The Use of the Internet in Distributing Packaged Software

By

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Author's Declaration for Electronic Submission Of A Thesis

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Shuangzeng Hu

Abstract

To reflect common practice in the software industry and extend transaction cost theory, this research developed building on previous research and empirically tested a model to identify conditions in which software vendors are likely to sell and distribute their packaged products directly to end-users through the Internet. How software firms distribute their products over the Internet is an important issue because software is a digital product, and the potential for the Internet to transform the distribution channel is considerable. Extant literature shows that Canadian software firms frequently choose direct instead of market channels. However, none of the existing studies focuses specifically on packaged software, or on the Internet as a distribution channel. Further, recent research on what products are suitable for distribution through the Internet does not address the case of packaged software.

- Knowledge-based asset specificity, human asset specificity, and physical asset specificity are positively associated with the likelihood of using the Internet to distribute packaged software (H_1, H_2, and H_3).
- The likelihood of using the Internet in delivering products has a positive relationship with the volatility of packaged software, its clients, and markets (H_4); whereas this likelihood has a negative relationship with diversity (H_5).
- Channel growth is positively associated with the online distribution of packaged software (H_6); Channel volume is negatively associated with the likelihood that packaged software developers use the Internet to deliver products (H_7).
- The rate of growth in gross sales has a positive relationship with the likelihood of online distribution by packaged software firms (H_8); while the gross sales of a firm negatively are associated with this likelihood (H_9).
- The use of the Internet in the distribution of packaged software is positively associated with the United States market and negatively associated with other national markets (H_{10}).

The data to test these hypotheses were collected from Canadian software developers by a web-based survey. The information includes the distribution channels for their best selling product in its largest market, and Likert scales that measure forms of asset specificity, market uncertainty, and channel volume. The hypotheses are tested using logistic regression. The results provide support for hypotheses H_5, H_6, and H_9 whiles hypotheses H_1, H_2, H_4, H_7, H_8, and H_{10} are not supported. The result for H_3 is statistically significant, but the direction of the relationship is the opposite of the expectation.

The results of this study have implications both for theory and managerial practice. This research contributes to the literature a test of the ability of transaction cost analysis to explain the use of the Internet in distributing software. It also provides managers with reliable insights into some of the circumstances where packaged software developers may use the Internet to deliver their products. However, further research is required to verify the generalizability of the findings of this study.

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1. Introduction

1.1 Background to the Research

To reflect common practice in the software industry and extend transaction cost theory, this research developed and empirically tested a model to identify conditions in which software vendors are likely to sell and distribute their packaged products directly to end-users through the Internet. How software firms distribute their products over the Internet is an important issue because software is a digital product, and the potential for the Internet to transform the distribution channel is considerable. To investigate this issue, this research uses transaction cost analysis (TCA) as a theoretical basis. TCA focuses on how firms work (Williamson, 2003). From a TCA point of view, the unexamined issue is essentially how Canadian software firms should be organized to sell and distribute their products efficiently. This section discusses why the research is important and how it is positioned in the current literature, including transaction cost theory, transaction cost analysis of channel choice, and transaction cost analysis of Internet use.

Packaged software is an important part of the software industry and expands yearly (Jorgenson, 2004). The sales of worldwide packaged software for all platforms were estimated by International Data Corp (IDC) at $179 billion in 2004, a 5% growth over 2003. Revenues in 2005 are expected to grow by 5 - 6%, a significant improvement over 2002's global collapse (The Software & Information Industry Association, 2005). Moreover, packaged software is digital, and can be delivered through the Internet directly. Online distribution of packaged software is becoming popular. In the sample conducted in this research, 39 % of the respondents deliver products to clients directly through the Internet, and over 73 % of the respondents use the Internet to distribute products directly and indirectly. For nearly one third of the respondents, the rate of growth in gross sales through the Internet is over 50%. Business activities happening through the Internet involve making payments, after-sale service, downloading software, and monitoring accounts.

The theoretical basis of this research is transaction cost analysis. According to Williamson's work (1975, 1985, 1991, 1996, 2003), TCA consists of governance structure (market mode and hierarchical mode), transaction costs (searching cost, contract cost, and opportunity cost), and transactions attributes (asset specificity, environmental uncertainty, and transaction frequency). TCA has enabled the development of rich literature in different fields (McNaughton, 2002). The two categories of TCA applications relevant to this research are the analysis of the channel choice by software firms and the application of TCA regarding the Internet use.

Many researchers use transaction cost theories to address the issues of marketing channel choice and software outsourcing in the software industry. For instance, Eric and Wang (2002) studied the relationships between transaction attributes and software outsourcing success by an empirical investigation of transaction cost theory. McNaughton (1996, 2000, 2001, 2002) produced a series of studies relevant to Canadian

software firms. However, none of the existing studies focuses specifically on packaged software, or on the Internet as a distribution channel.

As for the application of the Internet, the progenitors of this research stream are Liang and Huang (1998); Shailendra, Jain, and Vijay (1999); Lohrke (2002); Hoffman and Novak (2000); Clemons and Aron (2002); Thompson, Wang, and Leong (2004); Butler (2003); Houghton and Winklhofer (2004); Loane, McNaughton and Bell (2004); Levenburg and Klein (2006); and MacInnes, Kongsmak, and Hecman (2004). However, most of these studies analyze, from the buyer's point of view, issues like online shopping behavior and the consumer acceptance of products in the electronic markets. Relatively little attention has been paid to packaged software and the relevant channel choice by packaged software developers.

1.2 Research Issues

Although much attention is paid to software marketing channels and the use of the Internet in marketing and distribution, no significant research directly addresses the application of the Internet in packaged software, marketing, and distribution. The objective of this research is to fill this gap.

Given the research objective, the fundamental question addressed is how and when Canadian packaged software companies use the Internet to deliver their products. The issue is divided into the following sub-issues:

- How do Canadian packaged software firms distribute their products through the Internet?
- What is the governance structure (markets or hierarchies) that software firms use to distribute their packaged software through the Internet?
- What factors (transaction attributes) influence whether Canadian packaged-software developers use the Internet to distribute their products?

According to transaction cost theory (TCT), the governance structures for firms fall into two types of governance structures: hierarchies or markets. The former denotes the governance structure where the transactions are internalized so that the economic activities involved in the transaction occur within a single firm. The latter refers to those where transactions are carried on with third parties by using contracts.

Transaction attributes are the three principal dimensions affecting transaction costs. "These key attributes are the frequency with which transactions recur, the uncertainty (disturbances) to which transactions are subject, and the degree to which transactions are supported by transaction specific assets. A good deal of the explanatory power of transaction cost economics turns on this last (Williamson, 1999, p. 1089)."

The above questions were explored by referencing and building upon the works of McNaughton (1996, 1999, 2002); McNaughton and Bell (2001); and Clemons and Aron (2002). This research investigates these questions by empirically studying Canadian software firms.

1.3 Justification for the Research

Several considerations account for the decision to focus on the online distribution of packaged software by Canadian firms. The use of the Internet has quickly become a key factor in the strategy of software firms. A reduction in software prices is gradually causing a reduction in direct marketing staff, since there are savings in time, convenience, and cost when software is delivered through the Internet. Therefore, software developers are actively reducing their use of indirect marketing in favour of electronic channels. The Web allows companies to increase product awareness and possible sales at lower cost. It allows smaller firms to obtain easier access to the market. Most software firms have a presence on the Web and offer demonstration, Beta, upgrade versions, and software packs: One of the purposes of doing so is to try to by-pass distributors.

Hoffman and Novak (2000) argued that the World Wide Web is not only an efficient marketing communication medium, but also an efficient market channel. Benefits arise from the potential of the Web as a distribution channel, a medium for marketing communications, and a market itself. This is most likely for firms in publishing, information services, or digital product categories (Jones, Hesterly, and Borgatti, 1997). For example, digital products can be delivered immediately. Moreover, buyers and sellers can access and contact each other electronically, potentially eliminating some of the marketing cost and constraints imposed by physical interactions. This may also have the effect of shrinking the channel and making distribution much more efficient due to reduced overhead costs through such outcomes as uniformity, automation, and the large-scale integration of management processes. Translating into additional efficiencies for the firm, the above outcomes reduce time to complete business transactions.

Online software distribution benefits both suppliers and consumers in terms of time and place utility. On one hand, the effective use of the Internet enables software developers to provide anytime/anywhere access to their products. With online software distribution, customers can buy and download software products from any location where the Internet is accessible, and install it directly to their computers. In addition, online software distribution may enable a firm to reduce logistics, hardware, and supply costs by minimizing paperwork and physical shipments. Furthermore, the Internet allows software firms to address more points of sale worldwide and at low cost. Small and medium enterprises (SMEs) in the software industry take advantage of this new and powerful marketing medium and are able to position themselves ahead of their competitors who do not use the Web as a marketing tool.

A large portion of the Canadian population has access to the Internet and can purchase software online. Internet connections and broadband access are very popular in Canada where the Internet has linked millions of users and computers. An international comparison of Internet connections shows that Canada is ranked in second place with 60 percent of its population connected to the Internet (Strigel, 2002). The number of high-speed connections per 100 inhabitants is 4.54, 8.88, and 11.7 in 2000, 2001, and 2002, respectively (Ismail and Wu, 2003). IDC projected that eighty percent of Canadians would have access to the Internet by 2005 and over 10 million Canadians would access to the Internet through a wireless device in 2005 (Nadine, 2002). E-commerce is one of the fastest growing segments in Canadian industry, and Canadian companies will continue to play a significant role. IDC Canada estimated the Canadian e-commerce market at approximately $21 billion in 2000, with B2B accounting for most of spending (Nadine, 2002).

1.4 Overview of Research Methodology

This section presents an overview of the methodology used in the research: transaction cost theories, web-based survey, and logistic regression analysis. The transaction cost analysis produces a theoretical basis for the study, and the justifications of choosing TCA are presented here. More details are discussed in Chapter two. A web-based survey was used for gathering the data. This approach involves administering a questionnaire for a researcher to collect data via web sites and emails. Logistic regression analysis was also employed to analyze the data and test a transaction cost model. Further justifications for the methods are developed in Chapter three.

Because transaction cost economics, property rights theory, agency theory and the resource-based view of the firm are the major components of new economics theories of organization, the transaction cost theory is closely related to the other theories. All these theories involve the explanations of how companies work, and have basically similar assumptions. Specifically, bounded rationality is the common human assumption; the transaction cost theory and property right theory also assume that human beings are opportunistic. Agency theory supposes that individuals are self interested and risk averse. The transaction cost theory of organization is chosen as most appropriate for this study, with regard to the units of analysis, key variables, and basic rationales.

A survey method was used to collect data from Canadian packaged-software developers for the following reasons. First, most prior research in this field adopted a survey approach (Bell, 1995; Cornish, 1996; McNaughton and Bell, 2001; and McNaughton, 1996, 2000, 2002). The use of the same research methods will enable a researcher to compare the results of his research to those of previous studies. A web-based survey instead of a traditional mail or fax survey was administered. Compared to a mail survey, a web-based survey allows for a larger sample size using fewer resources. In addition, it is difficult to create

an adaptive questionnaire with a traditional pen-and-paper approach. In contrast, using a web-based technique enables dynamic adaptation of the questionnaire based on earlier responses. Finally, previous research shows that a web-based survey is efficient and effective. McNaughton (1999) analyzed the advantages of a web-based survey over mail and fax techniques, and reached positive conclusions. Other studies showed that this approach yielded a higher response rate, and that a web-based approach was expected to produce better response quality (Cobanoglu, Warde, and Moreo, 2001).

The targeted participants in this study were chief executive officers, information executive officers, marketing vice presidents/managers, and other senior ranking officers responsible for marketing in software firms with packaged software products (Bell, 1995; O'Farrel, Wood and Zheng, 1996; Cornish, 1996; McNaughton and Bell, 2001; and McNaughton, 1996, 2000, 2002). These executives were selected because they have a good understanding of the firm's software products marketing strategies, product characteristics, and development history. That is, they have the best knowledge to answer the questionnaire. After the online data collection process, the data were tested and analyzed using several methods, including descriptive analysis, and logistic regression analysis. Statistical test methods were used to check data consistency and reliability. Due to the nature of variables in this kind of research, logistic regression analysis was employed for data analysis. Specifically, a step-wise logistic regression model based on forward inclusion of variables was used.

1.5 Definitions

Generally, software products are classified in two ways (Cornish, 1996). Traditionally, software products include system programs, vertical applications, and horizontal applications. System programs drive computer hardware directly or provide tools for enhancing the functionality of hardware or other software programs. Horizontal applications provide generic functions to end-users in different sectors (word processing and business graphics), and vertical applications are designed for specific functions in particular sectors. Cornish (1996) contended that most software products fall into three categories: shrink-wrapped (off-the-shelf or packaged) products, including products such as word processing and business graphic packages; module products such as educational and general business management software; and core products such as industrial process-controlled software.

The second classification approach (Cornish's approach) is accepted in this research for several reasons. First of all, in the development of the software industry, a shift from customized computer programming (or software products) to standardized programming (or software products) is apparent. A study showed that some software was developed for a single client but evolved over time into standardized packages (Cornish, 1996). Furthermore, this method captures the characteristics of packaged software. All

software products are digital products (like music and video) that not only can be sold on the Internet, but can be delivered immediately through the same channel.

Jackson (2003) argued that packaged software could be purchased "off-the-shelf", typically mass produced, and sold or licensed in standardized form. Packaged software is intended for general use common to the everyday operations of businesses and governments. According to McNaughton and Bell (2001), packaged software is often referred to as "shrink-wrapped" after a common form of packaging. Because it is a standardized product, packaged software "has more in common with a product than a service (McNaughton & Bell, 2001, p. 30)." The Software & Information Industry Association (2005) defines packaged software as "written for mass distribution, not for the specific needs of a particular user, and may be distributed in any format – electronic download, physical media such as disk or CD, or a web-based service." Basically, these definitions characterize the essence of packaged software. Pre-packaged software is synonymous with packaged software. To be consistent, the term of packaged software is used in this thesis.

Packaged software might be classified into three sub-categories such as packaged system software, packaged vertical software, and packaged horizontal software (Cornish, 1996). System packaged software includes operating systems, which control the basic functions of a computer or network. Packaged vertical software is a kind of packaged software designed for specific functions in particular sectors. Packaged horizontal software is composed of operating systems, utilities, programming languages, and general applications. Operating systems control the basic functions of a computer or network. Utility software supports functions such as backup or virus-protection. Programming software is used to develop the sets of instructions that build all other types of software. General application software includes the familiar word-processing, spreadsheets, and e-mail packages used in business as well as games and reference software used at home and subject or skill-based software used in schools.

The United States is estimated to have approximately 50% of the world market. U.S. software companies lead the world in development and production of original, effective, and efficient products for business, homes, and schools. According to Software & Information Industry Association (2005), the packaged software market in the United States is estimated at nearly $70 billion with business software, home use products, and education software accounting for $64 billion, $5.5 billion, and $600 million, respectively.

1.6 Outline of the Thesis

This thesis consists of five chapters. The roles of each chapter are as follows:

- Chapter one prepares the building blocks for the thesis. It presents the readers with some background information such as research issues, methods, and justifications.

- Chapter two reviews literature on the applications of transaction cost theories (TCT) in the software industry and in the use of the Internet. It interweaves these seemingly two independent areas of research and brings them to a common ground for further discussion.
- Chapter three describes the methodology employed in this study. The utility of a web-based survey with soliciting emails is reviewed and justified. Then this chapter presents how the survey was implemented in details, including instrument design, the administration of survey, resulting sample, the choice of software package, statistical procedures used in the research, and several limitations.
- Chapter four reports the key findings from analyses of the survey data of the online distribution of packaged software by Canadian software developers.
- Chapter five presents the implications of the key findings and draws crucial conclusions about the use of the Internet in distributing packaged software. It also discusses limitations and future research opportunities in the field.

1.7 Conclusion

This chapter lays the foundations for the research. It presented the background information to the research, research objectives, and research issues. After the research justifications and methodology are discussed, the remainder of the thesis is outlined.

2. Literature Review

2.1 Introduction

This section briefly outlines the status and development of packaged software distribution and online distribution (electronic delivery). Then, the basic concepts and key frameworks of transaction cost theories are discussed. Lastly, a research model and hypotheses are proposed. The structure of the literature review is illustrated by Figure 1.

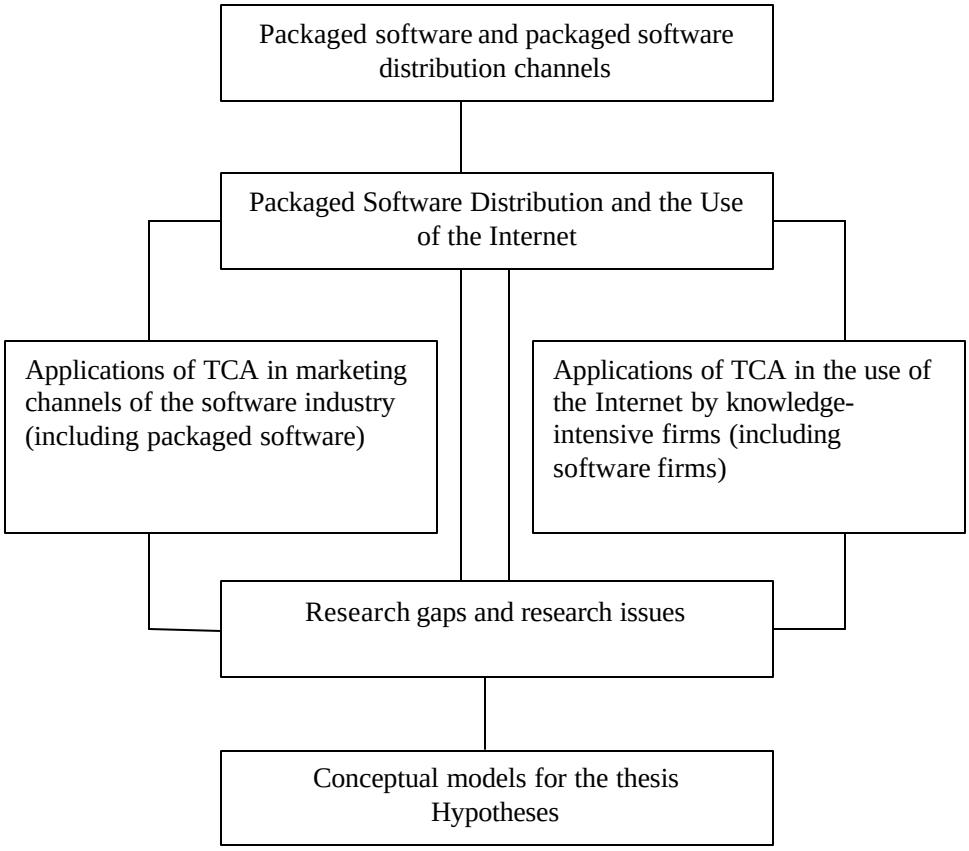

Figure 1. Logical Structure of Literature Review

2.2 Packaged Software Distribution and the Use of the Internet

Understanding traditional channels, online channels, and their relationship is fundamental to starting this research. Various methods of distributing packaged software are analyzed. And, Internet-based distribution models are described from example web sites and the literature.

2.2.1 Various Methods of Packaged Software Distribution

Various combinations of distribution channels available to packaged software firms include retail distribution, value-added distribution, and direct marketing channels (Wilson, 2001; Market Profile: software sector, 1998). Retail distribution channels are composed of five kinds of distributors: computer vendors, big-box stores, office equipment vendors, stores specializing in software sales, computer supermarkets selling in large quantities at low prices, and warehouse clubs. These various distribution channels are not very different from each other and are good only for packaged software products (Market Profile: software sector, 1998). Presumably, this conclusion is drawn in comparison with software services which need shorter distribution channels Wilson argued (2001) that these channels should not be overlooked as "possibilities" for distributing packaged software.

Distributors, original equipment manufacturers, value-added resellers (VARs), systems integrators, and service partners comprise value-added distribution channels. There are two major kinds of distributors: horizontal distributors and vertical distributors (Wilson, 2001; Market profile: software sector, 1998). The first type lists thousands of products and offers little technical support. Their clients are in horizontal markets. The so called vertical distributors concentrate on highly specialized categories of software and target a vertical market. Distributors generally do not only offer a high level of technical support, but also sell to retail stores and other resellers. It can be difficult to get listed with distributors because the distributors are increasing in size and have very strict selection criteria. Usually, distributors drive very hard bargains and should be used only for packaged software applications (Wilson, 2001; Market Profile: software sector, 1998).

Original equipment manufacturers (OEM) refer to either vendors or manufacturers of all kinds of computer hardware. Putting together specialized products, hardware, and services, OEM VARs sell the package in the form of a turnkey product intended for a specific area of activity. Software firms may employ an OEM channel to access wide distribution channels. However, it is difficult for smaller software firms without a developed brand to reach these channels.

