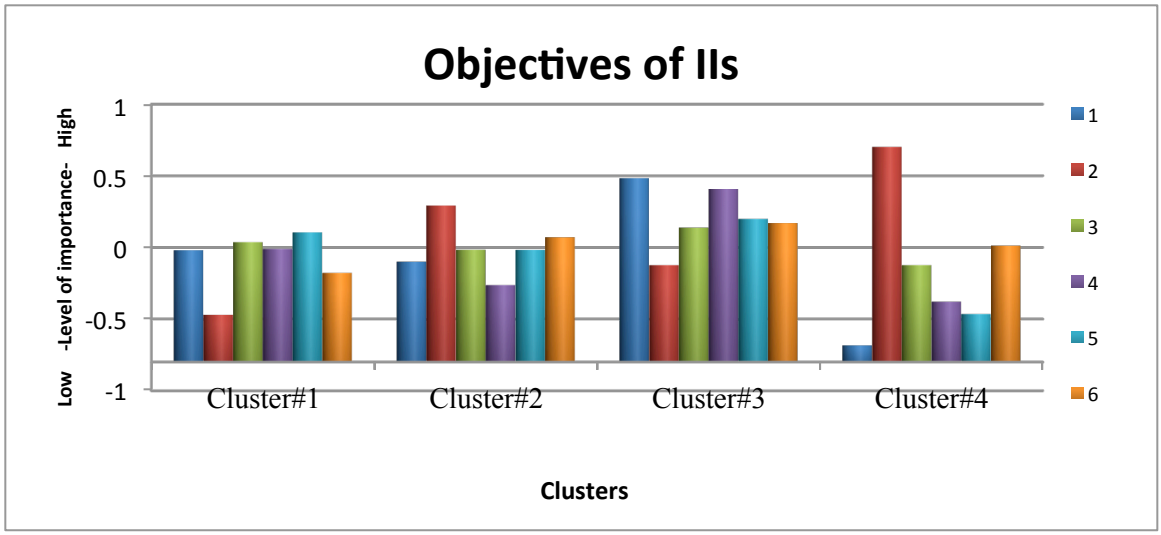


Post-hoc Result for Objectives Differences Between Clusters

Dependent Variable	(I) Clusters	(J) Clusters	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
Improve the economic performance of the local community	#1	#2	0.079	0.205	0.981	-0.454	0.611
		#3	-.5036081*	0.191	0.045	-0.999	-0.008
		#4	.6638009*	0.227	0.020	0.075	1.252
	#3	#1	.5036081*	0.191	0.045	0.008	0.999
		#2	.5824627*	0.207	0.028	0.045	1.120
		#4	1.1674090*	0.228	0.000	0.575	1.760
Increase the financial success for companies	#2	#1	.7628521*	0.202	0.001	0.238	1.288
		#3	0.417	0.204	0.177	-0.113	0.946
		#4	-0.410	0.237	0.312	-1.025	0.205
	#4	#1	1.1728064*	0.223	0.000	0.593	1.753
		#2	0.410	0.237	0.312	-0.205	1.025
		#3	.8264957*	0.225	0.002	0.242	1.411
Promote local industry by commercializing technologies	#3	#1	0.095	0.199	0.964	-0.423	0.612
		#2	0.216	0.216	0.750	-0.345	0.778
		#4	.6645643*	0.239	0.030	0.045	1.284

Assumption tests (Table-6-U-2D) for One Way Repeat ANOVA Test for Objectives:

Means for Objectives for Each Cluster



Post-hoc Result for Objectives Within Each Cluster

Clusters	(I) Objectives	(J) Objectives	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	5	1	0.125	0.144	1	-0.32	0.569
		2	.575*	0.168	0.019	0.057	1.093
		3	0.068	0.223	1	-0.62	0.757
		6	0.282	0.157	1	-0.204	0.768
#3	1	2	.608*	0.139	0.001	0.178	1.038
		3	0.345	0.128	0.142	-0.049	0.74
		5	0.284	0.15	0.953	-0.179	0.747
		6	0.313	0.147	0.577	-0.142	0.769
#4	2	1	1.386*	0.194	0	0.756	2.017
		3	.826*	0.233	0.024	0.069	1.582
		5	1.168*	0.221	0	0.45	1.886
		6	0.689	0.247	0.15	-0.113	1.492

