

Factors Affecting Participation
in
Online Communities of Practice

by
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Abstract

Communities of practice are groups of people who share a concern, a set of problems or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger et al, 2002). An understanding of why working, technical professionals participate in knowledge- based communities of practice can provide better opportunities to support individual and organizational knowledge management strategies. Online communities of practice were investigated at two global corporations: Xerox and IBM. At Xerox, Eureka is an internal network service designed to support knowledge sharing and problem solving by a community of practice for field service technicians. It allows the submission of problems from field service technicians and the retrieval of validated solutions for use and adaptation, by all members of the global Eureka community. At IBM Corporation, public network based communities of practice were investigated that focused on db2™ and Websphere™ software technology. Unlike the Xerox Eureka community of practice, knowledge contributions at IBM communities of practice are not validated prior to submission and access is open to public participation globally by IBM employees and by independent users of IBM software technology.

The purpose of this case study research was to explore and to describe how and why participants became members of communities of practice – what influenced them to join and to participate. We collected survey data from participants in these communities, to examine the relationships among members’ expectations of purpose, their relationship to the community of practice, their attitudes toward information handling, the costs and benefits of membership, the size of the community of practice and the resulting participation behaviour in these knowledge-based communities of practice at Xerox Corporation and IBM Corporation.

As one aspect of exploring user behaviour, we investigated the applicability of two theoretical frameworks for understanding user behaviour in these communities, based on propositions from normative and utility theory and from public goods critical mass theory. The research study provides a test for the explanatory power of public goods, utility and normative theories in a new

area; namely, online knowledge-based communities of practice in workplace contexts. This analysis provided support for the applicability of utility theory and for some aspects of public goods-based theory/critical mass theory.

The findings of the case study point out some differences in the two communities of practice. A majority of the IBM-based community members reported belonging to multiple communities (6-10) and using access to the community to form online social networks and to meet members outside the community at in-person meetings. They reported their participation as being self-directed and on an ad hoc basis. Most respondents were community members for less than 2 years. In contrast, a majority of Eureka members reported belonging only to the Eureka community and do not report forming online social networks in Eureka. Participation in Eureka is seamlessly integrated into prescribed, standard work practices of the company and supported by company management and with resources. Most respondents were community members for over 5 years.

The analysis of members' contributing behaviour in two online communities of practice reaffirms that the majority of members are passive participants with a core group of regular message contributors. Message composition is a careful and deliberate activity requiring communication discipline, time and effort. Members in both settings reported a strong desire to spend more time in their communities (and more time per visit).

Communities of practice are dynamic complex entities that present not only a theoretical challenge but also a practical challenge. This study's results point to the complexity of facilitating communities of practice: benefits dynamics and flow and permanence dynamics of membership can only be externally managed to a limited extent. The participants' roles need to be conceptualized in ways that support different types of participation while at the same time highlighting the inherently cooperative nature of self-managed communities of practice.

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Table of Contents

List of tables pp 19

List of figures pp 77

1. INTRODUCTION

- 1.1 Importance of communities of practice pp 1
- 1.2 Communities of practice pp 2
- 1.3 Impacts related to communities of practice pp 4
- 1.4 Statement of the problem pp 8

2. LITERATURE REVIEW

- 2.1 Conceptual approaches to communities pp 13
 - 2.1.1 Community pp 13
 - 2.1.2 Community of interest pp 16
 - 2.1.3 Practice pp 17
 - 2.1.4 Community of practice pp 17
 - 2.1.5 Summary pp 22
- 2.2 Theoretical approaches pp 23
 - 2.2.1 Normative social theory pp 23
 - 2.2.2 Social influence approach pp 24
 - 2.2.3 Reciprocal influence approach pp 25
 - 2.2.4 Participation as a multilevel phenomenon pp 26
 - 2.2.5 Utility theory pp 27
 - 2.2.6 Media richness theory pp 28
 - 2.2.7 Critical mass theory and public goods approach pp 28
 - 2.2.8 Public goods approach pp 34
 - 2.2.9 An application of public goods-based theories - laboratory and field studies pp 35
 - 2.2.10 From information centered to user centered pp 37
 - 2.2.11 Summary pp 39