Systems integrators are often large companies and may be specialized in a vertical market. Systems integration is a growth sector. More and more consulting companies such as Andersen Consulting now offer information technology services. OEMs such as DEC or Sun Microsystems also act as systems integrators. This sector is experiencing the greatest growth in revenue (Wilson, 2001; Market Profile: software sector, 1998). Unlike system integrators, service partners do not offer integration services, but may provide consulting, software development, and training services. Most VARs work solely with distributors and keep no stock. In general, VARs have limited roles in providing advice to their end-user clients. They suggest a turnkey product and offer mainly the software that their clients request.

Direct marketing channels (also termed direct marketing) refer to those composed of salespeople directly employed by the software developers (Wilson, 2001; Market profile: software sector, 1998).

Packaged software is sold directly to clients. Direct marketing channels include such methods as in person selling, mailing, direct-mail advertising, catalogue houses, and internet telemarketing. The advantages of direct marketing channels are the ability to better identify market expectations, and facilitate a more rapid response to uncertain in markets (McNaughton, 2002). In addition, the use of a sales force with a high level of technical skill is often required in the distribution of very complex applications requiring adjustments for each client. However, it is worth noting that direct marketing can be very expensive and that this significantly increases costs. This solution is, therefore, often unaffordable for a small business.

"The distribution of software over the Internet exceeds other means of distribution in many important aspects such as the ease of obtaining and installing the software (Sobr and Tuma, 2004, p.1)." According to the market profile of software sector (1998), use of the Internet in distributing packaged software includes both direct and indirect uses. The direct use of the Internet in online distribution refers to such online channels as web, online service, CD-ROM, Internet marketing; the indirect use of the Internet in online distribution refers to those functioning as and hosted by outside sales representatives, distributors, system integrators, and catalogues (Market profile: software factor, 1998).

Observations show that several software firms that have packaged software products also use the Internet to distribute and provide clients with the following services: supports for all licensing models, secure full-version hosting, CDs on demand, physical distribution, digital wrapping, and download-manager service. Some multiple channel distribution solutions such as premium affiliate management and integrated resellers are also provided through the Internet to handle conflicts among the participants (e.g., www.corel.com, www.microsoft.com, and www.ibm.com).

The technologies behind software online distribution are complex. At the beginning, the distribution of software over the Internet was fragmented (Sobr and Tuma, 2004). This issue hindered the wide use of online distribution because packaged software firms had to design and implement a distribution framework involving investment and advanced technologies. Recently, a universal distribution framework at the middleware level, which is illustrated by Figure 2, was introduced (Sobr and Tuma, 2004).

Figure 2 reflects the working of the universal distribution framework, i.e. SOFAnet. Packaged software firms access the Internet through their own or distributors' Intranet and upload their products. Simultaneously, customers may download the products they buy through the Internet (Intranet). Contrary to the Internet, Intranet refers to tightly-coupled local networks connected to the Internet. The SOFAnet supports classical distribution models: push and pull models. It also supports a variety of licensing models for secure delivery of packaged software.

In this study, websites and the Intranets are interchangeable. Because these technologies supporting software online distribution are becoming reliable and cost-efficient, more and more packaged software developers do business over the Internet.

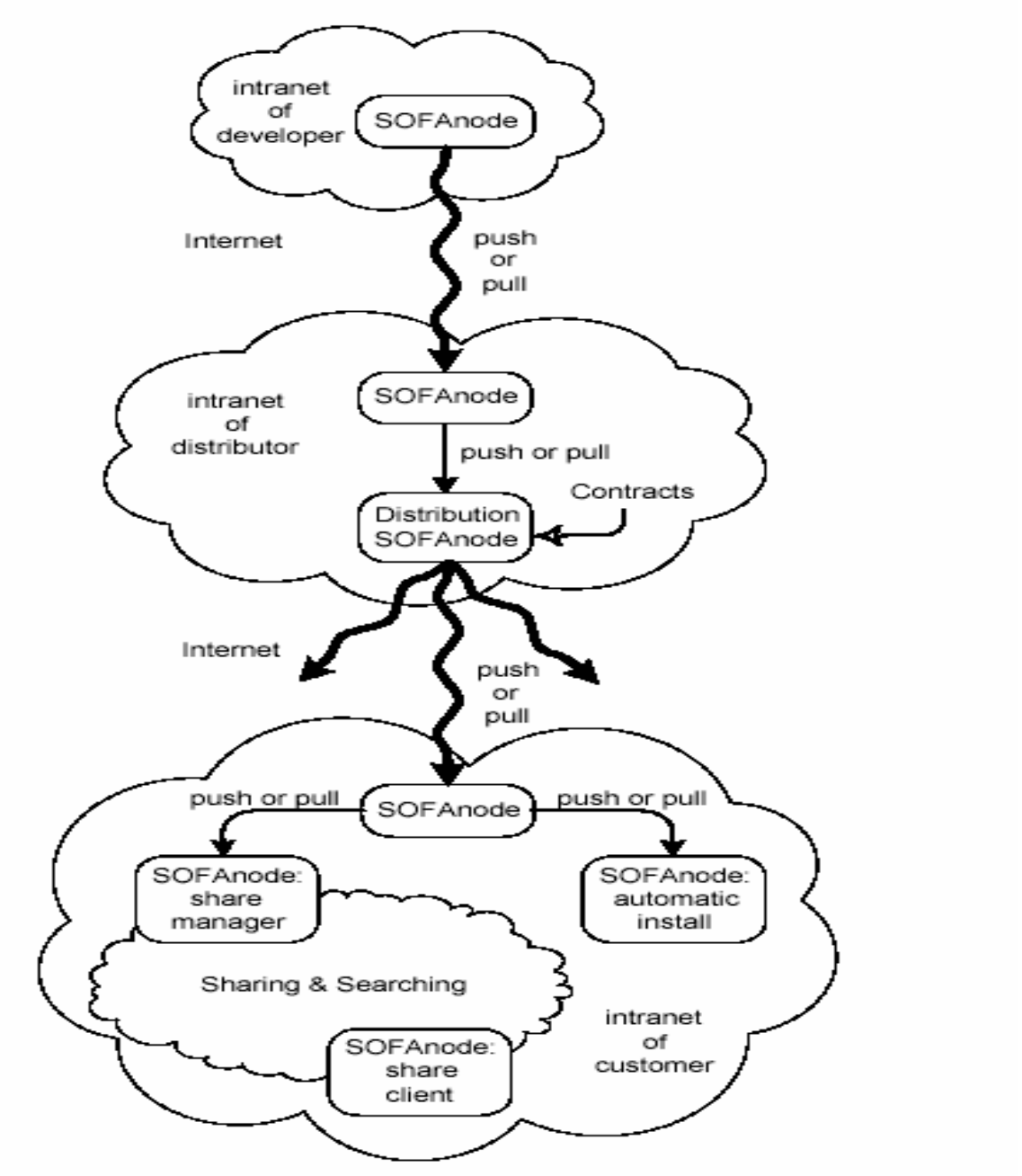

Figure 2. Overall Structure of Software Online Distribution through the Internet

Source: (Sobr and Tuma, 2004)

2.2.2 Profile of Packaged Software Distribution Channels

Although the packaged software industry is expanding, significant research that provides a better understanding of online distribution of packaged software is still lacking. McNaughton (1996) was the first researcher to examine the application of transaction cost analysis in marketing channel choice of the software industry. He described software channels and modeled the influences of packaged software' characteristics to channel choice for its distribution. Other searchers investigated packaged software distribution channels anecdotally (Wilson, 2001; Market Profile: software sector, 1998).

The most effective distribution channel for packaged software is determined by packaged software types, company size, and product price. Some channels mentioned previously are more efficient for distribution of packaged software. Based on various packaged software and targeted clients, main channels for distributing packaged software are employed, which is illustrated by Figure 3.

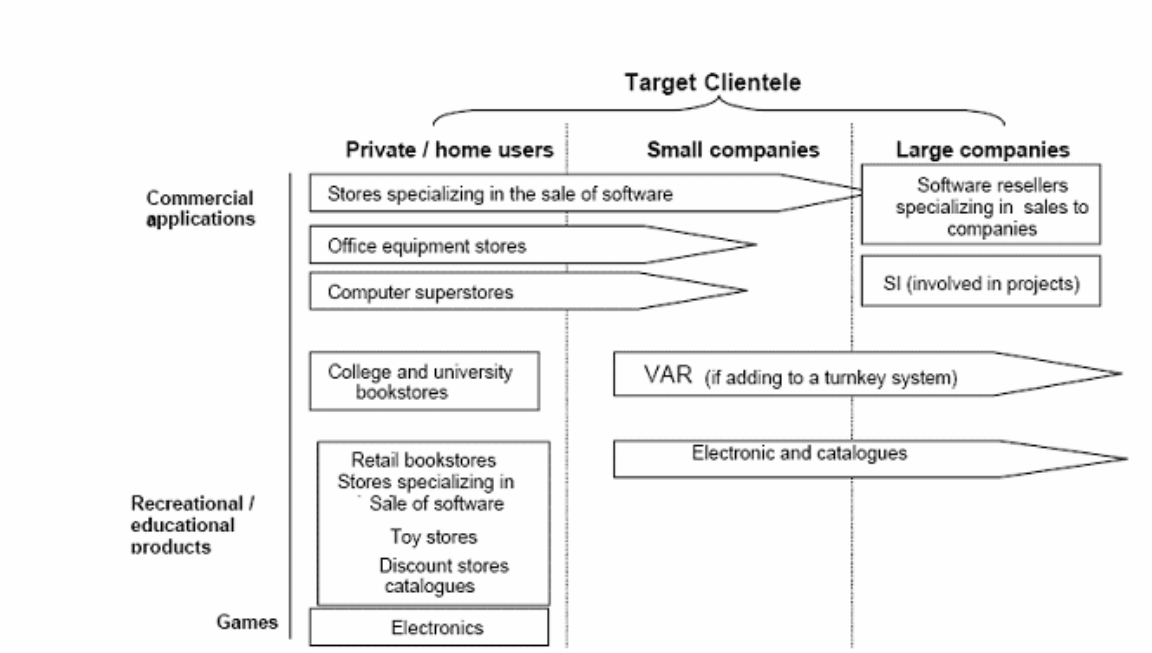

Figure 3. Distribution Channels for Packaged Software

Source: Market profile: software sector, 1998

2.2.3 Use of the Internet in packaged software distribution

Based on observations of packaged software firms' websites and relevant literature, the proposed model of the situations in which the Internet is used to distribute packaged software is proposed for this research. Figure 4 shows current distribution models with the Internet-based channels employed by packaged software firms.

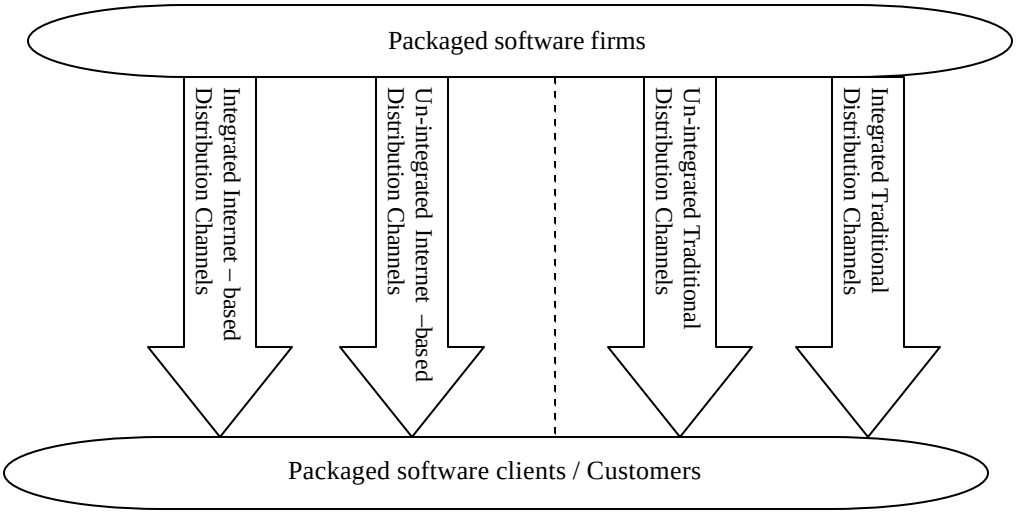

Figure 4. Use Model of the Internet in Packaged Software

Attention should be paid to the following points about this model. For the sake of research simplicity, packaged software channels are divided into hierarchical modes and market models instead of hierarchical, intermediate, and market models (McNaughton, 1996). The two kinds of channels with either hierarchical modes or market models are termed integrated and disintegrated distribution channels, respectively. The integrated distribution channels refer to the direct marketing channel from packaged software developers to end users; while disintegrated distribution channels refer to all of the channels available for packaged software other than the integrated channels. Because all software products are a digital product and may be distributed through the Internet, it is assumed that every traditional distribution channel for packaged software could have its relevant counterpart on the Internet. Accordingly, the Internet-based distribution channels are classified into integrated Internet-based channels and disintegrated Internet-based distribution channels. Specifically, the integrated Internet-based distribution channels have two characteristics. One is that they are located on the websites owned by software firms themselves. The other is that all the marketing and distribution functions of the websites are focused on end users of their packaged software products. All other distribution channels without these two kinds of traits are termed disintegrated Internet-based distribution channels. The four categories are illustrated in Table 1.

Table 1.Current Classification of Distribution Channels of Packaged Software

Electronic? yes or not	Integrated channels (Hierarchical modes)	Disintegrated channels (market modes)
Internet-based channels	Integrated Internet-based distribution channels	Disintegrated Internet-based distribution channels
Traditional channels	Integrated traditional distribution channels	Disintegrated traditional distribution channels

2.3 Transaction Cost Analysis

The purpose of this section is twofold. One is to point out the definition of transaction cost and its main dimensions to characterize transaction costs. The other is to address briefly its use in analyze distribution channel design.

2.3.1 Definition of Transaction Cost

Williamson (1979) contended that a transaction is a process by which a good or service is transferred across a technologically separable interface. Because markets are often inefficient, in order to proceed with a transaction, activities such as searching for information, negotiating terms, and monitoring the on-going process are required to be conducted to ensure a favourable deal. The costs involved with such transaction-related activities are called transaction costs. According to Williamson (1979), the three critical dimensions for characterizing transactions are asset specificity, uncertainty, and transaction frequency.

Asset specificity refers to durable investments that are undertaken in support of particular transactions, the opportunity cost of which investment is much lower in best alternative uses or by alternative users (Williamson, 1981). The rationale behind this dimension is that transactions supported by high levels of asset specificity should be governed by hierarchical structures, while transactions that require only general-purpose investments will most efficiently be conducted through markets.

Uncertainty refers to the cost associated with the unexpected outcome and asymmetry of information. Generally, a higher transaction cost is caused by a higher level of uncertainty because both parties involve the transaction will spend more time and effort in monitoring the transaction process. Uncertainty arises due to opportunism, bounded rationality, and asymmetry of information (Williamson, 1981, 1985).

Transaction frequency refers to how often the kind of transactions recurs. Williamson (1985) argued that higher levels of transaction frequency provide an incentive for firms to employ hierarchical governance structures because it will be easier for these structures to recover large transactions of a recurring kind. However, researchers have been largely unsuccessful in confirming the hypothetical positive relationship between transaction frequency and hierarchical governance in this field (Rindfleisch and Heide, 1997; McNaughton, 1996; Thompson et al., 2004).

2.3.2 Analysis of Distribution Channel Design

Transaction cost theories are used in an attempt to explain reasons or conditions in which firms extend forward into distribution or outsource those activities employing market modes. Whether internal organization or market exchange is preferable depends on the relevant transaction costs. Specifically, little incentive is provided in a competitive market because transaction costs are low in well-developed markets. In contrast, firms prefer to internalize distribution channels to reduce total costs due to inability of imposing pricing and / or behavioural constraints. McNaughton and Bell (2001) argued that distribution channel design is a problem of inter-organizational governance deciding how a product or service is distributed, and how a firm is organized. In short, from a TCA perspective, distribution channel choice involves decisions about how to minimize the total transaction costs, including transaction and production costs.

2.4 Software Marketing Channels and Transaction Cost Analysis

This section classifies the literature on the applications of transaction cost theories in the software industry into three categories: marketing channel choice of the software industry, marketing channel choice of manufacture and service industry, and software outsourcing and transaction cost analysis. For instance, Eric and Wang (2002) studied the relationships between transaction attributes and software outsourcing success by an empirical investigation of transaction cost theories. McNaughton (1996, 2000, 2001, 2002) addressed a series of studies relevant to Canadian software firms (knowledge-intensive firms) marketing: foreign marketing channel integration decision, channel switching between domestic and foreign markets, the export mode decision-making process, and use of multiple export channels. John and Weitz (1988) conducted an empirical test of TCA to study the forward integration of channel choices. Mols (2000) invested the dual channel systems in the software industry. Table 2 shows the research that contributes to each of these categories.

2.4.1 Marketing Channel Choice: Canadian Software Firms

McNaughton (1996) uses transaction cost theories to analyze the impacts of product and market attributes on the selection of distribution channels in the context of the Canadian software industry by collecting data on channel choice, channel volume, asset specificity, and external uncertainty from Canadian software exporters via a mail survey. He concluded that channel volume is positively associated with the use of foreign sales subsidiaries and negatively associated with the use of shared control modes; and that asset specificity is negatively associated with the use of shared control modes and positively

associated with the use of foreign sales subsidiaries. It is worth noting that he took packaged software into account. He stated that the extent to which software could be called a packaged product is positively associated with both the use of sales subsidiaries and the use of joint ventures. But it is not related to the choice of market channels.

Table 2. List of Literature on Software Firms Marketing

Group	Contributions	Author(time)
Transaction Theory analysis and Canadian Software Companies	• Further understanding of channel choice by knowledge-intensive firms • Focuses on Canadian software firms • Modify TCA to account for channel choice in software industry	McNaughton (1996)
	• A disk-by-mail survey is a good solution to some of the unique problems encountered when conducting research that involves firms in business markets • The cost and time advantages of on-line surveying may already outweigh the superior sample control of DBM in most cases	McNaughton (1999)
	• Characterizes channel selection and change decisions of Canadian software firms	McNaughton and Bell (2001)
	• Furthers understanding of knowledge-intensive SME's export channel decision process • Develops TCA model to account for this decision process	McNaughton (2002)
TCA & Software outsourcing	• Develops TCA model of software outsourcing success • Gathers survey data and reaches some conclusions	Eric and Wang (2002)
TCA and Use of the Internet	• Forward Integration into Distribution • An Empirical Test of Transaction Cost Analysis	John and Weitz (1988)
	• Dual channel systems are anomalies in traditional transaction cost theory • Many firms use both integrated and non-integrated distribution channels simultaneously • Dual channels exist both with homogeneous environments and with heterogeneous ones	Mols (2000)

In 2001, McNaughton and Bell proposed and examined seven hypotheses about the conditions when small, knowledge-intensive firms switch to a lower control mode from the channels they use domestically. According to TCA, asset specificity, external uncertainty, production cost efficiency, specific market (the U.S. market or other), and customization (packaged software products or customized software products) are used to explain switching of channels from a domestic market to a foreign market.

For simplicity, these firms tend to use the same channels in both domestic and foreign markets: only 23% of the respondents resorted to different channels when entering a foreign market. Specifically, the major patterns of channel choice those switching from a higher to a lower control mode, and there is a combination of dual-channel modes and single-channel modes in both lower and higher control modes. Binary logistic regression is used to explore and finalize the parsimonious model with a moderate fit of 0.37 and an overall classification rate of 80%. The conclusions presented in this research are as follows: switching channels from a high to a lower control mode is negatively associated with knowledge-based assets, physical assets, and relative contribution of market to sales; while this switching is positively associated with the diversity of software products. The findings suggest business managers must be aware of the momentum resulting from their domestic channels and pay attention to the extension of their domestic channels into a foreign market. Due to limited data availability, only the U. S. market, which is the largest foreign market, was taken into account (McNaughton and Bell, 2001).

McNaughton and Bell (2001) studied the channel selection and decisions of Canadian computer software firms using data gathered by a disk-by-mail survey. Their findings are consistent with the qualitative comments made by respondents and previous research on channel choice in the software industry. Generally, Canadian software firms make their decisions by an intuitive process, and they do not take formal studies or wide consultation with outside experts (McNaughton and Bell, 2001). They also concluded that mode change decisions "have a tendency to take a bit longer, and a greater proportion use a mix of intuitive and formal/structured approach (p. 24)."

McNaughton (2002) developed a TCA model of channel choice "to identify conditions that increase the likelihood that multiple channels will be used to serve a foreign market (p.190)." He posited "a notion that software firms prefer integrated over shared-control or market channels (p.190)." Because the prediction that larger channel volumes are associated with the use of multi-channels was not supported and the hypothesis that growth rate is negatively associated with the use of multi-channels was confirmed, he concluded that the use of multi-channel was to increase channel volumes, not to gain economies of scale. Furthermore, that knowledge-based asset specificity is not contained in the model means that software firms are able to protect knowledge-based asset in multiple channels. Finally, the rationale that multiple channels emerge in more mature markets which are experiencing slower growth is supported.