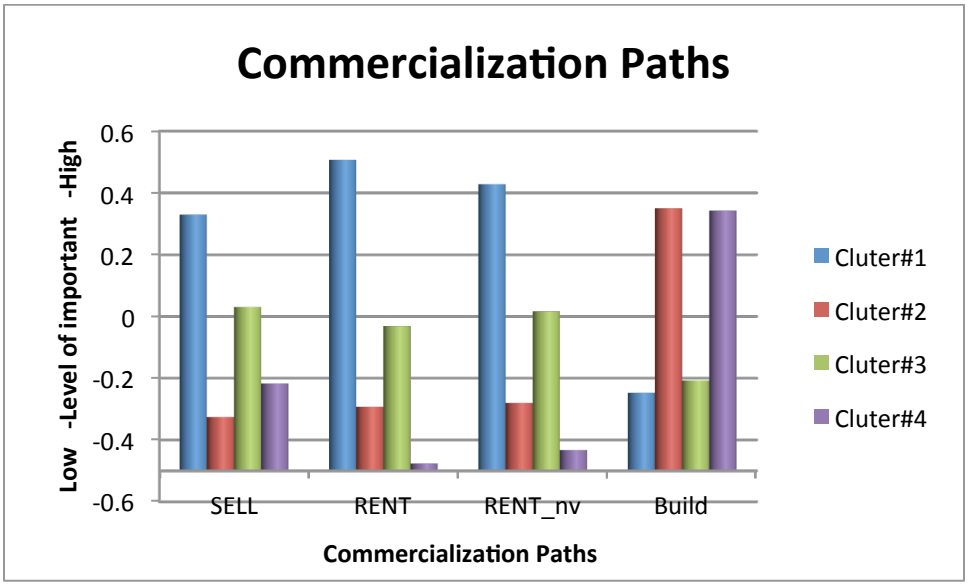
Results (**Table-6-U-3B**) for MANOVA Test for Commercialization Paths:

Post-hoc Result for Commercialization Paths Level of Importance Between Clusters

Dependent Variable	(I) Clusters	(J) Clusters	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
SELL	#1	#2	0.655*	0.214	0.014	0.099	1.211
		#3	0.299	0.199	0.438	-0.218	0.817
		#4	0.547	0.234	0.094	-0.061	1.154
RENT	#1	#2	0.800*	0.206	0.001	0.265	1.334
		#3	0.538*	0.191	0.028	0.042	1.035
		#4	0.983*	0.225	0.000	0.400	1.567
RENT_nv	#1	#2	0.708*	0.209	0.005	0.164	1.252
		#3	0.412	0.195	0.153	-0.094	0.918
		#4	0.861*	0.229	0.001	0.267	1.455
BUILD	#2	#1	0.597*	0.213	0.028	0.045	1.150
		#3	0.557*	0.215	0.050	0.001	1.115
		#4	0.008	0.247	1.000	-0.632	0.648