3. RESEARCH AND SURVEY DESIGN

- 3.1 Formation of the research questions pp 40
- 3.2 Theoretical approaches to the research problem pp 41
- 3.3 Research design pp 44
 - 3.3.1 Measurement scales pp 46
 - 3.3.2 Data analysis pp 49
- 3.4 Web-based survey: a tool in data collection pp 52
- 3.5 The response rate issue pp 53
 - 3.5.1 A total design method pp 54
 - 3.5.2 Models about the respondent's process of decision pp 54
 - 3.5.3 Stages in the web-based survey completion behaviour pp 53
- 5.4 Description of the survey instrument developed to gather individual responses pp 55
 - 3.5.4.1 Membership stability pp 58
 - 3.5.4.2 Sources of information for selecting and joining communities pp 59
 - 3.5.4.3 Non-public and reluctant participants pp 60
 - 3.5.4.4 Modes of participation pp 62
 - 3.5.4.5 Specific purposes – non interactive to interactive mode (a non-interactive to interactive measure) pp 64
 - 3.5.4.6 Involvement in the community message exchange pp 65
 - 3.5.4.7 Message contribution pp 65
- 3.6 Summary pp 67

4. SELECTION OF THE CASE STUDY COMMUNITIES

- 4.1 Method pp 68
 - 4.1.1 Purposive sampling strategy pp 68
 - 4.1.2 Community selection pp 68
 - 4.1.2.1 Corporate partners pp 68
 - 4.1.2.2 Selecting communities within corporate partners pp 71
- 4.2 Survey participants pp 73
 - 4.2.1 Data about community participation pp 74

4.2.2	IBM-based survey respondents	pp 74
4.2.2.1	Demographics	pp 74
4.2.3	Xerox Eureka survey respondents	pp 74
4.2.3.1	Demographics	pp 74
4.3	The survey questionnaire	pp 76
4.3.1	The variables	pp 76
4.3.2	The survey instrument	pp 77
4.3.3	Questionnaire piloting	pp 78
4.3.4	Questionnaire administration	pp 79
4.3.5	Response rates	pp 80
4.4	IBM and Xerox Eureka server statistics	pp 81

5. THE CASE STUDIES

5.1	Survey objectives	pp 84
5.1.1	Survey method and question design	pp 84
5.1.2	IBM and Eureka message statistics from servers	pp 85
5.2	Survey data from IBM-based communities	pp 86
5.2.1	Sources of information for joining a community	pp 86
5.2.2	Multiple community memberships	pp 87
5.2.3	Length of membership in the community	pp 88
5.2.4	Interaction within the community	pp 89
5.2.5	Reports of participation activities	pp 90
5.2.6	Benefits of public message contribution	pp 103
5.2.7	Deterrents to message contribution	pp 105
5.2.8	How members felt about participating	pp 107
5.3	Data report from the Eureka community	pp 121
5.3.1	Joining the Eureka community	pp 122
5.3.2	Multiple community memberships	pp 122
5.3.3	Length of membership in the Eureka community	pp 123
5.3.4	Content of messages posted to Eureka	pp 124
5.3.4.1	Relatedness of Eureka message contents to job interests	pp 125

- 5.3.5 Categories of participation in Eureka pp 126
- 5.3.6 Time and effort to participate in Eureka pp 128
 - 5.3.6.1 Time and effort to prepare and post messages to Eureka pp 130
- 5.3.7 Participation activities and feelings of membership in Eureka pp 133
 - 5.3.7.1 Norms of community membership pp 136
- 5.3.8 Advantages of participating in the community pp 138
 - 5.3.8.1 Reports of knowledge asymmetry pp 140
 - 5.3.8.2 Benefits reported for public participation pp141
- 5.3.9 Ambivalence about Eureka and plans for future participation pp 141
- 5.4 A comparison of the two communities - IBM and Eureka pp 144
- 5.5 Other observations pp 146

6. EXPLORING PARTICIPATION FACTORS FROM THEORETICAL PERSPECTIVES: PROPOSITIONS

- 6.1 Propositions pp 148
- 6.2 Definitions of variables pp 152
 - 6.2.1 Dependent variables and measures pp 153
 - 6.2.2 Independent variables and measures pp 153