In summary, the above three studies (McNaughton 2002; McNaughton and Bell, 2001) could be regarded as a research series for the following reasons. First of all, the above three studies are based on one large well-organized survey. The authors gathered data through a disk-by-mail survey of Canadian software firms. One hundred and twenty firms replied to their questionnaires completely, while a total of 470 firms were identified. The above variables were measured based on relevant references, and measure reliability was checked by calculating Cronbach's alpha. Moreover, McNaughton and Bell (2001) addressed the issues of switching channels from the domestic to foreign market. They also furthered the understating of this switching of marketing channels. That is, they studied the export mode decision-making process. In 2002,

McNaughton generalized the conclusions reached in the previous research: One is that the findings on switching of channels from domestic to foreign markets were generalized to those about choice of multi-channels. The other is that conclusions about selection of marketing channel were generalized from Canadian software firms to the sector of small knowledge-intensive firms.

2.4.2 Marketing Channel Choice: Manufacture and Service Industry

The previous section reviews the major literature about marketing channel choice based on the Canadian software industry. This section analyzes some studies about marketing channel choice in other sectors such as manufacture and service industry.

John and Weitz (1988) reported their study about forward integration based on a sample of industrial goods manufacturers. The data are analyzed by multiple regression and multinomial logit analysis. The findings are as follows: Manufacture firms are less likely to use reseller channels when specific assets levels are higher. The authors also stated that "Similar shifts were observed for higher levels of environmental uncertainty and behavioral uncertainty (p. 338)."

Mols (2000) employed transaction cost theory to analyze and explain the existence of dual distribution channels. The author stated that dual channel systems have often been viewed as anomalies in traditional transaction cost theory, and that many firms use both integrated and non-integrated distribution channels simultaneously. In this paper, the explanations of the existence of dual channels both with homogeneous and with heterogeneous environments are argued persuasively. Unfortunately, the conclusions are not supported by empirical evidences.

2.4.3 Software Outsourcing and Transaction Cost Analysis

Eric and Wang (2002) studied how transaction attributes and post-contractual opportunism may affect the success of outsourcing decisions and focused on customized software outsourcing. Specifically, dependent variables are outsourcing success and post-contractual opportunism, while independent variables are contractor reputation, uncertainty, and asset specificity. Post-contractual opportunism has two types: hold-up problem and moral hazard.

A cross-sectional postal questionnaire was developed for collecting customized software outsourcing data from a group of medium to large-sized firms in Taiwan. Because they are typically the most knowledgeable individuals concerning their firm's major outsourcing projects, and should also have

sufficient ability and information to assess various aspects of outsourcing deals, Chief Information Officers were selected as targeted respondents. The distribution of the sample in terms of sectors is as follows: 94 firms (58%), 47 firms (29%), and 22 firms (13%) come from the manufacturing, service, and financial sectors, respectively. Regression analysis is used to examine the interaction between asset specificity and uncertainty.

The conclusion is twofold. One is that asset specificity, one of the three transaction attributes, has significant positive effects on both reducing the contractor's post-contractual opportunism perceived by the client and increasing outsourcing success. The other is that asset specificity and uncertainty have both direct and indirect effects on post-contractual opportunism as well as outsourcing success.

2.5 Transaction Cost Theories and Use of the Internet

Previously, the literature on transaction cost theories and its application in marketing channel choice of software firms are reviewed. The section presents some studies employing TCA to analyze the use of the Internet and other important literature about how the Internet influences company operation. The results are illustrated by Table 3.

2.5.1 Application of TCA in Use of the Internet

Many researchers have used transaction cost theories to analyze the impact of the Internet on company operation in terms of customer choices and suitable products. In particular, the following two studies are notable for the depth in which they explain consumers' willingness to buying online and products' suitability for electronic markets.

Liang and Huang (1998) stated that whether customers buy products electronically depends on the transaction cost of the Internet-based channels, and that the transaction cost of a product on the web is determined by the uncertainty and asset specificity. They explored which products were suitable for marketing electronically and why. An interview survey was used to collect data, and the final sample consisted of 86 respondents. The survey was conducted in Taiwan and covered five products, including books, shoes, toothpastes, microwave ovens, and flowers. They used structural equation modeling to analyze the data. The modeling method is a powerful tool to build a model involving multiple constructs with multiple items. It is superior to traditional logistic regression and principal factor analysis (Liang and Huang, 1998).

The findings in the above research are encouraging and useful. Acceptance of products in electronic markets is determined by the uncertainty and asset specificity of these products. Experienced and inexperienced shoppers react differently: the former is more concerned with uncertainty in the electronic

market, while the latter is worried about both uncertainty and asset specificity. They held that the electronic commerce lowers search costs but raises examination, payment, and post-service costs. From their point of view, packaged software is suitable in the e-market because its search costs reduce dramatically and other costs do not increase.

Thompson *et al.* (2004) examined the antecedents of transaction costs and their impact on consumers. In this research, they used a method, which is similar to snowballing sampling techniques, to reach potential respondents in the United States and China, respectively. The respondents are Internet users instead of a specific group of users. Email addresses were collected randomly from different websites, and emails were sent out with a short note informing respondents of URLs of the survey. To increase the number of responses, Thompson et al. sent out following-up emails to non-respondents. The survey procedures used in this thesis build on their methods.

The following conclusions are supported empirically. Behavior uncertainty and asset specificity are positively related to transaction costs in both the U. S. and China. Dependability is negatively associated with transaction cost among the U.S. consumers. Furthermore, the U.S. consumers perceived less product uncertainty, behavior uncertainty, asset specificity, convenience, and economic utility than did those in China.

In summary, the authors of both articles argued that the use of the Internet (either willingness to buy electronically or acceptance of the products in electronic markets) is determined by relevant transaction costs. The explanatory variables are different: Liang and Huang (1998) proposed two independent variables, whereas Thompson *et al.* accepted (2004) six variables, such as product uncertainty, behavior uncertainty, convenience, economic utility, dependability, and asset specificity. These constructs and findings are insightful for us to study the use of the Internet to deliver packaged software products.

2.5.2 Use of the Internet and Market Channels

The advent of the Internet and its widespread adoption has inspired development of a rich literature on the strategic implications of the technology on marketing channel structures. The progenitors of this research stream are Clemons and Aron (2002); Maclnnes, Kongsmak, and Heckman (2004); Johnson and Bharadwaj (2005); Loane, McNaughton, and Bell (2004); Levenburg and Klein (2006); and Houghton and Winklhofer (2004). Relatively little attention, however, has been paid to the software industry.

Three studies were relevant to this research. The first one is Loane *et al* (2004)'s research. They empirically studied the internationalization of Internet start-ups. Specifically, they used a case study method and investigated a cross-national sample of target companies; investigated the patterns, paces, and drivers of internationalization; and examined "the extent to which the Internet has influenced the firms' international activities, behavior, and overall strategy (p.79)."

Table 3. List of Literature on Applications of the Internet

Contribution	Author (Time)
• Develops a TCA model to study which product is more suitable for marketing electronically and why. • Data on acceptance of 5 products in e-markets are gathered and analyzed	Liang and Huang (1998)
• Analyze use of the Internet in small business Internet employing transaction cost theories.	Lohrke, (2002)
• Studies the impacts of Internet commerce on traditional marketing channels • Analyzes the viability of the 'disintermediation ' hypothesis	Shailendra, Jain, and Vijay (1999)
• Studies marketing implications of Web pagess, the Internet and other commercializing hypermedia computer-mediated environments	Hoffman and Novak (2000)
• Reviews general taxonomy of channel structures • Offers recommendations on strategies that can be successfully pursued in each of the channel structures.	Clemons and Aron (2002)
• Examines the antecedents of transaction cost and its impact on consumers' willingness to buy online • Cross-validates the above TCA model across US and China	Thompson et al. (2004)
• Analyzes the creator-publisher interaction in the book and software industries • Proposes concept of pure electronic commerce, that is, a transaction that uses information systems to avoid physical exchange and occurs entirely in a digital form.	Maclnnes, Kongsmak, and Heckman (2004)
• Investigates the international strategies of cross-national sample of Internet-enabled firms	Loane, McNaughton, and Bell (2004)
• An institutional perspective on developing and implementing intranet- and Internet-based information systems	Butler (2003)
• Best practice of use of the Internet in SMEs • Online product delivery, demonstration, and order tracking increase firms' net profit • Use of the Internet depends on firm size, owners' personality, etc	Levenburg and Klein (2006)
• Shape a conceptual model that examines the effects of the digitization of selling activity on two salesperson outcomes • Assess the moderating effects on the impact of digitization of selling activity on salesperson effectiveness and job insecurity	Johnson and Bharadwaj (2005)
• Provides empirical insights into conflicts of exporting SMEs • Model conceptually the impact of website and ecommerce adoption • Integrates authoritative control and relationship marketing	Houghton and Winklhofer 2004

The methodology is a case study and thematic analysis. First, a judgment sample of forty internationalizing entrepreneurial firms was selected: ten firms were sampled from Ireland, ten firms from Belgium and Sweden, ten firms from Canada, and ten firms from the United States, respectively. A case profile was developed based on the secondary sources such as websites, government reports, and public media. Then, semi-structured in-depth interviews were conducted with key decision makers. All the cases were thematically analyzed, and eight of them were presented in the paper.

Second, Levenburg and Klein (2006) explored customer service practices among small and medium enterprises (SME)s which provide and enhance customer service via the Internet and identified best practices in the use of e-business applications for these firms. The best practice of use of the Internet consists of email customer service, real-time online interactions, online product demonstration, online ordering, online product delivery, and online order tracking. A survey method was used to collect data. A total of 461 responses were received, of which 395 were usable. Sixty-six firms were excluded from the study: 50 failed to identify the size of their organization and 16 identified theirs as a 'large' organization (more than 250 employees).

Their findings are as follows: offering online ordering capabilities has a positive impact on perceived sales; online product demonstrations and engaging in email for customer service purposes have positive impacts on perceived net profits; and they also found that the usage patterns vary depending on firm size. One area of future study may be the exploration of the impact of an owner/operator's personality or the factor of family-owned/ public-owned on the firm's strategic use of the Internet for customer service purposes.

Finally, Houghton and Winklhofer (2004) argued that channel conflict refers to "a situation in which one channel member perceives another member to be engaged in behavior that is preventing or impeding him from achieving his goals (p.369)." Channel relationship has two dominating paradigms: the authoritative and relationship paradigms. From 25 companies, interviews were held with owner-managers and senior managers, or with whomever the companies regarded as most knowledgeable about the effects of website and/or e-commerce adoption. The finding is that the Internet may be either a blessing or a curse to channel relationships.

2.6 Research Model

Based on the above review, the uncertainty, asset specificity, and transaction frequency of the online distribution of packaged software will affect the transaction costs and, in turn, affect whether and how Canadian packaged software companies employ the Internet to deliver their products. These factors are measured by various dimensions. Figure 5 illustrates the research model comprised of dependent variables and independent variables.

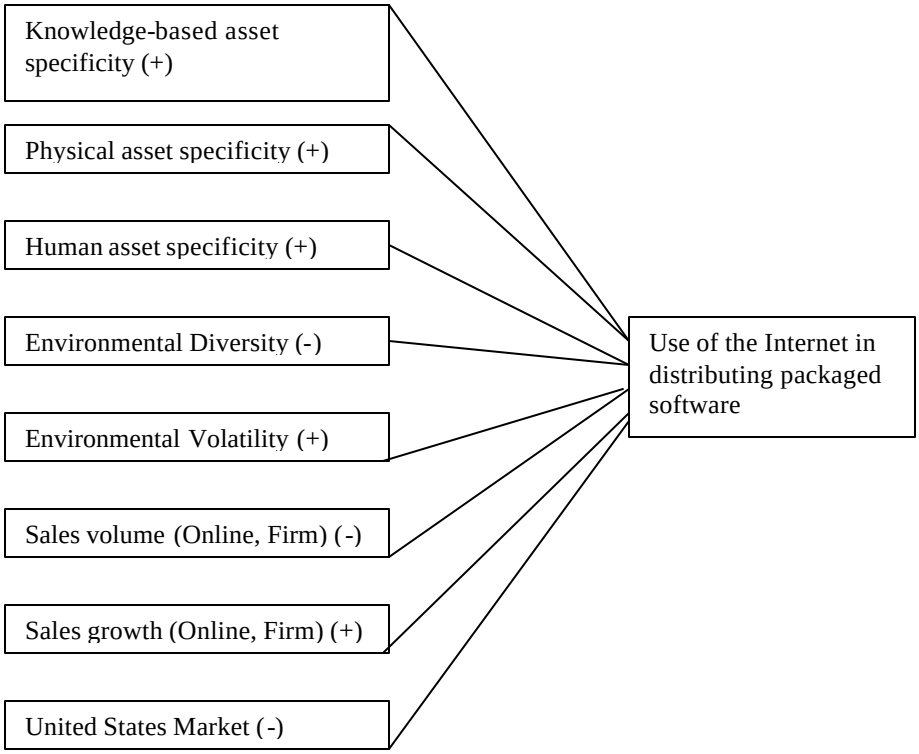

Figure 5. Illustration of Research Model: Dependent and Independent Variables

2.6.1 Assumptions about the Default Mode

In empirical studies of TCA, a default mode is deduced for the purpose of proposing hypotheses. An integrated mode is the default used in this research. Traditionally, TCA argued that market distribution mode is the default choice as it is more efficient. In contrast, in terms of knowledge-intensive firms and service firms such as software firms, it is popular that preference is given to the integrated channels (McNaughton, 1996). Furthermore, an evident rationality that the default choice is an integrated mode was given by McNaughton and Bell (2001) and McNaughton (2002). Although certain disintegrated distribution channels are exclusively used for packaged software, there is considerable evidence that an integrated mode in software industry is the method most often used (Wilson, 2001; Market profile: software sector, 1998). After all, the packaged software industry is part of the software sector. As mentioned previously, software firms with an integrated mode are able to identify market expectations more accurately because an integrated mode is able to facilitate rapid responses and maintains a sales force with high level technical skills.

However, the default mode of online distribution is arguable because packaged software is a special type of software product, which is standardized but not customized for any customer. McNaughton (2000)

stated that it is difficult to calibrate a model where the number of cases in the alternative category is much larger than the number of cases in the default category. That is, something is hardly the default if most firms are doing something else. Hence, this assumption about default mode is checked in the survey.

2.6.2 Packaged Software Products (Asset Specificity)

In this research, three dimensions are used to reflect asset specificity of online distribution: physical, human, and knowledge-based asset specificity. The physical asset specificity refers to investment in special equipment, such as computers, UPS, routers, and modems for the purpose of software distribution via the Internet. Human asset specificity refers to investment in time and effort to gain relevant experience. Knowledge-based assets refer to an asset in which value is added to products primarily by increasing embedded knowledge content and in which the content value evolves to exceed the material value (Glossary of knowledge management terms, 2005). In the Internet age when economy is knowledge-driven, organizations ultimately derive their value from intellectual and knowledge-based assets rather than physical assets (Brockbank 2001; Liang and Huang, 1998).

The variables are modified from previous studies. McNaughton (2002) and McNaughton and Bell (2001) argued that asset specificity of software firms are characterised by the dimensions of knowledge-based asset specificity and physical assets to sell software products. White (2000) included two variables reflecting specificity in his research: physical asset specificity and human asset specificity.

Theoretically, the following three statements determine the relationship between asset specificity and the use of the Internet by Canadian packaged-software developers. Classically, in a highly competitive market, the market channels of hierarchical mode are more cost efficient than those of market mode; whereas the transaction costs of market-mode channels are higher than hierarchical-mode channels (McNaughton 1996). That is, given specific market and channel mode, firms choose their market channels based on the relative transaction costs of these market channels. Literature about TCA shows asset specificity, including physical, human, and knowledge-based asset specificity, increases transaction costs (Thompson *et al,* 2004). High asset specificity increases transaction costs in that both parties have to invest in specific assets, such as sales persons and unique equipment. Hence, hierarchies are more efficient in performing these transactions with high asset specificity failure (McNaughton, 1996). Previously, packaged software developers employed online distribution as a hierarchy-mode channel. Therefore:

H_1. The use of the Internet in the distribution of packaged software is positively related to the physical asset specificity of the software.

H_2. The use of the Internet in the distribution of packages software is positively related to the human asset specificity of the software.

H_3. The use of the Internet in the distribution of packages software is positively related to the knowledge-based asset specificity of the software.

2.6.3 Various Market and Customers (Uncertainty)

It is interesting how different customers and market situations affect the use of the Internet in distributing packaged software products. Different dimensions are employed in previous literature. McNaughton (1996, 2000, 2002) and Bell (McNaughton and Bell, 2001) employed volatility and diversity to characterize environmental uncertainty. Thompson (2004) employed product uncertainty and behaviour uncertainty to measure uncertainty of online buying. In this research, two dimensions characterise uncertainty of packaged software online distribution: diversity and volatility. In a volatile market, software firms have difficulty predicting product demands and competitor actions in the future (McNaughton, 2002). In this situation, integrated modes, one of which is the Internet distribution, are likely deployed because few market-based parties would assume the risk of environmental volatility. Therefore,

H_4. The use of the Internet in the distribution of packaged software is positively related to environmental volatility of the software.

Diversity comes from the multiple sources of the uncertainty in a market, and packaged software developers, as a typical category of knowledge-intensive firms, tend to use multiple channels to gather and process the heterogeneous information (McNaughton, 2002; McNaughton and Bell, 2001). As the diversity of packaged software increases, more and more market channels are required. That is, the relative share of using the Internet goes down accordingly. Thus,

H_5. The use of the Internet in the distribution of packaged software is negatively related to environmental diversity.

2.6.4 Software Firms Growth (Frequency)

One of the research questions is how the software firm growth (volume and rate) influences the use of the Internet in distributing packaged software products. Software firm growth is characterized by two indicators. Production cost is a very important variable to explain the dependent variable. Distribution of packaged software over the Internet is a combination of software production and distribution because software products are manufactured and delivered simultaneously when they are distributed through the Internet (Ilan, 2005). From the TCA point of view, the object of using the Internet in online distribution is to minimize the sum of transaction and production costs. Therefore, the online distribution channel is used to minimize the sum of production and transaction cost of packaged software.

In this research, two dimensions are used to feature transaction frequency in the use of the Internet for distributing packaged software: online-distribution volume and online-distribution growth. Based on TCA, the higher transaction frequency is, the more incentive for firms to employ a hierarchical governance structure since firms are easier to recover the large transaction of a recurring kind. Transaction frequency is considered as a dichotomous phenomenon (John and Weitz, 1988) and the positive relationship among transaction frequency and hierarchical modes has not been largely confirmed (Johnson and Bharadwaj, 2005). Consequently, multi-dichotomous variables or continuous variables are preferred to be used.

Due to the lower cost of setting up a software electronic delivery channel, software firms usually capitalize on emails and websites. As a packaged software product starts to be popular, Canadian packaged-software developers are ready to deliver their products through the Internet. Consequently, with regard to anticipated production efficiencies, firms with larger volumes are better off using the Internet to distribute packaged software. It follows that:

H_6. The use of the Internet in packaged software distribution is positively related to the rate of growth in gross sales in the past year.

However, the increase of gross sales means that more financial resources are available for packaged software developers to form more expensive but efficient channels. For instance, traditional sales representatives and branch offices enable packaged software developers to communicate with their clients to learn about the needs of target markets. Furthermore, the higher the volume of packaged software is, the more possible multiple-channels are used (McNaughton, 2002). Therefore,

H_7. The use of the Internet in the distribution of packaged software is negatively related to the volume of delivering packaged software products through the Internet.

In addition, the gross sales of entire companies and the relevant rate of growth are also included in the model to check the assumption that an entire company's gross sales and rate of growth may have a different relationship with the decision of distributing packaged software through the Internet. The relationship between the gross sales and use of the Internet may be negative for several reasons. Given sufficient channel volumes, multiple channels are desirable (McNaughton, 1996) because reduces the use of the Internet. Furthermore, even if software firms run their own websites to deliver packaged products, communication with customers and learning about target markets are limited. As gross sales increase, software developers would use either direct channels or multiple channels. Therefore,

H_8. The use of the Internet in the distribution of packaged software is positively related to the rate of growth in gross sales of software developers in the past year.

H_9. The use of the Internet in the distribution of packaged software is negatively related to the gross sales of packaged software delivered through the Internet.

2.6.5 Market-Specific Consideration

To take account of the unique characteristics of the Canadian software industry, McNaughton (2002) proposed two variables: national market and customization. Because this research studies only packaged software, the variable of customization is blocked. The variable of the largest national market of packaged software is included in this research.

The United States is estimated to hold approximately a 50% share of the world market of packaged software (The Software & Information Industry Association, 2005). Due to proximity, size, growth, and similarity of language and business procedures, the U.S. market is very important to Canadian software developers (McNaughton, 2002). The U.S. is one of the countries where the coverage of the Internet is the highest, and this market is positively associated with the use of the Internet in distributing packaged products by Canadian software developers. Therefore,

H_{10}. The use of the Internet in the distribution of packaged software is positively associated with the United States market and negatively associated with national markets other than the US and Canada.