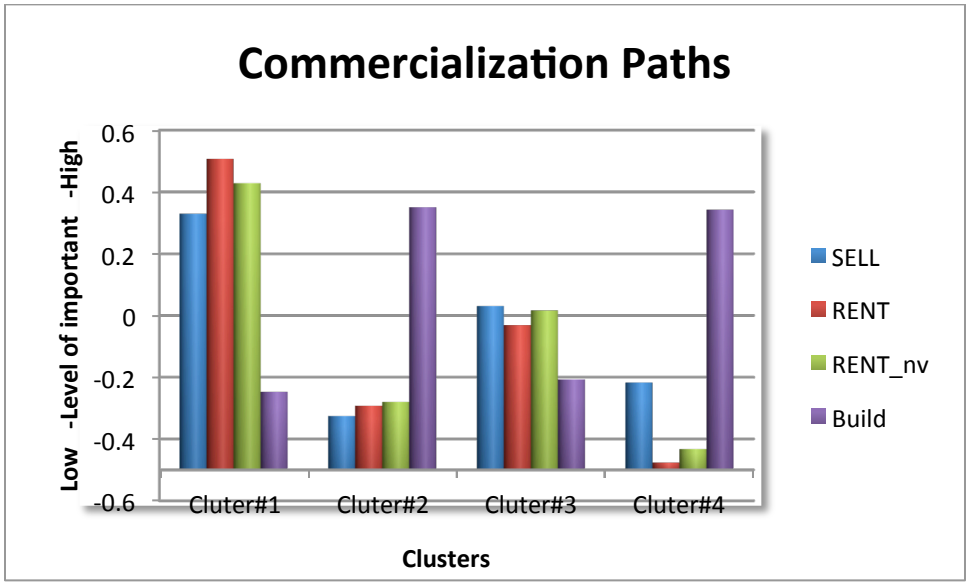
* is significant at level p< 0.05

Means for the Commercialization Paths



Results (Table-6-U-3D) for One Way Repeat ANOVA Test for Commercialization Paths:

Criteria for the Four Constructs of Commercialization Paths

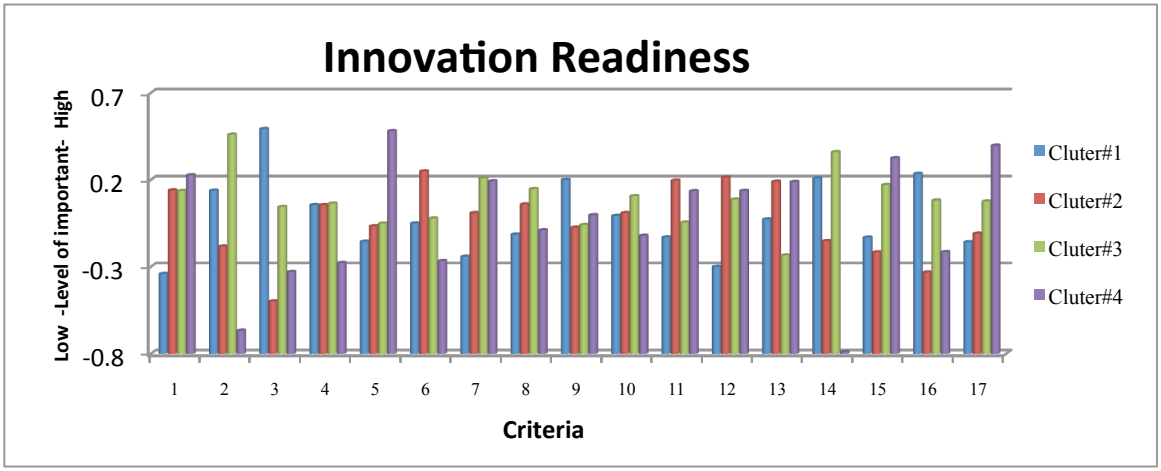


Post-hoc Result for Commercialization Paths' Level of Importance Within Each Cluster

Clusters	(I) CP	(J) CP	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	BUILD	SELL	-.577*	0.164	0.006	-1.027	-0.127
		RENT	-.755*	0.152	0.000	-1.173	-0.336
		RENT_nv	-.676*	0.178	0.003	-1.167	-0.185
#2	BUILD	SELL	.676*	0.169	0.002	0.202	1.150
		RENT	.643*	0.208	0.024	0.060	1.226
		RENT_nv	.630*	0.187	0.011	0.108	1.152
#4	BUILD	SELL	0.559	0.198	0.055	-0.007	1.126
		RENT	.819*	0.232	0.009	0.158	1.480
		RENT_nv	.775*	0.245	0.024	0.075	1.475