7. EXPLORING PARTICIPATION FACTORS FROM THEORETICAL PERSPECTIVES: RESULTS

- 7.1 Members reports of attraction to community, community purpose and reasons to participate pp 154
- 7.2 Exploring the survey results pp 157
 - 7.2.1 IBM Community: Proposition testing results pp 158
 - 7.2.2 Xerox Eureka Community - Proposition testing results pp 211

8. CONCLUSION AND IMPLICATIONS

- 8.1 Community Demographics pp 217
- 8.2 Review of utility theory ad public goods-based theory pp 219

- 8.3 Research limitations pp 220
- 8.4 Testing the accuracy of predictive relationships of public goods-based theories and utility theories pp223
 - 8.4.1 IBM-based community – results aligned with the predictions of the theory pp 223
 - 8.4.2 IBM-based community –results not aligned with the predictions of the theory pp 224
 - 8.4.3 Eureka community – results aligned with the theory pp 228
 - 8.4.4 Eureka community – results not aligned with the theory pp 228
- 8.5 Modes of participation in the communities pp 230
 - 8.5.1 Participation in the IBM community pp 230
 - 8.5.2 Participation in the Eureka community pp 231
- 8.6 Applying the results toward more successful corporate communities of practice pp 233
 - 8.6.1 Conditions associated with high message contribution pp 235
- 8.7 Some policy issues pp 237
 - 8.7.1 Member’s education and training issues pp 239
- 8.8 Future research pp 241
- 8.9 Conclusions and Implications pp 246

REFERENCES

Appendices

- Appendix One: Online survey: Participation in Online Knowledge Communities pp 262-276
- Appendix Two: Online survey: Participation in Eureka pp 277-287
- Appendix Three: Eureka brochure: Growing community knowledge through a socio-technical tip sharing system pp 288-289
- Appendix Four: Xerox Global Service Net (GSN) pp 290-291
- Appendix Five: Personal communication from M. Boucher at Xerox to G. Mahar at the University of Waterloo pp 292
- Appendix Six: Seventeen sample reports of message statistics from ibm.software communities pp 293-309

List of Tables

Table 2-1	Definitions of communities of practice in the literature	pp 19
Table 4-1	Message contribution and heterogeneity judgement	pp 66
Table 4-2	Message contribution rate	pp 76
Table 5-1	IBM and Eureka message statistics from servers	pp 79
Table 7-1	Participation activities in the community (a)	pp146
Table 7-2	Attraction to community and posting/replying to questions	pp 148
Table 7-3	Initial expectations of membership and reported public posts	pp 148
Table 7-4	Participation activities in the community (b)	pp 150
Table 7-5	Relevance of discussion to work domain and participation	pp 151
Table 7-6	Job utility of messages and message contribution	pp 153
Table 7-7	Access costs and public participation	pp 154
Table 7-8	All benefits and public participation	pp 156
Table 7-9	Perceived message content diversity and public participation	pp 158
Table 7-10	Quality ratings of discussion and message contribution	pp 159
Table 7-11	Correlation of average contributions per member and community size	pp 160
Table 7-12	Membership expectations and authoring message tips	pp 162
Table 7-13	Relatedness of messages to work domain and frequency of authoring message tips	pp 164
Table 7-14	Job utility of Eureka contents and authoring message tips	pp 165
Table 7-15	Perceived ease of contributing messages and public participation	pp 166
Table 7-16	Benefits and authoring message tips in Eureka	pp 167
Table 7-17	Perceived message diversity and authoring message tips	pp 169
Table 7-18	Rating content quality of Eureka and public participation	pp 170
Table 8-1	Theoretical perspectives and application	pp 174-175