2.7 Conclusions

This section reviews a rich body of the research on packaged software and transaction cost analysis, analysis of the channel choice by software firms, and application of TCA in the use of the Internet. First of all, based on the literature on packaged software, the traditional distribution model of packaged software is given, and the model of the Internet use in packaged software distribution is created. Compared with other new economic theories about firm organization such as agent property rights theory, agency theory, and resource-based view of firms, transaction cost analysis is chosen as the theoretical basis for this research.

Many researchers have used transaction cost theories to address the issues of marketing channel choice and software outsourcing in the software industry. For instance, Eric and Wang (2002) studied the relationships between transaction attributes and software outsourcing success using TCA. McNaughton (1996, 2000, 2001, 2002) addressed a series of studies relevant to Canadian software firms (knowledge-intensive firms) marketing. As for the application of the Internet, the progenitors of this research stream are Liang and Huang (1998); Shailendra, Jain, and Vijay (1999); Lohrke (2001); Hoffman and Novak (2000); Clemons and Aron (2002); Thompson *et al.* (2004); Butler (2003); Loane, McNaughton, and Bell (2004); Levenburg and Klein (2006); Houghton and Winklhofer (2004); and MacInnes, Kongsmak, and Hecman (2004).

Furthermore, the information gap identified is three-fold. There is no significant research about current development of packaged software. Furthermore, the channel choice of packaged software is not the focus of these studies where only a variable relating to packaged software is introduced. Finally, most

studies analyze, from the buyer's point of view, the issues such as online shopping behavior and consumer acceptance of products in the electronic markets. Relatively, little attention has been paid to packaged software and the relevant channel choices by packaged software developers.

3. Methodology

3.1 Introduction

After research objectives, issues, and conceptual models are determined, this section presents the detailed methodology. This research collected data using a web-based survey and analyzed them using logistic regression analysis. This chapter describes the development of survey instrument, survey procedures, resulting sample, measures, statistical procedures, and the limitations of the methodology.

3.2 Web-based Survey with Soliciting E-mails

Chapter one provides a brief justification for the choice of a survey method over a case study or other observation approaches. This section explains why this survey is administered through the web, with participants solicited by e-mail.

With the development of home computers and Internet access, email and web-based surveys become a valuable and speedy means of conducting a survey. An email survey is an obvious alternative to postal surveys (Tse, 1995, 1998; Kittleson, 1995; and Dillman, 1978, 2000). Barnett (2002) stated that a web-based, email survey was probably the most frequently used method of administering social science surveys.

Compared to other survey methods, a web-based survey has a fundamental difference for its target population "has to be accommodated within the set of those who happen to make contact with the Internet site running the survey (Barnett, 2002)." Hence, attention to coverage and response bias is important. The coverage varies widely from country to country, from industry to industry, and the degree of interest and involvement differs also among different age or social groups. The coverage issue and response bias could be reduced by sending out targeted emails. Thus, a combination of an email survey and a web-based survey appears and becomes popular when the Internet for both an e-mail and a web site is available.

A web-based survey with soliciting emails is a combination of an email survey and a web-based survey. It is a hybrid approach and follows all the usual designs and planning procedures of postal surveys, such as follow-up and reminders.

In the research, the following steps were followed:

- Designing the questionnaire of this research. An instrument, including a cover statement and a thanking letter was uploaded on December 18, 2005 at Website: http://www.mansci.uwaterloo.ca/s2hu/index.php.
- Sending out soliciting emails to the target population on January 8, 2006. The purpose is simply to increase the response rate, which should decrease the response bias
- To increase the number of respondents, sending out soliciting emails on January 8, January 15, January 25, February 6, and February 20, 2006, respectively.

3.3 Survey Instrument Design

According to TCA, different transactions may use different channels within a firm. However, many software firms are single product firms or have a dominant product, so this transaction is likely to account for a significant (even majority) of its revenue. Therefore, the unit of analysis for this research is a combination of the best-selling packaged software product and the largest national market. That is, each packaged software developer as a respondent is required to answer questions about its primary channel that is used to distribute its best selling packaged software in its largest market.

The contents of the instrument are determined by the unit of analysis. The major questions of this questionnaire are borrowed from McNaughton (1996, 2000, 2001, 2002) and Johnson and Bharadwaj (2005) for the following reasons. First of all, the same items used in this research ensured a certain level of reliability in the result and allowed for a comparison between the results of this study and those of its antecedents. Moreover, McNaughton (1996, 2000, 2001, 2002) addressed the relationship among channel management, market features, and product idiosyncrasy of Canadian software developers. Packaged software developers are part of his sample, and the relevant contacts were identified from the database, that is, Canada Company Capabilities.

The questionnaire is presented in Appendix I. It is divided into four components, which are discussed in the following sections.

3.3.1 Use of the Internet in Distributing Packaged Software

The first component of the questionnaire focuses on measuring the use of the Internet in distributing packaged software. The respondents must be those firms that develop their own packaged software because we are only interested in Canadian packaged-software developers in this research.

Accordingly, the eleven questions of this component are divided into three categories. The first three questions are used to identify the best-selling packaged software product of each software developer, its gross sales during the last fiscal year, and its growth rate in gross sales between the two most recent fiscal years. These questions are multi-choice ones, and the first question allows a respondent to specify the type of its product if none of the listed types is suitable for its best-selling product.

Question number 4 and question number 5 are used to collect the information about the largest national market. Each packaged software developer is asked what its largest national market is and what proportion of the gross sales of the best-selling packaged software is accounted for by this largest market. In question 4, a respondent is provided with two options: the Canadian market or the United States market. Respondents are also allowed to state the largest market other than the above two markets.

In question number 6 to question number 11, each Canadian packaged software developer is required to provide the detailed information about the use of the Internet in distributing its best-selling packaged software product at the largest national market. A respondent is solicited to identify the primary channel

that is used to distribute its best-selling product in the largest market, including catalogue publishers, value-added resellers, and direct to users through the Internet. If a software developer does not choose "Direct to users via the Internet", it is asked to specify where its best selling packaged software is sold to any market online; If the answer is "Yes", the proportion of gross sales accounted for by online sales is requested.

If a software developer chooses "Direct to users via the Internet", further information is collected:

- Whose website is the online sales of the best-selling packaged software sold through?
- What is the amount of the gross sales of a developer's best-selling products sold over the Internet during the last fiscal year?
- What is the approximate rate of growth in gross sales through the Internet between the two most recent fiscal years?
- How does a developer use the Internet to sell and distribute your best-selling packaged software? If none of the above applies, a respondent is asked to state the specific situation.

3.3.2 Dimensions of the Packaged Software Market

This set of questions asks about the extent to which each of the following statements characterizes the product or market characteristics of its best selling packaged software. The Likert scale used in this research is as follows: value "1" indicates that this characteristic is very weak for the products, and a value of "7" suggests that it is very strong.

Traditionally, transaction cost theories explain channel selection in terms of three variables such as asset specificity, external uncertainty, and channel volume. The information about asset specificity and external uncertainty of the best-selling packaged software products sold in each software developer's largest national market is solicited through the set of questions in this component. Three items, including human asset specificity, know-abased asset specificity, and physical asset specificity, are proposed to catch asset specificity about the best-selling packaged software products, while the items for identifying the external uncertainty are volatility and diversity.

Two items, gross sales and growth rate, are used to catch the information about the channel volume of the best selling products sold in the largest national market. The items are covered in both the first and the third component of the questionnaire.

3.3.3 Background Information about Packaged Software Firms

This set of questions focuses on the attributes of each packaged software developer and attempts to catch background information about the packaged software firm for which the respondent works. For valid establishment of the firm demographics of responding firms, respondents are told that their responses to these questions are used to aggregate responses with those of other respondents.

This section contains six questions, including five multi-choice questions and one open-ended question. The first two questions ask a packaged software developer to describe its gross sales across all business activities during the last fiscal year and to specify the rate of growth in gross sales for all business activities between the two most recent fiscal years. The answers are also used to confirm the channel volumes and growth of the primary channel used by packaged software developers to distribute their best-selling products in the largest national market. Question number 3 asks the packaged software developer to specify the approximate number of its employees. The questionnaire presents the set of values as ranges for firm size. Question number 4 asks for the year in which the packaged software developer was started. The purposes are as follows: one may be to model the relationship between the duration of a packaged software firm and the use of the Internet in distributing packaged software products. The other might be to testify the validity and justification of other variables. Question number 5 is used to enquire whether a packaged software firm is privately owned and whether the firm is still managed by the owner. The main purpose of these two questions is to establish the firm demographics of responding firms.

3.3.4 Respondent Profile

The last section of the instrument is the respondent profile, and the purpose is to collect accurate information of the resulting sample population. The questions consist of the respondent's position within the firm, the respondent's address, and the period that the employee has served the firm. The collection of respondent's job title, length of service, and email is consistent with these studies conducted by McDougall et al. (1994) and McNaughton (1996, 2000, 2001, 2002).

The respondent's job titles are collected to ensure that the information came from senior ranking officials within the firms. The ideal respondents include (vice) presidents, chief executive officers, chief information executives, and senior managers in charge of selling and delivery of packaged software products.

The length of service is also an important attribute, and can be used to validate that a substantial percentage of respondents has worked for their respective firms long enough to understand the use of the Internet to sell and deliver their packaged software products.

The field of respondent's email address is optional. If respondents want to have a summary copy of this research, an email address is required. Providing the results to respondents is used as a strategy to increase the number of respondents. It is clearly stated that their email addresses will be kept separately from their responses. This separation assures that all the responses will be anonymous, and increases the numbers of responses.

3.4 Survey Procedures

There are two distinct elements in a web-based survey with soliciting emails: choice of the statistical sampling design and how the survey is conducted (Barnett, 2002). This section presents how the sample of the survey of online distribution was determined and what procedures were followed for the survey to be implemented.

3.4.1 Sampling procedure

An original sample size is estimated according to the desirable final sample size and anticipated response rate. Based on literature review, final response rates ranges from 12% to 26%. McNaughton (1996, 2000, 2001, 2002) argued that a final sample with over 100 respondents and a response rate of around 20 percent is acceptable. A response rate of 12 percent is also expected from national entrepreneur surveys (Lohrke, 2005; Alpar and Spitzer, 1989; McDougall et al., 1994). In case the response rate of this research reached the bottom of the range, 1178 firms were identified from one of the Industry Canada Specialized Databases: Canadian Company Capabilities (CCC). This database is accessed via the so-called Canada's Business and Consumer site (http://www.strategis.ic.gc.ca) by clicking "Search" and "Canadian Company Capabilities." Later, the name of this database, Canadian Company Capabilities (CCC), refers to the database itself as well as the website where it exists. The target participants in the study are CEOs, marketing managers or other senior ranking officers responsible for marketing in the relevant organizations. These executives are being selected as the target for the study because they have a good understanding of the firm's software products marketing strategies, product characteristics and development history. That is, they have the best knowledge to answer the questions on the instrument.

An additional 589 contacts are collected from the website of the Ottawa Software Council. Quick observation show most of the software firms listed here are repetitive to those listed by Canadian Company Capabilities (CCC). The reason is that most software firms have either their headquarters or branch offices locating in Ottawa. The Ottawa Software Council (OSC) is an industry-sponsored association, the purpose of which is to help the founders, owners, and executives of these software companies to build great businesses in the community. It can be reached at http://www.ottawasoftwarecouncil.ca/.

The Canada Company Capabilities (CCC) is not an ideal data source to identify current contacts of packaged software developers because it has paid little attention to the packaged software industry. First of all, it is difficult to identify from CCC whether a firm is truly a developer of packaged software. A number of responses indicated they were not developers. Moreover, some literature about Canadian software identifies a population from the database of CCC. Calof (1994) and McNaughton (1996) pointed out that this database is biased toward the inclusion of larger firms. For adjustment of this bias, more contacts from the Ottawa Software Council, which is open to all the Canadian software firms present in Ottawa areas, are identified.

3.4.2 Survey Administration

Once the design, implementation and testing of the web-based questionnaire are completed, the process of administering the survey starts. This section focuses the steps followed to administer the survey.

- A website (http://www.mansci.uwaterloo.ca/s2hu/index.php) which contains the questionnaire, information letter, and think-you letter was set up and tested. Email addresses were uploaded into a web-based email client and separated into groups.
- The initial soliciting emails were sent to all available contacts collected at the beginning of January, 2006. The same emails were sent to all available contacts collected from the Ottawa Software Council in the middle of January, 2006. The text contained in the initial contact email is illustrated in Appendix A.
- The email server used in the survey is engmail.uwaterloo.ca, and the function "Request a Return Receipt" is checked. Once the initial soliciting email is read and replied to, the relevant contact is removed from the list. After one week, lists of two updated groups of contacts were sent out by the web-based email client, respectively. In February, 2006, the above steps were repeated.
- During the survey period, those emails from participants, concerning the questionnaire and privacy policy, were answered. By the middle of March, the total valid number of respondents was 82. The response rate of this survey is 7.0 %.

The emails of Canadian software companies are divided randomly into subgroups, and each subgroup contained approximately 35 potential participants. To ensure consistency among the subgroups, each group of participants received the same soliciting emails.

All potential participants were divided into subgroups for several reasons. The web-based email client and the email server have a capacity limit. Furthermore, sub-grouping contacts were used to minimize performance impact on the website that hosted the questionnaire. This grouping would potentially increase the response rate of the survey.

3.5 Resulting Sample

Through the procedure described above, 82 valid surveys were returned from software developers across Canada. Information collected from respondents covers basic information about respondents and the employers for whom they work, dependent variables, and independent variables. This section presents the first kind of information, and shows that this sample is reliable, and that respondent profiles are typical.

3.5.1 Sample Bias Check

The possible biases of this research are checked as follows. A web-based survey usually encounters "difficulties of covering the target population, of response bias due to an uneven mix of e-mail users (Barnett, 2002, p. 172)." However, it is worth noting that the common coverage bias (Barnett, 2002) is not an issue for the study because it is reasonably assumed that emails are very accessible for packaged software developers. Moreover, the data collected in the research are self-reported. Self-reported data tend to be inaccurate because respondents lack the ability to recall facts and because they are uncomfortable revealing information about their firms. We received three emails expressing concerns about privacy issues. In addition, the best-selling packaged software product-largest national market combination possible represents a biased sampling (McNaughton, 1996).

Finally, non-response bias can be identified by checking the geographic or size distribution of respondents versus non-respondents. However, for this research, the relevant information about non-respondents is not available. This research only tests for statistically significant differences in key variables between firms that responded quickly to the questionnaire (the first 38 firms that replied before February 15, 2006), and those that responded later (the last 44 firms that replied after Feb. 15, 2006). These variables include physical asset specificity, human specificity, knowledge-based specificity, diversity, and volatility, The logic is that those who take longer to respond are more like those that do not reply. T-test results are indicated in Table 4. The high p-values show that null hypotheses about the means of the five key variables are not rejected, indicating no significant difference in the mean response of early versus late respondents.

Table 4. T-test Results of Non-response Bias

Variable	Method	Variances	DF	t Value	Pr > |t|
Diversity	Pooled	Equal	79	0.70	0.4887
Diversity	Satterthwaite	Unequal	79	0.70	0.4886
Volatility	Pooled	Equal	79	0.60	0.5497
Volatility	Satterthwaite	Unequal	78.8	0.60	0.5493
Knowledge Specificity	Pooled	Equal	79	-0.45	0.6572
Knowledge Specificity	Satterthwaite	Unequal	79	-0.45	0.6571
Physical Specificity	Pooled	Equal	79	0.48	0.6304
Physical Specificity	Satterthwaite	Unequal	77.6	0.48	0.6309
Human Asset Specificity	Pooled	Equal	79	-0.58	0.5658
Human Asset Specificity	Satterthwaite	Unequal	78.4	-0.58	0.5662

3.5.2 Firm Sizes, Job Titles, and Starting Years

Table 5 shows the distribution of sample firms in terms of number of employees. The firms ranged in size from 1 employee to over 1500 employees. Nearly 30% of respondents (28 out of 82) have 1 to 5 employees, and over 75% of the respondents hire less than 30 employees. However, for 11% of Canadian packaged-software developers, the number of employees is over 100, and three Canadian developers in the sample have over 1500 employees.

Table 5. Distribution of Respondents by Firm Size

Number of Employees	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	3	0.036585	0.036585
1-5	25	28	0.304878	0.341463
6-10	10	38	0.121951	0.463415
11-15	12	50	0.146341	0.609756
16-20	6	56	0.073171	0.682927
21-30	7	63	0.085366	0.768293
51-70	3	66	0.036585	0.804878
71-100	1	67	0.012195	0.817073
101-150	6	73	0.073171	0.890244
401-500	3	76	0.036585	0.926829
1001-1500	3	79	0.036585	0.963415
over 1500	3	82	0.036585	1

The Canadian Company Capabilities database attempts to contain accurate and updated email contact information for senior officers of the targeted firms. The nature of the research requires that respondents have the whole picture of how their products are distributed in all the available markets (Eric and Wang 2002; McNaughton 1996, 2000, 2002; McNaughton and Bell, 2001). Table 6 contains the distribution of actual study participants by their title within the organizations. Over 71% of the respondents are presidents, vice presidents, and chief executive officers (CEOs). The other respondents are market directors (2), Software development managers (3), marketing managers (3), innovation managers (1), and sales & distributions manager (1), respectively.

Table 6. Positions Held by Respondents

Job Title	Frequency	Percent	Cumulative Percent	Cumulative Frequency
CTO, CEO, CIO	24	0.292683	0.292683	24
Co-President	3	0.036585	0.329268	27
Director Marketing	2	0.02439	0.353659	29
development Manager	3	0.036585	0.390244	32
Innovation Manager	1	0.012195	0.402439	33
Marketing Manager	13	0.158537	0.560976	46
President	24	0.292683	0.853659	70
Sales and Distributions	1	0.012195	0.865854	71
Vice president	11	0.134146	1	82

As indicated in Table 7, over 73% of the participants worked for the firm for 3 years or more. Furthermore, the percentages of the participants whose service time is between 3-5 years and 16 or more years are 22.64% and 18.87%, respectively. It is desirable that there are a significant number of participants who have been with their firms for a long period, as they should be more knowledgeable about the distribution channel decisions made by the firm.

Table 7. Distribution of Respondents by Length of Service

Work period	Frequency	Percent	Cumulative Frequency	Cumulative Percent
less than 1 year	6	7.32	6	7.32
1-2 years	10	12.2	16	19.52
3-5 years	18	21.95	34	41.47
6-8 years	11	13.41	45	54.88
9-12 years	12	14.63	57	69.51
13-15 years	8	9.76	65	79.27
16 or more years	17	20.73	82	100

The distribution of the respondents of Canadian packaged-software developers by the starting year is shown by Table 8. Over 42% of the respondents have been found since 1990, and one third of them started before 2000.

3.5.3 Management Structure and Ownership

Question 5 requested information on the management structure and ownership of the firm. The resulting information is illustrated in Table 9. Around 83% of respondents are managed by professional managers, and 89% of them are owned privately.

Table 8. Distribution of Respondents by Starting Year

Starting Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
before 1990	35	42.68	35	42.68
1991	3	3.66	38	46.34
1992	5	6.1	43	52.44
1993	3	3.66	46	56.1
1994	5	6.1	51	62.2
1995	5	6.1	56	68.3
1996	3	3.66	59	71.96
1997	1	1.22	60	73.18
2000	11	13.41	71	86.59
2002	5	6.1	76	92.69
2003	3	3.66	79	96.35
2004	3	3.66	82	100

Table 9. Distribution of Firms by Management Structure and Ownership

Management Structure	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Managed by Owner	14	17.07	14	17.07
Managed by Professional	68	82.93	82	100.00
Public or Private				
Private	73	89.02	73	89.02
Public	9	10.98	82	100.00

3.5.4 Gross Sales and the Rate of Growth

Tables 10 and 11 show the rate of growth and gross sales of each Canadian packaged software developer. As indicated in Table 10, 16 firms (20.78% of the respondents) have gross sales of from 1 to 5 million dollars in the past fiscal year. For nearly two thirds of Canadian packaged software firms, their gross sales are less than 1.5 million dollars. Only 3.8%, 3 out of 79, of Canadian packaged software developers revealed that their gross sales of last year are over 1000 million dollars.

Table 10. Gross Sales of Packaged Software Developers

Gross Sales In million CND $	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0-0.1	16	20.78	16	20.78
0.1-0.25	4	5.19	20	25.97
0.251-0.50	13	16.88	33	42.86
0.51-1.0	14	18.18	47	61.04
1.0-5.0	16	20.78	63	81.82
5.1-10.0	3	3.90	66	85.71
10.1-50	5	6.49	71	92.21
101-500	3	3.90	74	96.10
1000+	3	3.90	77	100.00

Note: Frequency Missing = 5

Table 11. Rate of Growth in Gross Sales of Packaged Software Developers

Rate of Growth	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing values	2	2.44	2	2.44
<0%	9	10.98	11	13.42
0%-5%	11	13.41	22	26.83
6%-10%	13	15.85	35	42.68
11%-15%	12	14.63	47	57.31
16%-20%	16	19.51	63	76.82
21%-30%	7	8.54	70	85.36
41%-50%	4	4.88	74	90.24
91%-100%	2	2.44	76	92.68
101%-250%	1	1.22	77	93.9
500+%	5	6.10	82	100

As shown in Table 11 over 34% of Canadian packaged software firms, 28 out of 82, have a rate of growth of 10% to 20%. 42.68% of the respondents have a rate of growth in gross sales less than 10%. However, for 6.1% of developers in the sample, their rates of growth in gross sales are over 100%.