Results (Table-6-U-4B) for MANOVA Test for Innovation Readiness:

Criteria for the Four Constructs of Innovation Readiness



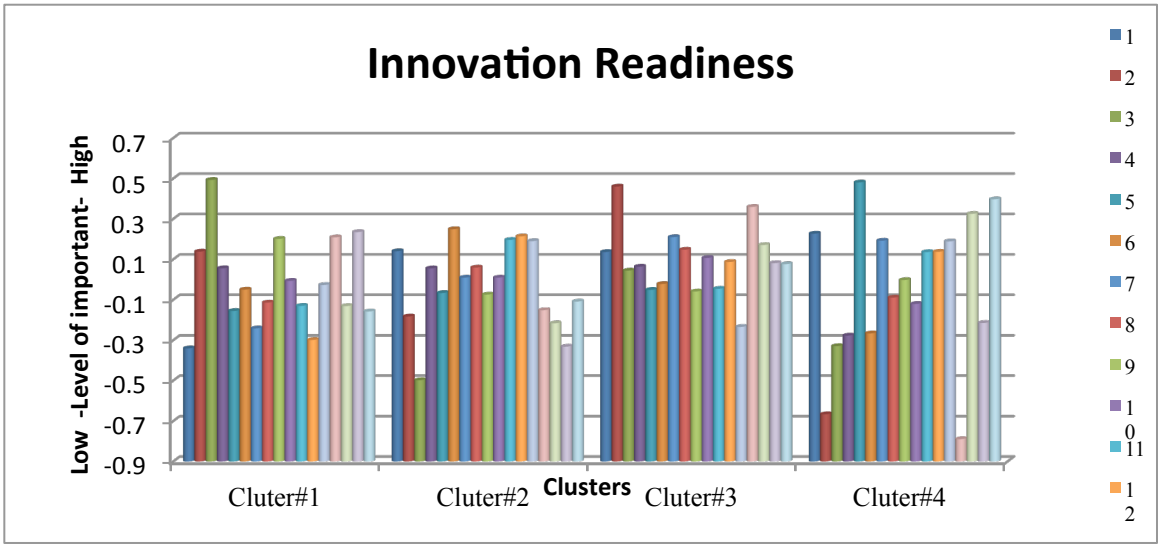
Post-hoc Result for Criteria Level of Importance Between Clusters

Dependent Variable	(I) Clusters	(J) Clusters	Mean Difference (I-J)	Std. Error	P-value	95% Confidence Interval	
						Lower Bound	Upper Bound
Synergy between capability of IIs and the proposed idea.	#1	#2	-.481*	0.216	0.027	-0.907	-0.054
		#3	-.477*	0.201	0.019	-0.874	-0.080
		#4	-.568*	0.236	0.017	-1.033	-0.102
Potential societal and environmental benefits from the idea	#3	#1	0.322	0.181	0.077	-0.036	0.679
		#2	.643*	0.195	0.001	0.257	1.029
		#4	1.126*	0.213	0.000	0.706	1.547
	#4	#1	-.805*	0.212	0.000	-1.224	-0.385
		#2	-.484*	0.225	0.033	-0.927	-0.040
		#3	-1.126*	0.213	0.000	-1.547	-0.706
Originality of the idea	#1	#2	.991*	0.205	0.000	0.585	1.396
		#3	.449*	0.191	0.020	0.071	0.826
		#4	.822*	0.224	0.000	0.380	1.264
	#3	#1	-.449*	0.191	0.020	-0.826	-0.071
		#2	.542*	0.206	0.009	0.135	0.949
		#4	0.374	0.225	0.098	-0.070	0.818
Potential contribution to local societal and environment	#3	#1	0.150	0.190	0.430	-0.225	0.526
		#2	.511*	0.205	0.014	0.106	0.916
		#4	1.149*	0.224	0.000	0.707	1.591
	#4	#1	-.998*	0.223	0.000	-1.439	-0.558
		#2	-.638*	0.236	0.008	-1.104	-0.172
		#3	-1.149*	0.224	0.000	-1.591	-0.707
Scientific and technology foundation of the new business venture	#1	#2	.567*	0.212	0.008	0.147	0.987
		#3	0.154	0.198	0.439	-0.237	0.544
		#4	0.450	0.232	0.054	-0.008	0.908