List of Figures

- 5-1 Reports of knowing members before joining the community pp 77
- 5-2 Reports of how members discovered the community pp 77
- 5-3 Participation direction pp 78
- 5-4 Reports of memberships in other communities pp 78
- 5-5 Length of membership in the community pp 79
- 5-6 How members describe interaction in the community pp 80
- 5-7 Way you participate in the discussion pp 81
- 5-8 Reports of monthly visits to community from home, work and elsewhere pp 81
- 5-9 Reports of medium used to contact members pp 82
- 5-10 Reports of activities with community members pp 82
- 5-11 Reports of criteria used for message selection pp 83
- 5-12 Members description of how they participate pp 83
- 5-13 Participation activities by time period pp 84
- 5-14 Reports of time duration per visit to community pp 85
- 5-15 Report of desire to spend more time in community pp 86
- 5-16 Report of extra time desired per visit pp 86
- 5-17 Time and effort to prepare messages for public posting pp 87
- 5-18 Reports of description of message posts pp 87
- 5-19 Posted responses to questions each month pp 88
- 5-20 Reports of comments posted each month pp 88
- 5-21 Uses of contacts within the community pp 90
- 5-22 Reports of how members contact each other pp 90
- 5-23 Members rating of community discussion pp 91
- 5-24 Deterrents to posting public messages pp 93
- 5-25 Report of overall satisfaction with the community pp 96
- 5-26 Members descriptions of their activities in the community pp 97
- 5-27 The way you participate in the discussion pp 97
- 5-28 How members describe interaction in the community pp 98
- 5-29 Norms of membership in the community pp 99
- 5-30 Participation activities and feelings of community membership pp 98

5-31	Feels like a member of the community	pp 101
5-32	Time in community and feelings of membership	pp 101
5-33	Recognition of individuals in the community	pp 102
5-34	Feelings of closeness to individuals and groups within the community	pp 102
5-35	Number of members and feeling close to rating	pp 103
5-36	Posting public messages and sense of community involvement	pp 104
5-37	Ambivalence about participating in the community	pp 105
5-38	Plans to stay or leave the community	pp 106
5-39	Knew members before joining the community	pp 107
5-40	Memberships in other communities	pp 108
5-41	Length of membership in the Eureka community	pp 109
5-42	Description of contents of Eureka messages	pp 109
5-43	Relation of message contents of Eureka to job interests	pp 110
5-44	Your participation activities in Eureka	pp 111
5-45	Description of participation in Eureka	pp 112
5-46	Report of weekly search in Eureka	pp 112
5-47	Report of desire to spend more time in Eureka	pp 113
5-48	Report of amount extra daily time desired in Eureka	pp 113
5-49	Report of amount extra daily time desired by validators in Eureka	pp 114
5-50	Amount of extra daily time desired by validators	pp 114
5-51	Reports of type of messages contributed to Eureka	pp 115
5-52	Time and effort to author message tips	pp 116
5-53	Estimate of daily message volume in Eureka	pp 116
5-54	How you made contact with members	pp 117
5-55	Activities with contacts in Eureka	pp 117
5-56	Sources of feelings of involvement in the community	pp 118
5-57	Authoring tips and feelings of involvement in the community	pp 119
5-58	Description of participation in Eureka community	pp 119
5-59	Norms of community participation	pp 120
5-60	Messages and self revelation	pp 121
5-61	Concern about public perception from message contents	pp 121

5-62	Advantages of participating in the community	pp 122
5-63	Enhance my reputation by contributing messages	pp 123
5-64	Report of knowledge asymmetry	pp 123
5-65	Benefits of public participation	pp 124
5-66	Ambivalence about the community	pp 125
5-67	Suggestions for improvement	pp 125
5-68	Future level of public participation	pp 126
5-69	Increase level of public participation by activity	pp 126
7-1	Distinct focus and purpose of IBM-based community	pp 154
7-2	Reasons reported to participate in IBM-based community	pp 154
7-3	Initial attraction to Eureka community	pp 155
7-4	Reasons reported to participate in the Eureka community	pp 156
7-5	Initial attraction to the IBM-based community	pp 158
7-6	Participation activities by time period	pp 159
7-8	Rating of relevance of message contents to work interests	pp 167
7-9	Rating the utility of discussion to job tasks	pp 169
7-10	Time, effort and attention to prepare and to post messages	pp 171
7-11	Benefits and public participation	pp 173
7-12	Message diversity – range of content	pp 175
7-13	Message diversity – depth of content	pp 175
7-14	Rating of message quality in the community	pp 174