3.6 Measures

3.6.1 Dependent variables

For each channel, both qualitative and quantitative assessments of the use of the Internet in online distribution of packaged software are asked.

Use of the Internet in online distribution of packaged software is examined as the dependent variable. This variable is measured both quantitatively and qualitatively. On one hand, respondents are asked two multiple-choice questions (Johnson and Bharadwaj, 2005): Whether or not online distribution is the primary channel used in delivering their best-selling packaged software products. If the respondents answer "No" to this question, they are required to specify if they use the Internet to distribute their products. The detailed information about these two questions is reported in section 4.2.2 and 4.2.4, respectively.

To assess the likelihood that software firms use the Internet to distribute their packaged software, this research used two coding schemes: binary response and three-value nominal response. In the binary response model, the dependent variable is binary:

- 0 if online distribution is not used. Neither "Direct to users through the Internet" in Question 6 nor "Yes" in Question 7 (1) is checked.
- 1 if online distribution is either the primary channel or secondary channel. Either "Direct to users through the Internet" in Question 6 or "Yes" in Question 7 (1) is checked.

For more information, an ordinal response model was fit. The dependent variable takes three categories:

- 1 if online distribution is not used. Neither "Direct to users through the Internet" in Question 6 nor "Yes" in Question 7 (1) is checked.
- 2 if online distribution channel is used as a secondary channel. "Direct to users through the Internet" in Question 6 is not checked, but "Yes" in Question 7 (1) is checked.
- 3 if online distribution channel is used as a primary channel. "Direct to users through the Internet" in Question 6 is not checked.

On the other hand, the use of the Internet in packaged software distribution is also measured quantitatively. The volume and growth rate of the online distribution of each developer' best-selling products directly reflect the use of the Internet by Canadian packaged-software developers. The use of the Internet could also be gauged by the ratio of gross sales of online distribution to that of the best-selling

products sold in the largest national markets. These two variables could be calculated based on the variables illustrated in Table 13. For comparison purposes, a regular regression model is explored.

Measuring the dependent variable both qualitatively and quantitatively ensures that respondents' opinions about the Internet employed in packaged software distribution are elicited effectively and correctly.

3.6.2 Independent Variables

The Independent variables of transaction costs are measured using Likert scales adapted from previous research (McNaughton 1996, 2002; McNaughton and Bell, 2001; Loane *et al.*, 2004). Respondents are asked to indicate their level of agreement ("Strongly disagree"=1, "Strongly agree"=7) about the seriousness of statements on asset specificity, environmental uncertainty and transaction frequency. Asset specificity refers to the degree to which transaction-specific assets are required for the Internet in packaged software distribution. Environmental uncertainty reflects a number of sources of uncertainty in the Internet in online distribution, particularly from users, competitors and suppliers. Transaction frequency refers to how often online-distribution sales happen.

Based on the above discussion, the questionnaire that was used is illustrated in Appendix 1. Survey Instrument. In the resulting sample, the values of all the independent variables mentioned above, including means, standard deviation, and variances, are shown in Table 12. Dimension Statistics of Packaged Software / Markets.

The five entries in this table represent the variables measured in each of the five questions in the Section B. Dimensions of the Packaged Software Market of the Instrument. These variables reflect the asset specificity (human, knowledge-based, and physical asset specificity) and environmental uncertain (external diversity and volatility).

In this research, the variables illustrated in Table 12 are also used directly as independent variables to denote the channel volumes and growth. To find the model with the most information, various model alternatives are developed using log-transformation, rank-transformation, and original data for these variables.

Table 12. Descriptive Statistics for Independent Variables (1)

Variable	N	Mean	Std Dev.	Minimum	Maximum
Knowledge Specificity	82	5.5243902	1.5964901	1.0	7.0
Physical Asset Specificity	82	2.1341463	1.6236082	1.0	7.0
Human Asset Specificity	82	3.9756098	2.1080423	1.0	7.0
Diversity	82	4.2804878	2.1214623	1.0	7.0
Volatility	82	3.8170732	1.9946103	1.0	7.0

Table 13. Descriptive Statistics for Independent Variables (2)

Variable	N	Mean	Std Dev	Minimum	Maximum
Gross sale _ best-selling products	79	41.9	191.7	0.05	1000.0
Rate of growth _ best-selling products	82	0.6	1.3	0	5.0
Gross sale _online	82	4.1	13.9	0	75.0
Growth rate _online	79	0.5	1.1	0	5.0
Gross sales_ all products	77	53.7	200.4	0.05	1000.0
Rate of growth_ all products	81	0.5	1.2	0	5.0

Note: Unit of Gross sale is million dollars. Unit of Rate of growth is %

As indicated in the research model, a question is introduced to reflect the influence of the U.S. market on the use of the Internet for Canadian software developers to deliver their packaged products. The information about this question is presented in the Table 14 of Section 4.2.1.

3.7 Statistical Procedures

3.7.1 Logistic Regression Analysis

According to the logistic regression method, this research model could be developed into a multinomial logistic regression model for two reasons. The dependent variable, the use of the Internet, is nominal as coded in this research. Since use of the Internet means whether the Internet is used and how it is used, the relationship among various choices is nominal not ordinal (McNaughton, 1996). Because the variable may have three values at most, the multinomial logistic regression, in which binary logistic regression is the special case, is chosen. To be compared with previous research, this study fits a TCA model using step wise approach and forward inclusion procedure to identify a parsimonious model and to maximize the use of available degrees of freedom.

Multinomial logistic regression analysis is often used to investigate the relationship between these discrete responses and a set of explanatory variables. The explanatory variables could be either numerical or categorical. In this study, the five variables reflecting the characteristics of packaged software /markets, gross sales, and rate of growth, etc are numeric, while the other variables are processed categorically, and re-categorized if necessary. The variables such as the number of employees, gross sales, and rate of growth are converted to numerical values. That is, the average of the upper and lower limit is used to substitute for the range.

For instance, if the dependent variable takes three values, the multi-valued logistic regression model is as follows:

$$\log\left(\frac{\Pr(Y=i\mid x)}{\Pr(Y=K+1\mid x)}\right)=a_i+b_i \qquad i=1,....3$$

Where, a_1, a_2, a_3 Three intercept parameters,

b_1, b_2, b_3 Three vector of parameters

$K=i-1$

Further, given the results of the equation, the probability of use of the Internet can be estimated by the values of transaction cost variables. The relevant equation is as follows:

$$p(y=i)=\frac{e^{u_k}}{1+\sum e^{u_i}} \text{ or } p(y=i)=1-\sum pr(y=j)$$

Where, i = 1, 2.

The choice corresponding to i= 3 is selected as the reference choice. Then $a_3=b_3=1$. That is, use of the Internet as a hierarchical mode is the base choice, and the probability of the other choice of the use of the Internet were calculated with reference to it.

However, this research does not focus on the interpretation of odds and odds ratios. From the logistic regression point of view, the purpose of this study is to determine the percent of variance in the dependent variable explained by the independents, to rank the relative importance of independents, and to assess interaction effects, if necessary.

3.7.2 Statistical Software

The data collected by the above survey is processed by using SAS 9.1.3. SAS was chosen for this research for several reasons. SAS/STAT software provides a complete, comprehensive set of tools that can meet the data analysis needs of the research. Moreover, SAS/STAT software is designed to allow a user to take advantage of a variety of data. Therefore, analysts are free to focus on analysis rather than data issues.

SAS has powerful functions for an analyst to process survey data. Many procedures such as proc mean, proc freq, and proc report help for the descriptive analysis of survey data; while other procedures, including proc logistic and proc catmodel enable a user to model survey data. Furthermore, graphic procedures available in SAS, including proc plot, proc gplot, and proc gchart, are designed for analyzing data visually. Finally, SAS 9.1.3 provides new procedures for the analysis of sample survey data. These procedures consist of surveyreg, surveylogistic, surveyselect, surveymean, and surveyfreq.

The LOGISTIC procedure of SAS, by default, models the probability of the lower response levels. An option in SAS allows a user to models the probability of either response levels. Because TCA predicts that the default is a market mode and also because the most frequent outcome is that more respondents do not

sell directly over the Internet, market mode is the default. That is, the model is predicting the circumstances under which firms do not use market mode.

3.7.3 Model Fitting Analysis and Interpretation

For assessment of the success of the logistic regression, two types of statistical indicators are looked at. One is the correct classification rate, showing the incorrect classifications of the dichotomous, ordinal, or polynomial dependents. The other is goodness-of-fit tests, indicators of model appropriateness, such as model chi-square, R^2 statistic, and H-L goodness-of-fit test statistic.

Correct classification rate is used to estimate the appropriateness of coding schemes. The calculation is as follows: Classification tables are computed based on the output of relevant logistic regression models: binary models and multinomial (ordinal) models have 2 x 2 and 2 x n tables, respectively. Then, correctly-classified observations appear on the main diagonal of the table. If a decision rule's cutoff value of 0.5 is used, the correct classification rate is ration of the number of correctly-classified observations to number of total observations. The Chi-square test is used for assessing the goodness of fit. Given that chi-square goodness of fit is not significant, the model has adequate fit; if the test is significant, the model does not adequately fit the data.

For binary models, the H-L goodness-of-fit test statistic is available for the measurement of model appropriateness. Because most of the independent variables in the model are continuous, and the data are too sparse, Pearson and the deviance goodness-of-fitness tests are not valid. Hosmer and Lemeshow good-of-fit test was proposed in 2000, however, it is only available for binary response models.

R^2 statistic is available to summarize the strength of the relationship. That is, how much the percent of variance of dependent variable is explained by relevant models. These values are a little low compared to relevant literature (McNaughton, 1996). However, the measures only seek to make a statement about how the percent of variance is explained, but there is no widely-accepted cutout point.

After transforming the dependent into a logit variable, the natural log of whether or not the odds of the dependent occur, the logistic procedure of SAS uses maximum likelihood estimation. In this way, logistic regression estimates the probability of a certain event occurring.

A p-value is used for the measurement of how significant coefficients are different from the null hypothesis. The smaller the p-value, the more significant the coefficient is.

In binary models, the coefficient, the logit β_1, for a given independent variable presents a unit increase in the independent variable is associated with β_1 change in the log odds of the dependent variable. As discussed previously, the natural log of ratio of odds, which equals the ratio of the probability that the dependent = 1 (a packaged software developer delivers products through the Internet) to the probability that the dependent = 0 (a respondent does not distribute packaged software products through the Internet).

The multinomial logistic regression is the extension of binary logistic regression that allows the simultaneous comparison of more than one contrast. The log odds of packaged software developers

primarily and secondarily using the Internet are estimated simultaneously with reference to the case that packaged software developers never use the Internet. In SAS, the last category is the reference category by default. For consistence, the reference category was custom-selected as the case that packaged software developers never use the Internet.

3.8 Conclusions

This chapter describes the methodology employed in this study. Utility of a web-based survey with soliciting emails is reviewed and justified. Then this chapter presents how the survey was conducted in detail, including instrument design, administration of survey, and resulting sample. Furthermore, this section justifies the choice of a software package and specifies statistical procedures. Finally, several limitations of the methodology are analyzed.

4. Findings

4.1 Introduction

Chapter three described the methodology of the research - a web-based survey that collected 82 responses from Canadian packaged-software developers. This chapter reports the results of analyzing these data, while the implications are discussed in Chapter five.

This chapter begins by describing the survey data in order to address how developers use the Internet to deliver packaged software. Then, the results of logistic regression models that test the hypotheses developed in Chapter two are reported. Finally, based on the estimation results, two additional issues are discussed. One is the purpose software developers have in using the Internet. Specifically, do packaged software developers regard online-distribution as one of their multiple-channels (one channel of Market mode) or an alternative for branch offices? The other is to identify the conditions where software developers use the Internet to deliver their packaged software.

4.2 Descriptive analysis

Based on the resulting sample, this section examines how Canadian software companies employ the Internet to distribute their packaged products. The purpose of this section is two-fold. One is to summarize the use of the Internet by Canadian software developers to deliver packaged software. The other is to address the first research question.

4.2.1 Largest National Markets and Packaged Software Categories

For most Canadian software firms, the largest national markets for their best-selling products are either the Canadian market (39 firms, 48.15%) or the United States market (36 firms, 44.44%). Only 7.41% of respondents view other national markets as the largest markets for their best-selling products. These largest markets include Australia (1 firm), Germany (1 firm), England (1 firm), Asia (1 firm), and Worldwide markets (2 firms). This profile is illustrated by Table 14. The table shows that most Canadian packaged software firms (92.59%, 75 firms) sell their products within North America, and a few of them have a global market.

Table 14. Distribution of Packaged Software Firms by the Largest National Market

Largest Market	Frequency	Percent	Cumulative Frequency	Cumulative percent
Canadian market	39	48.15	39	48.15
U. S. market	36	44.44	75	92.59
Other markets	6	7.41	81	100.00

Note: Frequency Missing = 2

The distribution of Canadian packaged software products by categories is indicated in Table 15. In the sample, 59% of Canadian developers produce packaged vertical software; while packaged horizontal and games / educational packaged software developers account for 11% and 5% of the 80 respondents, respectively. Four firms felt that their products do not belong to the specified categories in the questionnaire. From the descriptions of their products, including accounting and manufacturing software, custom research software for the insurance and finance, and business applications - project management, the dilemma is that these products cover two or more industries although they basically are packaged vertical software.

Table 15. Categorization of Canadian Packaged Software Products

Software Categories	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Packaged horizontal software	11	13.75	11	13.75
Packaged vertical software	59	73.75	70	87.50
Games and educational software	5	6.25	75	93.75
Accounting and manufacturing software	1	1.25	76	95.00
Business applications - project management	1	1.25	77	96.25
Custom research software- Insurance/Finance	2	2.50	79	98.75
Various electromagnetic thermal applications	1	1.25	80	100.00

Note: Frequency Missing = 2

4.2.2 Primary Distribution Channels and Proportion of Online Delivery of Packaged Software

The primary channels Canadian packaged-software developers use to distribute their best selling packaged software are illustrated in Table 16. Over 39% of Canadian packaged software firms deliver their products to users through the Internet. Twenty-nine percent of the respondents use direct marketing channels other than the Internet to distribute products. As expected, software developers seldom sell packaged products through value added resellers due to the characteristics of packaged software. In descending order, the shares of distributors or wholesalers through Original Equipment Manufacturers (OEMs), and catalogue publishers are 12%, 4%, and 2%, respectively. One respondent specified its primary channel for the best-selling packaged software is through licensed client station by means of touch-screen computers.

4.2.3 Approaches of Online Distribution of Packaged Software

The following tables illustrate how Canadian software firms use the Internet to sell and distribute their best-selling packaged software in the largest national markets. As indicated in Table 17, most Canadian packaged-software developers provide clients with after-sales services. The number of software firms that

allow their clients to download packs or updated versions is 27. In descending order, 23 packaged software developers provide downloads of beta or trial-versions; 21 firms provide downloads of full packaged software; and 14 firms take online payments. Other uses of the Internet include post-sale training (two firms), monitoring balance over the Internet, downloading user-guided brochures, downloading and purchasing supplemental and trial versions. Ten firms specified that their online distribution of packaged software requires involvement of sales persons.

Table 16. Distribution of Firms by Primary Channels

Primary channels	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Distributors or wholesalers	12	14.63	12	14.63
Catalogue publishers	2	2.44	14	17.07
Direct marketing channels	28	34.15	42	51.22
Through value added resellers	1	1.22	43	52.44
OEM	4	4.88	47	57.32
Reaching users via the Internet	32	39.02	79	96.34
Direct sales team	1	1.22	80	97.56
Touch-screen computers	2	2.44	82	100.00

Table 17. Distribution of Respondents by Utilities of the Internet[?]

Channels	Frequency	Missing value
Require a sales person	10	72
download a beta or trial version	23	59
download full packaged software	21	61
download packs or updated versions	27	55
access all after-sale service	34	48
Make payments online	14	68
Monitor their balance via the Internet	1	81
Clients can download PP brochure	1	81
Clients can only download supplemental version	1	81
Purchase directly from within the trial version	1	81
Post training support is available over the Internet	2	80

Note: Frequency Missing = 2

Table 18 shows the number of ways how responding firms use the Internet. Most companies use the Internet for at least three of the uses shown in Table 17, 19 firms has two of the uses while 23 companies have only one of the uses.

[?] Because firms could choose multiple uses, the frequencies sum up to more than 82. The "missing" value is a combination of firms that do not use the Internet for that purpose and firms that declined to answer the question.

Table 18. Distribution of Firms by Number of Approaches Used by Packaged Software Firms

Number of Approaches	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	23	0.280488	23	0.280488
2	19	0.231707	42	0.512195
3	32	0.390244	74	0.902439
4	2	0.02439	76	0.926829
missing values	6	0.073171	82	1.00

4.2.4 Popularity of the Internet in Delivering Packaged Software

If the respondents do not use the Internet as the primary distribution channels, they are required to specify whether they use the Internet to distribute their products and what the proportion of gross sales accounted for by online sales is. The detailed information is shown in Table 19 and 20, respectively.

Table 19. Secondary use of Online Distribution in Canadian Packaged Software Firms

Online Distribution	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing values	33	40.24	33	40.24
Non-online Distribution	20	35.37	62	75.61
Secondary Online Use	29	24.39	82	100.00

Table 20. Proportions of Gross Sales Accounted for by Online Sales

Proportion of Gross Sales Accounted for by Online distribution	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing values	60	73.17	60	73.17
0-5%	8	9.76	68	82.93
6-10%	4	4.88	72	87.81
11-15%	2	2.44	74	90.25
16%-20%	3	3.66	77	93.91

Note: Frequency Missing = 5

As shown in Table 19, only 20 respondents do not use the Internet. However, due to the sensitive nature of this question or lack of available data, most respondents (73%) decline to answer this question as illustrated in Table 20. One respondent said, "I can not disclose sales!" The results are still insightful. Of the valid responses, 47% indicated that less than 5% of their sales are online.

Table 21 combines the results of Table 16 and 19 to reflect the popularity of the use of the Internet in delivering packaged software. Over 73% (75.61% - 1.22%) of the total packaged software developers in this sample use the Internet to deliver their products. Further, of the firm that deliver packaged software products through the Internet, 52.5% use online distribution as the primary market channels; while 47.5% use online distribution as the secondary channels.

Table 21. Distribution of Firms in Terms of the Use of the Internet

Online Distribution	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing values	1	1.22	1	1.22
Primary online distribution	32	39.02	33	40.24
Secondary online distribution	29	35.37	62	75.61
Non-online Distribution	20	24.39	82	100.00

4.2.5 Use of the Internet and Channel Modes

Based on the concepts indicated in Table 1 and Table 6, this section examines relationships between the use of the Internet and the choice of channel modes (market or hierarchical channels).

Table 22 presents the distribution of respondents by the ownership of a website. More than 73%, namely 60 out of 80, of the respondents run their websites; while less than 10% of them distribute packaged software through distributors' websites. This result shows Canadian packaged software firms want to control online distribution channels and integrate these channels into their organizations. Moreover, this result combined with the result shown in Table 21 suggests that 11.5% of the developers who run their own website do not use them to deliver packaged software products.

Table 22. Distribution of Websites' Owner

Who owns Web	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing values	14	17.07	14	17.07
Distributors	8	9.76	22	26.83
Developers	60	73.17	82	100.00

It is assumed that packaged software developers must develop and run their own websites to use the Internet as a hierarchical market channel. Based on whether software developers use online distribution, including primary and secondary online distribution, all the channels are classified into two categories: Internet-based channels and non-Internet-based channels. The classification is based on the relevant questions:

- Non-Internet-based integrated channels. Neither "Direct to users through the Internet" in Question 6 nor "Yes" in Question 7 (1) is checked. In question 6, "Direct marketing channels other than the Internet" is checked.
- Non-Internet-based integrated disintegrated channels. Neither "Direct to users through the Internet" in Question 6 nor "Yes" in Question 7 (1) is checked. In question 6, any of the options other than "Direct marketing channels other than the Internet" and "Direct to users through the Internet"" is checked.
- Internet-based disintegrated channels. The events must meet the two conditions: Either "Direct to users through the Internet" in Question 6 or "Yes" in Question 7 (1) is checked; In Question 10,

software developers do not own the websites through which they primarily sold the best selling packaged software.

- Internet-based integrated channels. The events must meet the two conditions: Either "Direct to users through the Internet" in Question 6 or "Yes" in Question 7 (1) is checked; In Question 10, the best selling packaged software is primarily sold through software developers' own websites.