Based on observed means the error term was Mean Square(Error) = 0.929, * The mean difference was significant at the level.05.

Results (Table-6-U-4D) for One Way Repeat measure Test for Innovation Readiness:

Criteria for the Four Constructs of Innovation Readiness



Post-hoc Result for Criteria Level of Importance Within Each Cluster

Clusters	(I) Criteria	(J) Criteria	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
#1	3	1	.833*	0.187	0.007	0.116	1.551
		12	.792*	0.182	0.010	0.095	1.489
		17	.651*	0.148	0.008	0.083	1.219
#4	2	7	-.859*	0.192	0.018	-1.644	-0.073
		15	-.991*	0.235	0.037	-1.955	-0.028
		17	-1.064*	0.167	0.000	-1.747	-0.380
	14	13	-.978*	0.209	0.011	-1.834	-0.123
		15	-1.115*	0.265	0.037	-2.198	-0.031
		17	-1.187*	0.226	0.002	-2.110	-0.263

Appendix V

CMV (chapter 6)

Table 6-V-1 Harman's Single-Factor Test for CMV Verification Purposes Only.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.624	17.245	17.245	13.624	17.245	17.245	10.888	13.782	13.782
2	9.857	12.477	29.722	9.857	12.477	29.722	5.557	7.034	20.816
3	5.572	7.053	36.775	5.572	7.053	36.775	5.028	6.365	27.181
4	5.249	6.644	43.42	5.249	6.644	43.42	4.739	5.999	33.18
5	4.255	5.386	48.805	4.255	5.386	48.805	4.473	5.662	38.842
6	3.803	4.814	53.62	3.803	4.814	53.62	4.328	5.479	44.321
7	2.729	3.455	57.074	2.729	3.455	57.074	4.292	5.432	49.753
8	2.375	3.006	60.081	2.375	3.006	60.081	3.585	4.539	54.292
9	1.899	2.404	62.485	1.899	2.404	62.485	3.577	4.528	58.819
10	1.792	2.268	64.753	1.792	2.268	64.753	2.328	2.947	61.767
11	1.708	2.162	66.915	1.708	2.162	66.915	1.884	2.385	64.151
12	1.609	2.037	68.952	1.609	2.037	68.952	1.755	2.221	66.372
13	1.457	1.844	70.796	1.457	1.844	70.796	1.75	2.215	68.587
14	1.336	1.691	72.487	1.336	1.691	72.487	1.671	2.115	70.702
15	1.231	1.558	74.045	1.231	1.558	74.045	1.653	2.093	72.795
16	1.165	1.475	75.52	1.165	1.475	75.52	1.637	2.072	74.867
17	1.117	1.413	76.933	1.117	1.413	76.933	1.448	1.833	76.701
18	1.111	1.406	78.339	1.111	1.406	78.339	1.295	1.639	78.339
19	0.973	1.232	79.572						
20	0.918	1.161	80.733						
21	0.832	1.053	81.786						
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Extraction Method: Principal Component Analysis.

Table 6-V-2 Single-common-method-factor Test for CMV Verification and Used for Controlling Purposes Only.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.815[a]	.664	.644	.59673161	.664	32.746	9	149	.000
2	.820[b]	.673	.650	.59128435	.008	3.758	1	148	.054

a. All variables of level of importance and dependency level
b. All in a + CMV one single latent factor

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