Chapter 1

INTRODUCTION

More and more companies realize that knowledge is one of their most valuable assets and a source of competitive advantage. Over the past decade it has become widely accepted that a company's knowledge and learning capabilities are critical to achieving market success (Leonard-Barton, 1995; Nonaka & Takeuchi, 1995, Davenport & Prusak, 1998, Garvin, 2000, Stewart, 2001). Driven by a knowledge economy, companies increasingly recognize the need for employees to become "knowledge workers": individuals who draw constantly on a wealth of knowledge to devise new responses and solutions in a rapidly changing marketplace (Riesenberger, 1998; Stewart, 2001). Informal knowledge exchanges routinely take place in the workplace, e.g., in conversations over lunch or at the coffee machine. Beginning in the 1990s, partly in recognition of the increased knowledge-intensive nature of contemporary work, knowledge management strategies were developed to formally create, capture, acquire, transmit and share knowledge among groups of employees on private and public networks (Drucker, 1999). One of the goals of this knowledge management is to exploit a competitive advantage created by the possession of unique knowledge embedded within the work practices of a company (Davenport & Prusak, 1998). Unlike physical assets that can be counted and placed in inventory stockrooms, knowledge resides in people. Companies need to understand precisely what types of knowledge will give them a competitive advantage and how they can acquire and mobilize it. Companies also need to keep this knowledge on the cutting edge, to deploy it, to leverage it in operations, and to spread it across the organization.

1.1 Importance of communities of practice

To perform well in a knowledge economy, individuals must constantly learn and add to their own body of knowledge if they are to capitalize on opportunities in the work domain. One way to learn and to acquire knowledge is to engage, on a day-to-day basis, in a flow of knowledge consisting not only of the dissemination of data and printed materials but also of the exchange of ideas with others who have experience and skills related to the same work domain. Examples of online

spaces where people can record their “lessons learned” and best work practices and exchange knowledge include online discussion forums, corporate repositories and knowledge databases.

1.2 Communities of practice

Online interaction with others on work-related topics often reflects and supports the formation of communities of practice. The community of practice concept has two parts: (1) Community: groups of people and (2) Practice: work or activity. In the literature, communities of practice are typically described as a group of professional practitioners that are distributed over different departments and locations, who share a domain of interest or similar task responsibilities and who network together in formal and informal relations. Over time, members develop a shared meaning and increase the spread of knowledge and information among the community of practice (Wenger, McDermott Snyder, 2002).

Members think about and discuss common issues, explore ideas, act as sounding boards for one another, and generally support one another’s work responsibilities. Members may create tools, standards, generic designs, manuals, and other documents – or they may simply develop a tacit understanding of what they share in common. In the course of sharing knowledge, insight, and advice online, a corporate strategy can develop and personal relationships and ways of interacting within the communities of practice become understood. Over sustained participation members may also develop a sense of community identity, a unique perspective on topics of interests as well as a common body of knowledge, practices, and approaches to problem solving. Many leading companies have positioned communities of practice as a centerpiece in their knowledge management strategy and significant resources have been invested in people and information technology. They have designed global network infrastructures to increase the visibility of and access to knowledge within distributed communities of practice.

Initiatives involving communities of practice have been launched by organizations in a wide range of industries [IBM, HP, Xerox, Royal Bank of Canada, Canadian Imperial Bank of Commerce, Sun Life Insurance Company, Proctor and Gamble, Johnson & Johnson], and public organizations [Departments of the Government of Canada], nonprofits and citizen groups [Doctors Without

Borders, Engineers Without Borders, Health Care Best Practices, Instructional Design, Green Practices]. Whether formally recognized or not, every organization and industry has its own history of communities of practice. These are called different names at various times, names such as “learning communities” at Hewlett Packard Inc., “family groups”, at Xerox Corporation, “thematic groups” at the World Bank, “peer groups” at British Petroleum, and “knowledge networks” at IBM but they all remain similar in general intent.

Organized around knowledge domains, not products or markets, communities of practice are not new; what is new is the need for organizations to become more intentional and systematic about “managing” knowledge, therefore giving these age-old structures a new role in the company’s work processes. Until new ideas become embedded within groups in the workplace, lasting learning has likely not taken place in the larger organization. Contemporary theories of knowledge and learning point out how knowledge is distributed in networks of social actors, resource documents and artifacts (e.g. Lave & Wenger, 1991; Pea & Salomon, 1993) and how cognition is fundamentally a situated and cultural process (Hutchins, 1996; Lave, 1988; Suchman, 1988).