The relevant cross-table of channel modes and the use of the Internet is established, and the results are shown in Table 23.

Table 23. Cross-table of Channel Mode and the Use of the Internet (Frequency)

Market channels	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Non-Internet-based disintegrated	20	24.69	20	24.69
Non-Internet-based integrated	29	35.80	49	60.49
Internet-based disintegrated	9	11.11	58	71.60
Internet-based integrated	23	28.40	81	100.00

Note: Frequency Missing = 1

To reveal some insights into the relationships between channel modes and the use of the Internet by Canadian packaged-software developers, the frequency and percent of each category of channels are calculated and illustrated in Table 23.

As shown in Table 23, the frequency and percent of disintegrated traditional distribution channels are 20 firms and 24.69%, respectively. The frequency and percent of disintegrated Internet-based distribution channels are 9 firms and 11.1%, respectively. The frequency and percent of integrated Internet-based channels are 23 firms and 28.4%, respectively. Table 23 supports the previous assumption that packaged software developers deliver their products through the Internet in the context of either market modes or hierarchical modes. Much effort is paid to address the research issues based on the results of logistic regression.

4.2.6 Use of the Internet and Frequency of Online Distribution of Packaged Software

This section presents information about gross sales and growth rate of online distribution and the best selling packaged software.

As indicated in Table 24, 25.32% of the respondents have gross sales of less than 0.1 million dollars from their best-selling packaged software in the past fiscal year. For nearly two thirds of Canadian packaged software firms, their gross sales per year are less then 1.5 million dollars. Only 3.8 of Canadian packaged software developers revealed that their gross sales of last year are over 1000 million dollars. This table shows that Canadian packaged software firms are mainly SMEs.

Table 24. Gross sales of Best-Selling Packaged Software

Gross Sales of best-selling products in million CND $	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0-0.1	20	25.32	20	25.32
0.1-0.25	16	20.25	36	45.57
0.25-0.50	6	7.59	42	53.16
0.50-1.0	10	12.66	52	65.82
1.0-5.0	14	17.72	66	83.54
5.0-10	2	2.53	68	86.08
10-60	8	10.13	76	96.20
Over 1000	3	3.80	79	100.00

Note: Frequency Missing = 3

Some findings shown in Table 25 are as follows: For one third of Canadian packaged software firms, their rates of growth in gross sales are less than 16%. Another one- third of Canadian packaged software firms increased their online distribution by 25% on average. It is worth noting that 14% of Canadian packaged-software developers have a rate of growth of over 100% in gross sales.

Table 25 Rate of Growth in Gross Sales of Best-selling Products

Rate of Growth of the best-selling packaged software	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Less than 0	6	7.41	6	7.41
1-5%	8	9.88	14	17.28
6-10%	13	16.05	27	33.33
11-15%	15	18.52	42	51.85
16-20%	11	13.58	53	65.43
26-30%	6	7.41	59	72.84
31-40%	8	9.88	67	82.72
91-100%	3	3.70	70	86.42
100-250%	5	6.17	75	92.59
Over 500%	6	7.41	81	100.00

Note: Frequency Missing = 1

Question 5 asks respondents approximately what proportion of the gross sales of their best-selling packaged software sales are accounted for by the largest national markets (LNM), and Table 26 presents the results. The findings drawn from this table support that most Canadian packaged-software developers have only one product. For instance, for near 40% of Canadian packaged-software developers, the best-selling packaged software is their sole products.

Table 25 and 26 respectively show gross sales and the relevant rates of the growth of Canadian packaged software's online distribution in the last fiscal year. Most Canadian packaged-software developers (66.2%) have online gross sales arranging from 0.1 to 0.25 million in the last year, and those who have

gross sales of 0.1-0.25 million of the online distribution of BSP account for 9.86% of the respondents. Furthermore, 15.58% of Canadian packaged-software developers have a growth rate of online distribution of BSP less than 0, and 20.8% of them increase their gross sales by 1 to 5%. It is concluded that the rate of the development of online distribution of packaged software by Canadian software firms is very slow.

Table 26. Proportion of Gross Sales of the best-selling packaged software Accounted for By Largest National Market

Proportion Accounted for by the largest national market	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing values	2	2.44	2	2.44
<10%	6	7.32	8	9.76
21%-30%	5	6.1	13	15.86
31-40%	7	8.54	20	24.4
41%-50%	4	4.88	24	29.28
51-60%	9	10.98	33	40.26
61-70%	11	13.41	44	53.67
71-80%	7	8.54	51	62.21
81-90%	15	18.29	66	80.5
91-100%	16	19.51	82	100.01

4.3 Estimation Results

Several model alternatives such as rank-binary, log-binary, rank-multinomial, log-multinomial, and regular regression are modeled. The estimation results are indicated in Appendix D. Based on the model fitting indicators discussed in Chapter three, when the dependent variable takes two levels and when the independent variables are rank-transformed, the model provides the most information, which is shown in Table 27. For the variable of gross sales, p-value is 0.9942. This variable is added to the model at the second step; however, the coefficient of this variable is not significant any more when the rate of growth in gross sales and diversity is added. For this model, the correct classification rate is 82.9%; the residual chi-square is 3.2215 (p=0.7816 and df=6); The H-L goodness-of-fit test statistic is 15.24 (df=7 Pr=0.0330); the R^2 is 0.56. This model meets the default convergence criteria: GCONV=1E-8.

For the three-level dependent variable, the relevant model is the most informative when the independent variables are rank-transformed. The results of the multinomial model are illustrated in Table 28 and Table 29. The relevant indicators are as follows: the correct classification rate 79.3%; the residual chi-square test is 4.0829 (p=0.7702 and df=7); the R^2 is 0.3905; the model also meets the default convergence criteria: GCONV=1E-8.

Based on Table 27, Table 28, and Table 29, the relationships between transaction costs and the use of the Internet to deliver packaged software are discussed in depth.

Table 27. Relationships Between Transaction Costs and Use of the Internet (Binary)

Parameter	Sign	Estimate	Pr > ChiSq	WaldChi Square	Pr > ChiSq
Human physical specificity	+	--	--	--	--
Physical asset specificity	+	--	--	--	--
Knowledge asset specificity	+	-0.5113	0.0513	3.7983	0.0513
Diversity	-	-0.5825	0.0251	5.0164	0.0251
Volatility	+	--	--	--	--
Growth rate _online	+	0.0828	0.0015	10.0464	0.0015
Gross sales _ online	-	--	--	--	0.9942
Rate of growth	+	--	--	--	--
Gross sales	-	-0.0822	0.0003	13.1008	0.0003
Largest national market	+	--	--	--	--

Notes: Goodness of fit (residual test) chi-square = 3.2215 (p=0.7816 and df=6);
Hosmer and Lemeshow Goodness-of-Fit test =15.24 (df=7 Pr=0.0330)
Correct classification rate = 82.9% $R^2 = 0.56$

Table 28. Relationships Between Transaction Costs and Primary Use of the Internet

Parameters	Estimate	Signs	S.E.	Chi-Square	Pr > ChiSq
Intercept	8.0897		2.8261	8.1936	0.0042
Knowledge specificity	-0.5754	+	0.3317	3.0099	0.0828
Diversity	-0.6260	-	0.2588	5.8506	0.0156
Gross sales	-0.1353	-	0.0313	18.7212	<.0001
Growth rate _online	0.1225	+	0.0299	16.8406	<.0001

Reference: For the dependent variable, the Internet is not used in delivering the best-selling products.
For the categorical variable, other national markets other than U.S. and Canadian

Table 29. Relationship between Transaction Costs and Secondary Use of the Internet

Parameters	Estimate	Signs	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	5.8507		2.6187	4.9918	0.0255
Knowledge specificity	-0.5495	+	0.2891	3.6117	0.0574
Diversity	-0.6482	-	0.2681	5.8480	0.0156
Gross _rank	-0.0409	-	0.0238	2.9665	0.0850
Growth online _rank	0.0612	+	0.0233	6.9210	0.0085

Reference: For the dependent variable, the Internet is not used in delivering BSP.

4.3.1 Asset Specificity

The positive relationship between human asset specificity and the use of the Internet is not supported, and the positive association between physical asset specificity and the use of the Internet is not statistically significant either. As indicated in both Table 27, however, the sign of the coefficient (-0.5113, p-value

=0.0513) of knowledge-based asset specificity with the use of the Internet does not correspond to the expectation.

First of all, the hypothesis about the positive association between the use (including primary use and secondary use) of online distribution and the knowledge-based asset specificity is not supported. That means that Canadian packaged-software developers do not deliver their products through the Internet in order to protect knowledge-based assets. Furthermore, non-inclusion of physical asset specificity in the models implies that physical asset specificity is not a barrier for Canadian packaged-software developers to use the Internet. The result for H3 is statistically significant; however the direction of the relationship is opposite to the expectation. This inconsistency means either that the Internet is not able to protect packaged software from piracy or that software developers do not use the Internet as a means to prevent piracy. Technically, the Internet is not able to avoid the piracy of packaged software while delivering it. Packaged software developers use the Internet to distribute products without considering much the knowledge-based asset specificity of these transactions.

Commonly, from the TCA point of view, these results suggest that the assumption that most of packaged software developers employ the Internet as a substitute for traditional direct market channels is to some extent in doubt. Packaged software is different from other software products.

4.3.2 Uncertainty

As shown in the results of both binary and multinomial models, there seems to be some evidence that diversity is negatively associated with the use of the Internet, including its primary and secondary use, in delivering packaged software products (-0.2970, p=0.0745). The hypothesis about diversity suggests that the use of the Internet is only one option for a packaged software developer to distribute its products, and that the use of the Internet (odds / percentage) goes down as the diversity of packaged software increases.

The results indicated in Table 28 and Table 29 reveal more detailed information. The log-odds-ratio of using online distribution as a primary channel is lower than that of delivering packaged products through the Internet as a secondary channel. Namely, relative to the probability of non-online distribution, one unit change of the diversity of packaged software causes greater change in the probability of using online distribution as a second channel in the opposite direction than it does of using online distribution as a primary channel. Intuitively, the finding is reasonable because the secondary uses of the Internet more possibly diversify than do the primary uses of the Internet.

However, the proposition about the relationship between the use of the Internet and the volatility of delivering packaged software over the Internet is not supported.

4.3.3 Frequency

In the four variables describing the transaction frequency of the use of the Internet for a software developer to deliver packaged products, half are supported. As indicated in Table 27, it is strongly significant (0.0828, p-value<0.0015) that the rate of growth in gross sales of online distribution is positively associated with the use of the Internet. However, the positive relationship between the rate of growth in gross sales and the use of online distribution is not confirmed. The relevant finding is that Canadian software developers decide to use the Internet to distribute their packaged products because delivering packaged products via the Internet has a higher rate growth. Their decisions do not have a relationship with the rate of growth in the gross sales of the developers.

From the results of Table 28 and Table 29, further comparison of the primary and secondary online use may be made. In the models, the log-odds ratios of primary online use vs. non-online use and secondary online use vs. non-online use are 0.1226 ($p<0.0001$) and 0.0612 ($p<0.0085$), respectively. That is, a one unit increase of the rate of the growth in online gross sales causes a higher increase of the log-odds ratio of primary online use than it does secondary online use.

As indicated in both Table 27, Table 28, and Table 29, the proposition that a software developer's gross sales have a significantly positive association with the use of the Internet (-0.0822, p-value < 0.0003) is supported. However, the negative relationship between the gross sales of online distribution and the use of online distribution is not confirmed. It is concluded that Canadian software developers start delivering their products through the Internet mainly because developers have the financial capability to invest on specific equipment unique to online distribution. However, the investment in online distribution equipment alone is not found to have any relationship with the gross sales of online distribution.

In terms of gross sales, further comparison of primary and secondary online use may be made. As indicated in Table 28 and Table 29, the log-odds ratios of primary online use vs. non-online use and secondary online use vs. non-online use are -0.1353 ($p<0.0001$) and -0.0409 ($p<0.0085$), respectively. According to the logistic regression point of view, one unit increase of the rate of growth in online gross sales causes a larger decrease of the log-odds ratio of primary online use than it does secondary online use, and vice versa. Together with Table 27, these findings may be enriched: As gross sales go up, Canadian packaged-software developers tend to employ more expensive but more efficient channels or multiple channels. Therefore, the probability of using online distribution of packaged software goes down as the gross sales of a software developer go up; the primary online distribution is more sensitive than the secondary online distribution to a change in gross sales.

4.3.4 Market-specific Considerations

Given the reference case that the other national markets entered, the variable denoting the largest national market is not included in any of the models. The results show that a positive relationship between the likelihood of Canadian packaged-software developers through the Internet and the market share of the United States market is not supported. Nor is the negative relationship between the likelihood of Canadian packaged-software developers through the Internet and the market share of other markets is supported. That is, the likelihood of the use of the Internet to distribute packaged software does not much depend on various markets.

4.4 Conclusion

Based on descriptive analysis and the estimation results of logistic regression, this section presents the following findings:

In the sample, 73.41% of Canadian developers are using online distribution, including primary uses and secondary uses. However, Canadian packaged software firms have not yet taken full advantage of online distribution of packaged software. Most Canadian software developers, 59 out of 80 firms, produce packaged vertical software. Over 39% of Canadian packaged software firms deliver their products to users through the Internet. 29% of the respondents use direct marketing channels other than the Internet to distribute products. Furthermore, most companies take three approaches to their use of the Internet; 19 firms take two approaches in distributing packaged software through the Internet; and 23 companies take only one approach to online distribution of packaged software. Only two Canadian firms use four of the above approaches to distributing packaged products via the Internet.

Several hypotheses, including hypothesis H_5 and H_6, are supported based on the default that Canadian packaged-software developers use the Internet to deliver products as a hierarchical channel, while hypotheses H_1, H_2, H_4, and H_7 are not supported. The results are the same as those on hierarchical channels such as integrated exporting channels and direct sales persons. However, certain descriptive findings and several respondents' comments support that some Canadian packaged software companies use the Internet as a channel of market mode.

Finally, these results about relationships between the use of the Internet by Canadian packaged-software developers and the transaction costs reveal insights into understanding what factors and how these factors influence the decisions and approaches of Canadian packaged-software developers using the Internet.

5. Conclusions

5.1 Introduction

Based on the previous descriptive analysis, regular regression, and logistic regression analysis, this chapter discusses the results and findings, within the context of this and prior research examined in Section two. Then, it discusses the implications of the study on current theory and the implications of the findings on managerial practice. Finally, this section presents limitations and explores future research opportunities.

5.2 Discussion of Conditions of Online Distribution

In the research model presented in Section two, all of the hypotheses are divided into four categories: asset specificity, market uncertainty, transaction frequency, and market-specific considerations. Correspondingly, the findings and results shown in the previous chapter are discussed.

5.2.1 Asset Specificity

The set of variables used in this research to reflect transaction cost attributes is adapted from previous research (McNaughton, 1996, 2000, 2002; McNaughton and Bell, 2001; Thompson et al., 2004). Contrary to the previous research the hypothesis about physical asset specificity is not supported, while this research has yielded varied results about the knowledge-based asset specificity variable. The hypothesis about human asset specificity is not supported either.

The findings reported above support H_1 because physical asset specificity was not found to be positively associated with online distribution of packaged software by Canadian developers. The result is not consistent with the previous literature. In his series of research on the Canadian software industry and small knowledge-intensive firms, McNaughton (1996, 2001, 2002) argued that physical asset specificity is negatively associated with market-mode channels, including Multiple channels and switching from integrated channels to multiple ones, and that this specificity has a positive association with a hierarchical mode such as an integrated exporting channel or switching from multiple channels to integrated ones. Similarly, this research regards it as a default that Canadian packaged-software developers prefer to use Internet-based integrated modes; therefore, the findings of this research are expected to be consistent with those of the literature.

Although H_1 is not supported empirically, one respondent's comment agrees with it. This respondent pointed out that online distribution requires "associated investment".

> "We market our product on the Internet (our web site plus online ads on trade publication web sites), and we offer software patches/updates online for download, but it is a large enterprise system that requires associated investments."

However, the result for H_3 is the opposite of the expectation that there is a positive relationship between knowledge-based asset specificity and the use of the Internet. This hypothesis is consistent with the statement that knowledge-based asset specificity is negatively associated with switching to lower control mode, shared control mode, and dual channel alternatives (McNaughton and Bell, 2001; McNaughton, 1996). Although Thompson et al. (2004) and Liang and Huang (1998) confirmed a positive relationship between transaction costs and asset specificity, neither of them divided asset specificity into more detailed factors.

Contrary to the hypothesis of TCA, online software piracy and the use of the Internet as a channel of market mode may explain this inconsistency. Vasiu (2003) found that online distribution "may also render organizations more vulnerable to electronic fraud (e-fraud). E-fraud can drain an organization's financial resource and have a significant adverse effect (p. 1)" on the decision of whether or not the Internet is used and how it is used to distribute packaged software. Therefore, the more specific the knowledge-based asset is, the less likely packaged software developers use the Internet to deliver their products. This statement is supported by the following facts illustrated in the respondents' comments.

- "The Internet is a valuable sales channel, but pricing is discussed privately via e-mail and telephone. Therefore, there are no online financial transactions."
- "Our software requires a HASP key for activation."

The other explanation is that Canadian software developers may use online distribution as a lower control mode. Furthermore, "Switching from integrated mode to market mode is more likely for packaged software products (McNaughton and Bell, 2001, p.25)." A negative relationship between the knowledge-based asset specificity and the use of the Internet suggests that the use of the Internet does not require an integrated channel to protect knowledge-based specificity of packaged software.

This result is inconsistent with the results presented by McNaughton in 1996 that knowledge-based asset specificity is positively associated with foreign subsidiary alternatives. The hypothesis that knowledge –based asset specificity is negatively associated with multiple channels is not supported in terms of the Canadian software industry (McNaughton, 1996). A negative or not significant association between knowledge-based asset specificity and the use of the Internet reveals that Canadian packaged-software developers are able to protect their knowledge-based asset specificity in online distribution.

As discussed in Section 4.2, the descriptive analysis may reveal a reasonable explanation that some of Canadian packaged-software developers use online distribution as a market-mode channel. For instance, nine out of 32 firms prefer Internet-based channels of market mode. Some comments from respondents are helpful for understanding this inconsistency. Basically, they regard the Internet as an electronic market and use it as either an information portal or a place for both to negotiate:

- "You assume that using the Internet means using a web page - we find that the web pages are for information and email communication is a vital form of contact for both initial and follow up sales, as well as technical support."
- "By comparison with bricks and mortar channels, we largely control the manner and extent to which products are offered. Nobody "owns" the Internet shelf space. This is why we choose Internet over other retail channels. Enterprise sales are still conducted"

Human asset specificity is first added to TCA model of channel choice, however, it is not found to be positively significant with the use of the Internet in delivering packaged software. The results presented by Liang and Huang (1998) do not show any significantly evidence that human asset specificity is negatively associated with consumer acceptance of products in electronic markets.

However, much attention is required to this issue because several respondents commented on the human involvement in online distribution in various respects.

- "We use the Internet for marketing, but there is always a phone or in-person component of the sales process. Technically, distribution is not an issue. However, we would sometimes mail the software, or install it in person."
- "I can't disclose sales :-) Our product is sold by direct outbound sales call but delivered and supported over the Internet."

5.2.2 Uncertainty

The uncertainty of transaction costs is divided into two variables, which are borrowed from the research by Liang and Huang (1998); McNaughton and Bell, (2001); and McNaughton (1996, 2002). Although Liang and Huang (1998) and Thompson et al. (2004) found a positive relationship between the use of the Internet and transaction uncertainty, only one variable is used in their research. The findings in this research will be discussed and compared to the latter literature.

H_5 is significantly supported because diversity was found to be negatively associated with the use of the Internet by Canadian packaged-software developers. McNaughton (2001, 2002) found a positive relationship between diversity and switching to lower control modes and multiple channels. Basically, the findings of this research agree with his conclusions because the default is that Canadian packaged-software developers prefer Internet-based hierarchical channels. That H_5 is supported means that the rationale behind it is correct.

Several comments also support the results of H_5. As packaged software and its markets become more diverse, software developers tend to turn to the traditional distribution channels that they are comfortable with.

- "At this time we use the Internet as an information portal to our products. As our

software is scientific and can be used in various applications, assistance from our company is needed to determine the best piece of software."

- "Our packaged software is a very sophisticated product that requires training and face-to-face with sales."
- "We distribute to the municipal and governmental market so paying online did not work out for us, although at one time we set it up we now just have them send us a purchase order and we send them an invoice."

H_5 is not found significant in this research. The variable denoting volatility is included in several studies. For instance, McNaughton and Bell (2001) found there is no statistically significant evidence that volatility is negatively associated with switching to lower control mode. Contrarily, volatility is found to be significantly negative with share control mode and dual mode, while there is a positive relationship between foreign subsidiary and volatility.

5.2.3 Frequency

Since frequency is one of the three important attributes of transaction costs, including the variables reflecting frequency of transaction costs in TCA modeling is very important.