Social psychologists and educational theorists who view cognition as distributed, either among social actors or among social actors and the environment, propose an interactionist model of knowledge construction, in which interaction and collaboration lead to learning, rather than being simply peripheral to it. In this view, individual learning is very much a process of community enculturation, of being introduced to the modes of discourse in a particular community, of participating in a social process of making sense and negotiating understanding, mostly through narrative construction (Bruner, 1990; Brown & Duguid, 1991, 1996, 2002). Indeed, sharing knowledge outside the community is extremely hard to achieve, and one of the reasons why initiatives fail is because they hit this invisible community boundary. The boundary exists to identify members within the community of practice from those on the periphery. One way to manage across this boundary has been through mentorship and apprenticeship. This is one of the reasons why the age-old systems of apprenticeship and mentoring remain one of the most effective methods of learning in organizations, and why managers often have great problems trying to understand and build meaningful systems to enable this process of learning (Schein, 1996).

The organizational challenge is not so much with new ideas and initiatives but with gaining commitment of members among different communities. According to Brown and Duguid (2000), an important lesson from the behavioural approach to learning is that learning is about work and work is about learning, and both are social processes built around the concept of informed participation. The work practice is embedded in the community and the only way to learn the work practices in all their nuances and complexities is to become a member. Learning either takes place through participation, or it does not take place at all. Also it is members' participation that structures the organization. According to Brown and Gray, "organizations are webs of participation. Change the patterns of participation, and you change the organization. At the heart of participation is the mind and spirit of the knowledge worker. Put simply, you cannot compel enthusiasm and commitment from knowledge workers. Only workers who choose to opt in – can create a winning company" (Brown & Gray, 1995, pp 78-82).

1.3 Impacts and problems related to online communities

Communities of practice can form irrespective of organizational support (Wenger, 1998). They are a natural group phenomenon that self-organizes and their purpose may or may not be beneficial to an organization (Lave & Wenger, 1991; Wenger, 1998; Wenger, McDermott, & Snyder; 2002). Because communities of practice can be sources of innovation, corporations and other organizations need to recognize communities of practice that are beneficial to them and learn to cultivate their growth. This potential source of innovation has moved communities of practice into an area of great interest for organizations (Powell, Koput, & Doerr, 1996; Stamps, 1997; Wick, 2000).

Wenger, McDermott, and Snyder (2002) cite the current instability of working in companies and point out that communities of practice, with their collegiality of learning relationships, can provide stable professional contacts in a working climate with constantly shifting personnel.

Brown and Duguid (1991) note that traditional training methods and procedural documentation inadvertently lower workers' skills by trying to prescribe complex working practices into a series of steps. Stamps (1997) showed that traditional instructional design teams are three levels removed

from actual practice. Instructional designers usually obtain their information from process analysts, as opposed to from those directly involved in practice.

Communities of practice are also of particular interest for the promise they hold as powerful knowledge sharing forums (Cox & Morris, 2004). Participation in communities of practice enables members to share and create knowledge and to collaborate on problem solving tasks and projects. These communities are particularly interesting because they highlight the interactive nature of knowledge creation and knowledge sharing. Some authors (Steinfeld & Fulk, 1988; Connolly & Thorn, 1991) have pointed to the potential of communities of practice to efficiently link those in need of information with appropriate sources of expertise. Other researchers (Rafaeli, 1993, 2004; Feldman, 1987; Freeman, 1984) have pointed to the capability of communities of practice to bring into contact people with similar interests who otherwise would not have met and people who do not know each other and who are geographically separated at minimum cost and effort. Feldman (1987) also maintains that communities of practice enable people to signal their interests to others and to get to know other's interests with little effort. According to Kraut, Galagher, & Egidio (1988) frequent exchanges involving ideas and research in progress may lead to research collaboration.