According to the literature review in Section two, gross sales and the rate of growth in gross sales are used as the two indicators of transaction frequency. At the beginning of the forward inclusion procedure of logistic regression, four relevant variables are included in the logistic regression models: the gross sales of each developer, the rate of growth in the gross sales of each developer, the gross sales of each developer through the Internet, and the rate of growth in the gross sales of each developer through the Internet.

The purpose of including transaction frequency is to find the relationship between the growth and gross sales of the companies and the use of the Internet by Canadian packaged-software developers. Several similar studies have been done, and two of them are notable due to their similarity to this present research. McNaughthon (1996) found that for the Canadian software industry, there is a negative association between a the relevant channel volumes and direct exporting from domestic location with shared control mode or dual channel alternatives because they are market channels of lower control mode. Furthermore, there is a positive relationship between the relevant channel volumes and direct exporting from domestic locations with foreign subsidiary alternatives because they are market channels of high control mode. This study empirically supports the conclusion that the higher the channel volume, the more efficient the internal transaction costs.

The channel growth of online distribution, that is, the rate of growth in gross sales through the Internet, is found to be significantly and positively associated with the use of the Internet for Canadian software developers to deliver packaged software, while there is no significant evidence that the gross sales of each

developer through the Internet are negatively associated with the preference of using the Internet for the delivery of packaged software. The expected signs in the previous studies (McNaughton and Bell, 2001; McNaughton, 2002) are opposite to those proposed in this research because they discussed various governance structures. However, all the results are the same: the relationship between channel growth and the use of the channels is supported, while the relationship between channel volumes and the use of the channels is not supported. The comparison between this study and the previous ones shows that the default channel, namely, the use of the Internet as an integrated mode is supported. Therefore, the explanations of the literature may be borrowed: packaged software developers deliver their products through the Internet because of the need to increase channel volume.

However, the rate of growth in gross sales of each developer is found to be significantly and positively associated with the use of the Internet for Canadian software developers to deliver packaged software, while there is no significant evidence that the gross sales of each developer are negatively associated with the preference of using the Internet for the delivery of packaged software. The present research is the first one to propose these two important hypotheses.

5.2.4 Market-specific Considerations

As aforementioned, this research builds mainly upon McNaughton's studies (1996, 1999, 2002, 2004) and McNaughton and Bell (2001). For comparison purposes, the categorical variable relating to the largest national market (1=Canada, 2=U.S, and 3=others) is retained in this research.

However, there is no significant evidence that the use of online distribution is positively associated with the United States markets. That variable was not identified in the previous literature (McNaughton and Bell, 2001; McNaughton, 2002) either. This hypothesis may not have been identified for the following two reasons. First, the sample size of this survey, 82, is too small to have enough power. Second, it is true there is no relationship between the U.S. market and the use of online distribution. That is, performing transactions for delivering packaged software through the Internet as a market mode is more cost-efficient due to "high proportion of firms producing packaged software, greater market maturity, and the availability of export intermediaries (McNaughton, 2002, p.200.)."

5.3 Implications

This research employs transaction cost theory to analyze the fundamental issues of how and why Canadian packaged-software developers use the Internet in delivering their products. This research contributes to understanding the use of the Internet to distribute packaged software, and it produces some implications both for theory and managerial practices.

5.3.1 Theoretical Implications

This study contributes to three streams of literature: the marketing of packaged software, the analyses of TCA in the software industry, and the applications of TCA in the use of the Internet. The benefits to the first stream of literature relating to this research further the understanding of the online distribution of packaged software; while the contributions to the last streams of literature lend support for the validity of analyzing channel choice using TCA in the context of widespread adoption of the Internet for commercial use.

Based on the web-based survey with soliciting emails, this research analyzes descriptively how Canadian packaged-software developers use the Internet to deliver their products. To the best of our knowledge, this is the first empirical TCA model focusing on the channel choice of packaged software developers. Previously, only several anecdotic studies involved this field (Porter, 2001).

Furthermore, this research extends the work on the software industry in several ways. First, building upon previous work (McNaughton, 1996, 1999, 2002; McNaughton and Bell, 2001), this study examines the channel choice of Canadian packaged software developers. It is held that the results based on industry-specific studies tend to be reliable and insightful to the managerial implications of the relevant industry. Sector-specific study is more advanced than cross-sector because some factors are blocked (McNaughton and Bell, 2001). In this research on packaged software, excluding customized software, the conclusions are more reliable for packaged software developers. Hence, this research produces more practicable guidelines for Canadian packaged-software developers. By answering the fundamental research issues, this study fills both the research gaps as discussed before and the "time gaps" of the research on software marketing, which ranged from 1997 to 2005.

This research also provides information about the online distribution of packaged software, which was not previously available. On one hand, this stream of literature involves the consumer acceptance of products in electronic markets by using TCA, this study examines the implications of online distribution on company governance structure. On the other hand, analyzing the use of the Internet by Canadian packaged-software developers, this study extends the literature on the distribution of digital products through the Internet (Liang and Huang, 1998).

5.3.2 Managerial Implications

This research is a national-specific and packaged software-specific study; therefore, it generates a number of reliable and practicable implications for Canadian packaged software developers. The research results reveal some conditions where software firms might consider using the Internet to distribute packaged software. Specifically, using the Internet for delivering packaged software should be considered in the circumstances in which:

- Certain amount of investment, including a developer's and a potential distributor's investment, in physical assets is required; and
- Packaged software does not incorporate significant unique knowledge, nor would it be difficult to redeploy this knowledge to another product because online distribution exposes packaged software to piracy; and
- Packaged software products do not have many different types of customers with different needs and/or they are not geographically dispersed because online distribution can not easily satisfy various needs and dispersed customers; and
- The growth in gross sales over the Internet is increasing, and/or the relevant financial resource is available.

Attention should be paid to how volatility, the gross sales of packaged software distributed through the Internet, the rate of growth in gross sales, and the largest national market impact the use of the Internet. These hypotheses are supported by anecdotic evidences instead of this empirical study.

The above managerial implications are relevant to the population of Canadian packaged-software developers. They could be generalized and applied to packaged software firms of the other countries if the transaction cost attributes of packaged software are similar in each of the countries.

5.4 Research Limitations

This study is subject to the following limitations. The assumption that Canadian packaged-software developers prefer integrated Internet-based channel is plausible because the predominance of either integrated Internet-based channels or market-mode Internet-based channels are not obvious. That is, lack of research in this field makes it difficult to study how the Internet influences the firm organization of software developers, which is beyond the scope of this research.

The obvious issue is that the response rate is lower than for previous literature. It may be due to the following reasons mentioned in the literature and reasonably deduced. Barnett (2002, p.171) stated that human beings are "of resistance to the perceived intrusion of unsolicited e-mails." Software firms choose to, and are able to, fight against spam emails. For instance, in the study, the number of those emails deleted without being read or auto-replied is over 700. Low response rate also may be caused by outdated contacts because the database of CCC is updated only once per year (McNaughton, 1996).

The scope of this research is a little narrow. Some firms said they wanted to respond, but they were either resellers of packaged software, developers of customized software, or distributors of packaged software. Some firms said they seldom use the Internet for distribution, but only for advertising their products. The number of those firms that replied, but did not answer the questionnaire validly amounts to 92. If we take this number into consideration, the response rate is about 10%, which falls within the range of the response rate mentioned in the references. Another reason is that during this period, Canadian

software firms may be busy with budgeting or planning, so that some of their senior management personnel might be on holidays or at meetings.

The extent of the models presented in this research account for the total variance of online distribution ranges from 39% to 70%. It is a little lower, but still acceptable given the threshold value used in the literature. The R-square for the TCA model of online shopping behavior is only one third (Liang and Huang, 1998); while these indicators about the coverage of variable variances are over 80% in the TCA models of the software industry (McNaughton, 1996, 2002; McNaughton and Bell, 2001).

It is expected that knowledge-based asset specificity is positively associated with the use of the Internet in delivering packaged software. However, the result for this hypothesis is statistically significant, but the direction of the relationship is opposite of the expectation. This inconsistence may be caused for the following reasons: The measure corresponding to this attribute of transaction used in the study is neither a valid nor reliable indicator of the underlying constructs. Using multiple items to gauge the extent of knowledge-based specificity of online distribution of packaged software may be a solution to this issue.

5.5 Future Research

Although much literature involves either the channel choice of software firms or the use of the Internet, little research has been done to intensively examine the use of the Internet in distributing packaged software. The suggestions for future research opportunities could be:

- Other Canadian software databases and / or survey methods are recommended to be used to conduct in the future research.
- The findings are drawn based on only Canadian software developers. Investigating Canadian software developers would benefit the generation of the conclusions of this search.
- For generalization of the results drawn from this research, similar empirical research is recommended to be done in another country or other countries.
- The decision process of how and what governance structure packaged software developers use the Internet to delivery their products is worthwhile to be explored. Due to a small sample size and lack of detailed information, the issue could not be addressed in this research.

References

Alpar, P., & Spitzer, D. (1989). Response behavior of entrepreneurs in a mail survey. *Entrepreneurship: Theory and Practice, 14*, 31-44.

Barnett, V. (2002). *Sample survey: Principles and methods* (3rd ed.). London: Oxford University Process.

Bell, J. (1995). The internationalization of small computer software firms: a further challenge to stage theories. *European Journal of Marketing, 29*(8), 60-75.

Brockbank, B. (2001). War of knowledge. Retrieved Sept.15, 2005, from http://www.refresher.com/!warofknowledge.html.

Butler, T. (2003). An institutional perspective on developing and implementing intranet- and Internet-based information systems. *Information Systems Journal, 13*, 209-231.

Calof, J.L. (1994). The relationship between firm size and export behavior revisited. *Journal of International Business Studies, 25*(2), 367-387.

Chiles, T.H., & McMackin, J.F. (1996). Integrating variable risk preferences, trust and transaction cost economics. *Academy of Management Review, 21*, 73-99.

Clemons, E.K., & Aron, R. (2002). Online distribution: A taxonomy of channel structures, determinants of outcome, and determinants of strategy. *Proceedings of the 35th Hawaii International Conference on System Sciences.* Retrieved October 21, 2005, from http://csdl2.computer.org/comp/proceedings/hicss/2002/1435/07/14350180b.pdf.

Cobanoglu, C, Warde, B, & Moreo, P.J. (2001). A comparison of mail, fax and web-based survey methods. *International Journal of Market Research, 43*(4), 441-452.

Cornish, S.L. (1996). Software Products: the importance of 'being there' and the implications for business service exports. *Environment and Planning A, 28*, 1661 -1682.

Demsetz, H. (1967). Towards a theory of property rights. *The American Economic Review*, 57(2), 347-359.

Dholakia, N., Dholakia, R., Zwick, D., & Laub, M. (2005). Electronic Commerce and the Transformation Marketing. Retrieved August 1, 2005, from http://ritim.cba.uri.edu/working%20papers/Fritz-2nd-ed-Transformn-Mktg-v2%5B1%5D.pdf.

Dillman, D.A. (1978). *Mail and telephone surveys: The total design method*. New York: Wiley.

Dillman, D.A. (2000). *Mail and Internet surveys: The tailored design method.* New York: Wiley.

Eisenhardt, K.M., & Martin, J.A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal, 21*, 1105-1121.

Electronic software distribution (ESD) with HASP SL. Retrieved September 10, 2005, from http://www.aladdin.com/HASPSL/electronic_software_distribution.asp.

Eric, T., & Wang, G. (2002). Transaction attributes and software outsourcing success: an empirical investigation of transaction cost theory. *Information Systems Journal, 12*, 153-181.

Frasier, G., & Victor R. (1990). A transaction cost analysis model of channel integration in international markets. *Journal of Marketing Research, 27* (5), 196-208.

Glossary of knowledge management terms. (2005). *Products and Services.* Retrieved October 1, 2006, from http://www.nrcan.gc.ca/cfs-scf/science/prodserv/kmglossary_e.html#0011 2005

Hoffman, D.L., & Novak, T.P. (2000). Commercial Scenario for the Web: Opportunities and Challenges. *Project 2000: Research Program on Marketing in Computer-mediated Environments.* Retrieved October 23, 2005, from http://www.ascusc.org/ jcmc/vol1/ issue3/hoffman.html.

Hosmer, D.W., & Lemeshow, S. (2000). *Applied logistic regression,* (2nd ed.). New York: John Wiley & Sons, Inc.

Houghton, K.A., & Winklhofer, H. (2004). The effect of website and e-commerce adoption on the relationship between SMEs and their export intermediaries. *International Small Business Journal, 22*(4), 369-388.

Ilan, Y. (2005). The Economics of Software Distribution over the Internet Revisited. *Journal on the Internet.* Retrieved October 12, 2005, from http://www.firstmonday.org/issues/issue6_12/ilan/.

Ismail, S., & Wu, I. (2003). Broadband Internet access in OECD countries: A comparative analysis. Retrieved September 10, 2005, from http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-239660A2.pdf

Jorgenson, W. (2004). Economic Growth in Canada and the United States in the Information Age. *Industry Canada Research Monograph,* Retrieved September 10, 2005, from http://strategis.ic.gc.ca/ epic/Internet/ineas-aes.nsf/vwapj/rv200405e.pdf/$FILE/rv200405e.pdf

Jackson, C. (2003). Capitalization of software in national accounts. Retrieved March 23, 2006, from http://www.statcan.ca/english/freepub/13-605-XIE/2003001/conceptual/2001software/Jones,

Johnson, D.S., & Bharadwaj, S. (2005). Digitization of selling activity and sales force performance: An empirical investigation. *Journal of the Academy of Marketing Science, 33*(1), 3-18.

Jones, C., Hesterly, W.S., & Borgatti, S.P. (1997). A general theory of network governance: Exchange conditions and social mechanisms. *Academy of Management Review, 22,* 911-945.

John, G., & Weitz, B. (1988). Forward integration into distribution: An empirical test of transaction cost analysis. *Journal of Law, Economics, and Organization, 4,* 337-355.

Kanuk, L, & Berenson, C. (1975). Mail surveys and response rates: A literature review, *Journal of Marketing Research, 22,* 440-453.

Kingsley, L. (1997). Electronic Software Delivery and Wearables: Two future outlets for distributing content. Retrieved September 10, 2005, from http://www.seyboldreports.com/SRIP/subs/ 0204/IP0204.HTM.

Kittleson, M.J. (1995). An assessment of the response rate via the postal service and email. *Health Values, 18*(2), 27-29.

Levenburg, N.M., & Klein, H.A. (2006). Delivering customer services online: identifying best practices of medium-sized enterprises. *Information Systems Journal, 16,* 135-155

Liang, T.P., & Huang, J.S. (1998). An empirical study on consumer acceptance of products in electronic markets: a transaction cost model. *Decision Support Systems, 24,* 29-43.

Lohrke, F.T. (2002). The Internet as an information conduit: A transaction cost analysis model of small business Internet use, Retrieved December 22, 2005, from http://www.usasbe.org/knowledge/ proceedings/2002/38.pdf

Loane, S., McNaughton, R., & Bell, J. (2004). The Internationalization of Internet-enabled entrepreneurial firms: Evidence from Europe and North American. *Canadian Journal of Administrative Science, 21*(1), 79.

MacInnes, I., Kongsmak, K., & Hecman, R (2004). Vertical integration and the relationship between publishers and creators. *Journal of Electronic Commerce Research, 5*(1), 25-37.

Market profile: software sector. (1998, July). Montreal: Canada Economic Development.

McDougall, P., Covin, J., Robinson, R., & Herron, L. (1994). The effects of Industry growth and strategic breadth on new venture performance and strategy content. *Strategic Management Journal, 15,* 537-554.

McFadden, D. (1973). Conditional logit analysis of qualitative choice behavior. In Zarembka, P. (Eds.) *Frontiers in Econometrics*. New York: Academic Press.

McNaughton, R.B. (1996). Foreign market channel integration decision of Canadian computer software firms. *International Business Review, 5*(1), 23-52,

McNaughton, R.B. (1999), Disk by mail for industrial survey research: a review and example. *Industrial Marketing Management, 28*(3), 32-47.

McNaughton, R.B., & Bell, J. (2001). Channel switching between domestic and foreign markets. *Journal of International Marketing, 9*(1), 24-39.

McNaughton, R. B. (2002). The use of multiple export channels by small knowledge-intensive firms. *International Marketing Review, 19*(2/3), 190-203.

Mols, N.P. (2000). Dual channels of distribution: a transaction cost analysis and propositions, The International Review of Retail, Distribution and Consumer Research, 10(3), 227-246.

Nadine, A.C. (2002). Software and computer service in Canada. Retrieved September 10, 2005, from http://strategis.ic.gc.ca/epic/Internet/inictic.nsf/vwapj/~7250610.pdf/$FILE/~7250610.pdf.

Noorderhaven, N.G. (1999). National culture and the development of trust: the need for more data and less theory. *Academy of Management Review, 24,* 9-10.

O'Farrel, P.N., Wood, P.A., & Zheng, J. (1996). Internationalization by business service firms: towards a new regionally based conceptual framework. *Regional Studies, 30*(2), 101-108.

Perry, C. (1998). A structured approach for presenting theses. *Australasian Marketing Journal, 6* (1), 63-85.

Porter, M. E. (2001). Strategy and the Internet. Retrieved April 22, 2005, from http://www.isc.hbs.edu/Strategy_and_the_Internet.htm.

Rangan, V.K., Corey, E.R., & Cespedes, F. (1993). Transaction cost theory: inference from clinical field research on downstream vertical integration. *Organization Science, 4*(3), 454-477.

Rindfleisch, A., & Heide, J.B. (1997). Transaction cost analysis: past, present and future applications. *Journal of Marketing, 61,* 30–54.

Shailendra C., Jain, P., & Vijay, K. (1999). Distribution channels in electronic, markets a functional analysis of the 'disintermediation' hypothesis. *Electronic Markets, 9*(1/2), 118–125.

Sobr, L., & Tuma, P. (2005). SOFAnet: Middleware for Software Distribution over Internet. *Symposium on Applications and the Internet,* Retrieved March 26, 2006, from http://nenya.ms.mff.cuni.cz/publications/SobrTuma-SOFAnet.pdf.

Strigel, W. (2002). The Canadian Software Industry. *IEEE Software, 19*(4), 86-89.

The Software & Information Industry Association (TSIIA). (2005). Packaged software industry revenue and growth. Retrieved September 10, 2005, from http://www.siia.net/software/pubs/growth_software05.pdf.

Thompson, S.H., Wang, P., & Leong, H.C. (2004). Understanding online shopping behavior using a transition cost economics approach. *Internet Marketing and Advertising, 1*(1), 62-84.

Tsang, E. (2000). Transaction cost and resource-based explanations of joint ventures: a comparison and synthesis. *Organization Studies, Winter 2000,* 1-4.

Tse, A. (1995). Comparing two methods of sending out questionnaires: emails vs. mails. *Journal of the Market Research Society, 37*(4), 441-446.

Tse, A. (1998). Comparing the response rate, response speed, and response quality of two methods of sending questionnaires: Emails vs. mails. *Journal of the Market Research Society, 40*(4), 353-363.

Vasiu, L. (2003). A conceptual framework of e-fraud control in an integrated supply chain, Retrieved March 26, 2006, from http://csrc.lse.ac.uk/asp/aspecis/20040168.pdf.

White, J.C. (2000). The role of slotting fee and introductory allowances in retail buyers: New product acceptance decisions. *Academy of Marketing Science Journal, 28,* 291-299

Williamson, O.E. (1975). *Markets and hierarchies: Analysis and antitrust implications*. New York: The Free Press.

Williamson, O.E. (1979). Transaction-cost economics: the governance of contractual relations. *Journal of Law and Economics,* 22, 233–262.

Williamson, O.E. (1981). The economics of organization: the transaction cost approach. *American Journal of Sociology, 87,* 548–577.

Williamson, O.E. (1983). Credible commitments: using hostages to support exchange. *American Economic Review, 73,* 519–540.

Williamson, O.E. (1985). *The Economic institutions of capitalism: Firms, markets, relational contracting*. New York: The Free Press.

Williamson, O.E. (1996). *The Mechanisms of Governance*. New York: Oxford University Press.

Williamson, O.E. (1999). Strategy research: governance and competence perspectives. *Strategic Management Journal, 20*, 1087-1108.

Wilson, L. H. (2001). Software development industry study. *Business & Research Services.* The U.S. Small Business Administration, Retrieved March 25, 2006, from http://www.spa.org/sharedcontent/press/2000/6-6-00.html.

Appendices

Appendix A. Survey Questionnaire

A1. Initial Contact Email to Potential Study Participants

Dear Participants,

My name is Shuangzeng(Shawn) Hu and I am a Masters student at the University of Waterloo in the Management Science department. I am currently working on fulfilling the thesis requirement for my MASc degree. We are conducting a research study about the influences of the Internet to distribution of packaged software, i.e. the relationship of distribution channel selection with product characteristics, market (or clients) uncertainty, packaged software firms growth and status. Please be informed that we are only interested in responses from software resellers.

I am seeking your participation in a short web-based survey. I am targeting participants such as you who are in senior positions in which, based on your educational and/or professional background, or by the nature of your position held in the workplace, you have been, or are currently exposed to the practice of online distribution of packaged software in your company. Please be informed that we are only interested in responses from software resellers. Your participation in this 10-15 minute online survey is entirely voluntary and anonymous. At any point during the survey you may choose to withdraw by exiting the questionnaire. If you provide your email address after completing the survey or just click the REPLY button on the toolbar of your email software, I will send you a summary of the findings from the survey and some suggestions on how to apply these findings. Survey data will be stored for two years on a secure server at the University of Waterloo.

This project has been reviewed and has received ethics clearance through the Office of Research Ethics at the University of Waterloo. If you have any comments or concerns regarding resulting from your participation in this study, please feel free to contact Dr. Susan Sykes, Director, Office of Research Ethics at (519) 888-4567, ext. 6005 or by e-mail at ssykes@uwaterloo.ca.

Should you have any questions about the study, please contact either Shawn Hu at (519) 888-4567 ext.3368 / s2hu@engmail.uwaterloo.ca or Dr. Rod McNaughton (519) 888-4567 ext. 6203, rmcnaughton@uwaterloo.ca. Further, if you would like to receive a copy of the results of this study, please contact Shawn hu, Rod McNaughton or submit your email address at the end of this study. To begin, visit our survey website:

http://www.mansci.uwaterloo.ca/s2hu/index2.php Thank you for your time!

Shuangzeng(Shawn) Hu, MASc Candidate
Management Science, Faculty of Engineering,
University of Waterloo
January 10, 2006

A2. Online Questionnaire: Introductory Page

Online Distribution of Packaged Software by Canadian Software Firms

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The questions in this survey concern the influences of the Internet on distribution of packaged software, i.e. the relationship of distribution channel selection with product and market characteristics. The first set of questions will ask you to rank your firm on a scale with respect to how accurately the statements describe your firm. Other questions will ask for brief comments about online distribution of packaged software by your firm. The survey should take no longer than ten-to-fifteen minutes to complete. There are no known or anticipated risks from participating in this study.

For more information on the Security and Privacy Information, please click Security and Privacy Information.

This study has been reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. If you have any comments or concerns resulting from your participation in this study, please contact Dr. Susan Sykes, Director, Office of Research Ethics at (519) 888-4567 ext. 6005 or by email at ssykes@uwaterloo.ca.

Should you have any questions about the study, please contact either Shuangzeng(Shawn) Hu at s2hu@engmail.uwaterloo.ca. or Professor Rod McNaughton (519) 888-4567 ext. 6203, rmcnaughton@uwaterloo.ca. If you would like to receive a copy of the results of this study, please contact Shuangzeng(Shawn) Hu, Rod McNaughton or submit your email address at the end of this study.

Thank you for your participation.

A3. Online Questionnaire: Security and Privacy Information

Online Distribution of Packaged Software by Canadian Software Firms

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Security and Privacy Information

It is important for you to know that any information that you provide will be confidential. You do not need to identify yourself by name on any materials. All of the data will be summarized and no individual can be identified from the summarized results. Furthermore, the survey web site is programmed to collect responses on the survey items alone. The site will not collect any information that could potentially identify you (such as machine identifiers). Additionally, if you begin entering responses to the survey on the Web and then choose not to complete the survey, the information that you have already entered will not be transmitted to us.

The data collected from this study will be accessed only by the two researchers named above and will be maintained on a password-protected computer database in a restricted access area of the university. As well, the data will be electronically archived after completion of the study and maintained for two years after the research study has been completed and any submissions to journals have been completed.

If you have any questions regarding the security and privacy of your responses, please contact Shuangzeng(Shawn) Hu (s2hu@engmail.uwaterloo.ca.) or Professor Rod McNaughton (rmcnaughton@uwaterloo.ca).

A4. Online Questionnaire

University of Waterloo

Online Distribution of Packaged Software by Canadian Software Firms

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Does your firm develop any of its own packaged software? If so, proceed. If not, thank you for your time. We are only interested in responses from software developers.

Section A. Use of the Internet in Distributing Packaged Software

Please answer the following questions about the use of the Internet to sell and distribute your *best-selling packaged software.*

1.Please indicate which of the following best describes your best-selling packaged software. If none of the categories applies, please describe the software.

- ☐ Packaged system software e.g., an operating system
- ☐ Packaged horizontal software, e.g., programming languages, general applications and utilities
- ☐ Packaged vertical software, e.g., applications for a specific industry, such as financial software
- ☐ Games and educational software

Other type(s) of packaged software, please specify: _____

2.Please select the category that best describes the gross sales of your best-selling packaged software during the last fiscal year: Please select

3.Please select the category that best describes the rate of growth in gross sales of your best-selling packaged software sales between the two most recent fiscal years. Please select

4.Please identify the largest national market for your best selling packaged software

- ☐ The Canadian market
- ☐ The United States market

A foreign market other than the United States, please specify: _____

5.Approximately what proportion of the gross sales of your best-selling packaged software sales are accounted for by this market Please select

6.Please identify the primary channel that is used to distribute your best selling packaged software in its largest market.

- ☐ Distributors or wholesalers
- ☐ Catalogue publishers

☐ Direct marketing channels other than the Internet

☐ Through Value Added Resellers (VARs)

☐ Through Original Equipment Manufacturers (OEMs)

☐ Direct to users through the Internet

Other channel(s), please specify:

Please note: If your answer to question number 6 is "Direct to users through the Internet", please proceed to question number 8 directly. Otherwise, please answer question number 7 first.

7.If your answer to question number 6 is not "Direct to users through the Internet", please reply to the following question(s).

(1) Is your best selling packaged software sold to any market online?	Please select
(2)If your answer is YES, what is the proportion of gross sales accounted for by online sales?	Please select

8.Please choose the category that best describes the gross sales of your best-selling packaged software over the Internet during the last fiscal year: Please select

9.Please indicate the approximate rate of growth in gross sales through the Internet between the two most recent fiscal years. Please select

10.Are online sales of your best selling packaged software *primarily* sold through:
Please select

11.From the following list, please choose *all* the statements that best reflect how your firm uses the Internet to sell and distribute your best-selling packaged software. If none of them applies, please state the specific situation.

☐ Customers are required to identify a salesperson when making a purchase online (e.g., they contact a representative by telephone, email or fax).

☐ Clients can only download a beta or trial version of packaged software.

☐ Clients can download full packaged software via the Internet right away.

☐ Clients can download packs or updated versions.

☐ Clients can access all after-sale service via the Internet.

☐ Customers can make payments online without contacting a representative.

☐ Clients can monitor their balance via the Internet if they have an account with our firm.

Other situation(s), please specify:

Section B. Dimensions of the Packaged Software Market.

Please indicate the extent to which each of the following statements characterizes the product or market characteristics of your best selling packaged software. The value "1" indicates that this characteristic is very weak for your products, and a value of "7" suggests that it is very strong.

	1	2	3	4	5	6	7
1.Our best-selling product incorporates significant unique knowledge. The value added by this embedded knowledge is very specific, and it would be difficult to redeploy this knowledge in another product.	☐	☐	☐	☐	☐	☐	☐
2.Our best-selling software package requires investment in special equipment such as high-end computers, special peripherals, or high bandwidth. A potential distributor (or VAR) would need to make specific investments to be able to demonstrate and sell this software.	☐	☐	☐	☐	☐	☐	☐
3.Our best-selling packaged software takes considerable time to learn to use. A sales person would require considerable time to learn about the software before being able to demonstrate it confidently. Knowledge about the software and how to run it is not easily transferred to other software products.	☐	☐	☐	☐	☐	☐	☐
4.The market for our best-selling software product is very diverse, and there are multiple sources of uncertainty in the market. We have many different types of customers with different needs and/or they are geographically dispersed.	☐	☐	☐	☐	☐	☐	☐
5.The market for our best-selling software product is very volatile. It is difficult to predict future demand and the future actions of competitors.	☐	☐	☐	☐	☐	☐	☐

Section C. Background Information about your Firm

In this section, general questions are asked about your firm. The primary purpose of these questions is to establish the firm demographics of responding firms. Your responses to these questions will be used to aggregate responses with those of other respondents.

1.Please select the category that best describes your firm's gross sales across *all business activities* during the last fiscal year: Please select

2.Please specify the rate of growth in gross sales for *all business activities* your firm experienced between the two most recent fiscal years. Please select

3.Please specify the approximate number of people employed by your firm in all locations :

Please select

4.Please specify in which year from the following options your firm was first established:

Please select

5.Please indicate the following management features of your firm.

(1)Is your firm privately owned or not?	Please select
(2)Is your firm managed by the owner?	Please select

6.Do you have any comment on your experiences using the Internet to distribute packaged software that are not captured in the preceding questions?

Section D. Respondent Profile

Please provide some information about yourself. This information will be used to create a profile of the participants in the study.

1.Your job title:	
2.Period (in years) you worked for your present employer:	Please select
3.Your email address to receive the results (Please note: Your email address will be kept separately from your response. This assures that your response will be anonymous):	

Reset

A5. Online Questionnaire: Thanks Letter

Online Distribution of Packaged Software by Canadian Software Firms

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Thank you very much for participating in our Use of the Internet in Distribution of Packaged Software Survey! Your feedback is extremely valuable. If you indicated on the survey that you would like a copy of the results, they will be sent to you by email at the address you provided by April, 2006.

If you have any general comments or questions related to this study, please contact Shuangzeng Hu, Management Sciences, Engineering Faculty, University of Waterloo, s2hu@engmail.uwaterloo.ca or Rod McNaughton, Management Sciences, Faculty of Engineering, University of Waterloo, telephone number: 519 888 4567 extension 6203. rmcnaughton@uwaterloo.ca.

This study has been reviewed by, and received ethics clearance through, the Office of Research Ethics at University of Waterloo. If you have any concerns regarding your participation in this study, please contact Dr. Susan Sykes, Director, Office of Research Ethics at ssykes@uwaterloo.ca. or (519) 888-4567 Ext. 6005.

Best Regards!

Shuangzeng (Shawn) Hu

January 10, 2006

Appendix B. Original Data

Table B1. Knowledge-base Asset Specificity

Knowledge specificity	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.89	1	1.89
2	3	5.66	4	7.55
3	3	5.66	7	13.21
4	5	9.43	12	22.64
5	10	18.87	22	41.51
6	14	26.42	36	67.92
7	17	32.08	53	100.00

Table B2. Human-base Asset Specificity

Human Asset Specificity	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	13.21	7	13.21
2	10	18.87	17	32.08
3	6	11.32	23	43.40
4	5	9.43	28	52.83
5	7	13.21	35	66.04
6	11	20.75	46	86.79
7	7	13.21	53	100.00

Table B3. Environmental Uncertainty: Diversity

Diversity	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	5	9.43	5	9.43
2	9	16.98	14	26.42
3	4	7.55	18	33.96
4	9	16.98	27	50.94
5	4	7.55	31	58.49
6	12	22.64	43	81.13
7	10	18.87	53	100.00

Table B4. Environmental Uncertainty: Volatility

Volatility	Frequency	Percent	Cumulative frequency	Cumulative Percent
1	8	15.09	8	15.09
2	11	20.75	19	35.85
3	4	7.55	23	43.40
4	6	11.32	29	54.72
5	13	24.53	42	79.25
6	5	9.43	47	88.68
7	6	11.32	53	100.00

Table B5. Physical Asset Specificity

Physical Specificity	Frequency	Percent	Cumulative frequency	Cumulative Percent
1	26	49.06	26	49.06
2	15	28.30	41	77.36
3	3	5.66	44	83.02
4	3	5.66	47	88.68
5	3	5.66	50	94.34
6	1	1.89	51	96.23
7	2	3.77	53	100.00

Appendix C. Results of Descriptive Statistics

Table C1. Detailed List of Utilities of the Internet

Channels	Frequency	Percent	Cumulative Frequency	Cumulative Percent
• Missing values	6	7.32	6	7.32
• Clients can download PP brochure	2	2.44	8	9.76
• Clients can only download supplemental versions	1	1.22	9	10.98
• Customers work through sales team	1	1.22	10	12.20
• Clients contact us by email phone or fax no dire	2	2.44	12	14.63
• Access all after-sale service	2	2.44	14	17.07
• Access all after-sale service • Make payments online	2	2.44	16	19.51
• download packs or updated versions	3	3.66	19	23.17
• Download full packaged software	5	6.10	24	29.27
• download full packaged software • Make payments online	2	2.44	26	31.71
• Download full packaged software • Download packs or updated versions	4	4.88	30	36.59
• Download full packaged software , • Download packs or updated versions, • Access all after-sale service Post training support is available over the Intern	2	2.44	32	39.02
• Download full packaged software • Download packs or updated versions • Access all after-sale service Make payments online	9	10.98	41	50.00
• Download a beta or trial version	3	3.66	44	53.66
• Download a beta or trial version • Access all after-sale service	1	1.22	45	54.88
• Download a beta or trial version • Access all after-sale service Make payments online	2	2.44	47	57.32
• Download a beta or trial version • Access all after-sale service Make payments online • Purchas e directly from within the trial version	1	1.22	48	58.54
• Download a beta or trial version • Download packs or updated versions • Access all after-sale service	10	12.20	58	70.73
• Download a beta or trial version • Download packs or updated versions • Access all after-sale service and technical support	2	2.44	60	73.17

Table C1. Detailed List of Utilities of the Internet (Continued)

• Download a beta or trial version • Download full packaged software	2	2.44	62	75.61
• Download a beta or trial version • Download full packaged software • Make payments online	1	1.22	63	76.83
• Download a beta or trial version • Download full packaged software • Access all after-sale service	2	2.44	65	79.27
• Download a beta or trial version • Download full packaged software • Download packs or updated versions • Access all after-sale service	1	1.22	66	80.49
• Require a sale person	4	4.88	70	85.37
• Require a sale person • Access all after-sale service	1	1.22	71	86.59
• Require a sale person • Download packs or updated versions	1	1.22	72	87.80
• Require a sale person • Download packs or updated versions, • Make payments online	1	1.22	73	89.02
• Require a sale person • Download packs or updated versions • Access all after-sale service	2	2.44	75	91.46
• Require a sale person • Download a beta or trial version	3	3.66	78	95.12
• Require a sale person • Download a beta or trial version • Monitor their balance via the Internet,	2	2.44	80	97.56
• Require a sale person • Download a beta or trial version • Download packs or updated versions • Access all after-sale service	1	1.22	81	98.78
• Require a sale person Download a beta or trial version • Download full packaged software • Access all after-sale service	1	1.22	82	100.00

Appendix D. Output of Logistic Regression

Table D1. Logistic Regression Models: Rank _Binary

Parameter	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	7.4390	2.8504	6.8111	0.0091
Knowledge specificity	-0.5113	0.2624	3.7983	0.0513
Diversity	-0.5825	0.2601	5.0164	0.0251
Gross sales _rank	-0.0822	0.0227	13.1008	0.0003
Gross sales _online _rank	-0.00014	0.0186	0.0001	0.9942
Growth rate _online _rank	0.0828	0.0261	10.0464	0.0015

Notes: Goodness of fit (residual test) chi-square = 3.2215 (p=0.7816 and df=6);

Hosmer and Lemeshow Goodness-of-Fit test =15.24 (df=7 Pr=0.0330)

Correct classific ation rate = 82.9% $R^2 = 0.56$

Table D2. Logistic Regression Models: Log _ Binary

Parameter	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	2.0447	1.0692	3.6567	0.0558
Physical asset specificity	0.6236	0.3292	3.5891	0.0582
Diversity	-0.2970	0.1665	3.1817	0.0745
Growth rate _ online _log	0.8114	0.2914	7.7503	0.0054

Notes: Goodness of fit (residual test) chi-square = 10.93 (p=0.2055 and df=8);

Hosmer and Lemeshow Goodness-of-fit: Chi-Square 23.0113 (pr >0.0033 df=8)

Correct classification rate = 71.95%

$R^2 = 0.3905$

Table D3. Logistic Regression Models: Rank _ three

Parameter	Online use	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	3	8.0897	2.8261	8.1936	0.0042
Intercept	2	5.8507	2.6187	4.9918	0.0255
Knowledge specificity	3	-0.5754	0.3317	3.0099	0.0828
Knowledge specificity	2	-0.5495	0.2891	3.6117	0.0574
Diversity	3	-0.6260	0.2588	5.8506	0.0156
Diversity	2	-0.6482	0.2681	5.8480	0.0156
Gross _rank	3	-0.1353	0.0313	18.7212	<.0001
Gross _rank	2	-0.0409	0.0238	2.9665	0.0850
Growth online _rank	3	0.1225	0.0299	16.8406	<.0001
Growth online _rank	2	0.0612	0.0233	6.9210	0.0085

Notes: Goodness of fit (residual test) chi-square = 10.788(p=0.7026 and df=14);

Correct classification rate = 79.3% $R^2 = 0.6313$ D.V. = Value of dependent variable

Table D4. Logistic Regression Models: Log _ three

Parameter	Online use	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	3	4.6090	3.2468	2.0151	0.1557
Intercept	2	7.1994	3.2595	4.8785	0.0272
Knowledge specificity	3	0.3153	0.4198	0.5641	0.4526
Knowledge specificity	2	-0.4786	0.3389	1.9939	0.1579
Diversity	3	-0.5307	0.3073	2.9821	0.0842
Diversity	2	-0.7500	0.3328	5.0791	0.0242
Gross _log	3	-2.1535	0.5534	15.1439	<.0001
Gross _log	2	-0.4993	0.3733	1.7892	0.1810
Gross online _log	3	2.4234	0.6515	13.8381	0.0002
Gross online _log	2	0.9025	0.4195	4.6274	0.0315

Notes: Goodness of fit (residual test) chi-square = 13.7890 (p=0.9679 and df=14);

Correct classification rate = 85.6%

$R^2 = 0.7021$ D.V. = Value of dependent variable

Table D5. Logistic Regression Models: Rank_ Four-value Models

Parameter	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	-3.2576	0.6003	29.4468	<.0001
Intercept	-1.2143	0.4533	7.1767	0.0074
Intercept	-0.3935	0.4257	0.8543	0.3553
Gross sales _rank	0.0662	0.0132	25.1585	<.0001
Growth rate _ online _rank	-0.0405	0.0108	14.1615	0.0002

Notes: Log likelihood =34.42;

Goodness of fit (residual test) chi-square = 10.4286 (p=0.3169 and df=9)

Table D6. Logistic Regression Models: Log _Four-value Models

Parameters	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	-3.9817	1.0727	13.7782	0.0002
Intercept	-1.1213	0.9284	1.4586	0.2272
Intercept	0.2571	0.9181	0.0784	0.7795
Physical asset specificity	-1.0447	0.3612	8.3650	0.0038
Volatility	0.2946	0.1592	3.4262	0.0642
Gross sales _log	1.5153	0.3080	24.1977	<.0001
Gross sales _online _log	-1.4715	0.3234	20.7058	<.0001

Notes: Log likelihood =24.82;

Goodness of fit (residual test) chi-square = 20.86 (p=0.569 and df=9)

Table D7. Classification Table of Rank - Binary Models

Table of online use two by pred_dis			
Online use two	pred_dis		Total
	0	1	
0	27	8	35
	32.93	9.76	42.68
	77.14	22.86	
	81.82	16.33	
1	6	41	47
	7.32	50.00	57.32
	12.77	87.23	
	18.18	83.67	
Total	33	49	82
	40.24	59.76	100.00

Table D8. Classification Table of log - Binary Models

Table of online use two by pred_dis			
Online use two	pred_dis		Total
	0	1	
0	29	6	35
	35.37	7.32	42.68
	82.86	17.14	
	63.04	16.67	
1	17	30	47
	20.73	36.59	57.32
	36.17	63.83	
	36.96	83.33	
Total	46	36	82
	56.10	43.90	100.00

Table D9. Classification Table of Rank - multinomial Models

Table of online use three by pred_dis			
Online use Three	pred_dis		Total
	0	1	
0	61	9	70
	37.20	5.49	42.68
	87.14	12.86	
	70.93	11.54	
1	25	69	94
	15.24	42.07	57.32
	26.60	73.40	
	29.07	88.46	
Total	86	78	164
	52.44	47.56	100.00

Table D10. Classification Table of Rank - multinomial Models

Table of online use three by pred_dis			
Online use three	pred_dis		Total
	0	1	
1	64	6	70
	39.02	3.66	42.68
	91.43	8.57	
	59.26	10.71	
2	20	10	30
	12.20	6.10	18.29
	66.67	33.33	
	18.52	17.86	
3	24	40	64
	14.63	24.39	39.02
	37.50	62.50	
	22.22	71.43	
Total	108	56	164
	65.85	34.15	100.00

Table D11. Results of Regular Regression Analysis

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	1.58878	0.25654	5.81398	38.35	<.0001
Knowledge specificity	-0.05350	0.03185	0.42775	2.82	0.0979
Diversity	-0.07496	0.02626	1.23513	8.15	0.0058
Growth rate	-0.00328	0.00231	0.30621	2.02	0.1601
Gross sales	-0.01687	0.00213	9.52908	62.86	<.0001
Growth _ online	0.01496	0.00204	8.15861	53.82	<.0001