Communities of practice are good for teaching new members the basics of a new activity, using a distinctive range of types of learning such as on the job training through engagement in peripheral tasks and observation about how others do their work. Communities of practice can also improvise solutions to troublesome real world problems, perhaps by using collaborative storytelling. Learning from other members and gaining new insights into problems or issues may be possible from cross - fertilization of ideas over organizational boundaries. In communities having a work focus, more informality and honest open debate may be possible compared to face-to-face discussions because occupational status is not an influencing factor in the discussions (Por, 2005). A community of practice gathers, creates and stewards a collective reservoir of past workplace solutions, working knowledge and norms, so it is an important continuing memory of organizational knowledge. The strength of ties among members makes communities of practice excellent places for very fast information sharing and diffusion of innovations. There is good knowledge among community members of who knows what, and a trust and willingness to

articulate and share ideas. Although tacit knowledge cannot be codified, it can be transferred among people by connecting people with similar interests. Knowledge transfer is the ability of individuals to apply knowledge in novel situations. All in all, the community of practice is a powerful knowledge construct (Bieber, 2002; Brown, & Duguid, 2002; Cox & Morris, 2004; Wasko & Faraj, 2000).

Executives and managers need to appreciate the strategic value of communities of practice and understand their management. However, they also need sound knowledge about the robust practice of knowledge development within communities of practice settings. People responsible for the development of knowledge resources need to know how to run a broad knowledge management initiative. They also need to understand, in some depth, what it takes to start communities of practice, to cultivate participation and to support and sustain its growth and development. Online, developers and moderators of communities of practice need to understand the developmental stages of communities of practice and the specific actions they can take to cultivate participation among community members.

Public participation in communities of practice involves several interrelated actions: joining, browsing, reading messages and contributing messages. Because communities of practice gain value as they connect more people, early joiners will affect subsequent participation (Hagel & Armstrong, 1997; Markus, 1987; Rafaeli, Ravid, & Soroka, 2004). Early joiners who contribute a higher quality and quantity of messages that are relevant to interests of the community will create more potential for benefits, and thereby attract more new members to join. If, on the other hand, the messages of early joiners are not reciprocated or if only a few follow them in joining and posting messages to the community of practice, early joiners and others can leave thus beginning a process of community extinction.

One significant aspect of online communication may be the way in which it alters the economies of communication and coordination by making it possible for larger groups to "succeed" with less effort and difficulty. In successful online communities, public and non-public participants frequently develop relations with other participants that have some stability and longevity

(Nonnecke, Preece, Andrews & Voutour, 2004). This should not be surprising considering the ease with which network systems allow individuals to find others with like interests.

Online communities are in many ways dynamic electronic "Schelling" points. In *The Strategy of Conflict* (1960), Schelling developed the idea of natural and constructed points that focus interactions, places that facilitate connections with people interested in a participating in a common line of action. The clock at Grand Central Station is an example, as are singles bars and market places. Each is a space designated as a point of congregation for people of like interests. Networks enhance the flexibility of Schelling points by radically altering the economies of their production and use. Members of these virtual social networks frequently identify themselves as members of online communities. Many participants turn to online communities as a convenient way to quickly find information. The community acts as an "organic information filter." Getting just the right piece of information can be difficult. But in a community of people with common interests and experiences, various participants often have sifted through large amounts of information, have had different experiences, are expert in differing areas, and each can be drawn upon by others in the discourse community.

While economists have observed the existence of "tipping points" associated with network externalities or critical mass, there is currently no widespread theory to predict when they will occur. (Katz & Shapiro, 1994; Rogers, 1995; Schelling, 1960, 1978; Varian, 1998). There is also little empirical evidence to suggest what type of strategy organizations should deploy in their efforts to establish and cultivate communities of practice. Factors affecting the success and effectiveness of communities of practice include the software technology supporting it, the design of the community, the number of participants, and others. However, the most important factor for the success of any community of practice is its member's participation behaviour. The defining feature of these communities is that the membership is the primary source of message content as well as its receiver, therefore it is crucial to understand what triggers member's public contributing behaviour and factors regulating this behaviour.

1.4 Statement of the problem

Communities of practice are entities that emerge and evolve for the purposes of learning and solving authentic problems (Liedtka, 1999; Wick, 2000; Wenger, 1998). Wenger (1998) notes that communities of practice can be powerful entities for accomplishing problem solving and learning and have always existed and will emerge even under the most adverse situations. For this reason, enabling and cultivating their emergence and continuation should be a priority among organizations (Wenger & Snyder, 2000). Learning in a community of practice is situated in authentic practice that is created via group collaboration and interaction (Herrington & Oliver, 2000). All learning and social activity that takes place in communities of practice is completely authentic since it is learning that emerges from participation with others in the context of work processes.

Little is known about the dynamics of participation in corporate communities of practice within professional, workplace contexts and concrete impacts of the community business activities. As Brown and Duguid (1991) pointed out there is a gap between the canonical practice that is recognized by the organization through conventional job descriptions, and non-canonical practices that are generated in an informal context of actual work communities and actual work practices. In order to close the gap, the organization must begin to acknowledge many non-canonical communities in its midst. As these previous studies indicated, it is important that managers understand the relationship between informal practices and the formal organizational structure around the online community. Understanding the relationship leads them to understand what makes an online community successful and therefore the business case for support and for funding resources.

Despite the implementation of online communities in various forms, Preece (2001) noted that there has been little attention on understanding what makes an online community successful. Success in an online community could be manifested through the level of participation that can be understood as the number of public participants and the number of messages posted in the community. Preece also noted that most virtual community research is interdisciplinary and calls for more research specific to the field. She points out that communities of practice and other types of online communities have specialist needs (Preece, 2000). Further research needs to be done to clarify and

what these specialist's needs are. Likewise, Ridings, Gefen, and Arinze (2002), mentioned that there is limited knowledge on what motivates people to participate in online communities. Studies that have examined success factors have commonly focused on trust, anonymity and a sense of community (Andrews, 2002).

Roth (1998) emphasizes that communities of practice studies are hard to replicate because no two communities will use the same artifacts (i.e., tools, language, technology, documentation, etc.) and will emerge in the same way. While there is a growing body of practice-based literature affirming nascent views about communities of practice, there is little explicit theory about why members join communities of practice, the nature of members contributing behaviour, the factors governing this behaviour and its impact on the growth and development of sustainable communities of practice. To find answers to these questions about participation in communities of practice in professional workplace contexts, it is important to empirically examine some of the online knowledge-based communities that have reported knowledge creation, sharing and transfer.

The focus of this research study is on members' participation behaviour in corporate public and private communities of practice. The principal questions of research interest are:

- Why and how do participants become members of communities of practice?
- What is the nature of members contributing behaviour and the factors governing this behaviour?

Specifically, the focal points of investigation are the relationships between members' expectations of purpose, the relationship of members work role to the community focus, members' attitudes toward information handling, members' perceived costs and benefits derived from the membership experience, the size of the community and their impacts on participation within a knowledge-based community of practice.

This study differs from the studies that have been considered so far in the literature in the field in various respects:

- Unlike earlier studies of participation and knowledge sharing in communities of practice that focused on students in distance education programs (Haythornthwaite & Wellman, 1998; Rafaeli, Ravid, & Soroka, 2004); and on passive participation behavior called lurking

(Nonnecke, 2000; Nonnecke & Preece, 2000; Rafaeli, Ravid & Soroka, 2004), this study addresses situations in which the participants are engaged in knowledge creation, sharing and transfer in industrial, workplace settings.

- It investigates participation behavior in two contexts: emerging, open, non-moderated communities of practice (IBM communities) and a mature, closed, moderated community of practice (Xerox).
- The research study analyzes users' reports of their behaviour using two perspectives, one derived from utility and normative theory and one derived from aspects of a public goods approach to critical mass theory. The research study thus provides an empirical test for the potential contribution of these theories in a relatively new domain – understanding online communities of practice.

This study is organized as follows. Chapter 02 is devoted to the task of characterizing the nature of knowledge-based communities of practice and to exploring three theoretical approaches that could explain joining and contributory behavior in a new context of communities of practice. This is done to:

- present current understanding of members' expectations and purposes of membership, what is involved in joining and becoming a member and to understand participation from the inside, from the actors' perspective
- suggest in what ways utility theory, normative theory and the public goods approach to critical mass theory, could contribute to an understanding of joining and message contributing behavior and their impact on community growth and development
- present the propositions derived from these theoretical frameworks, which can later be used to analyze data for the case studies.

Chapter 03 presents the research strategy including the formation of the research question of the study, the web-based survey and other data gathering for the case studies. Chapter 04 describes the selection of the sample of web-based communities of practice for the case studies and the survey design beginning with the IBM-based communities and followed by the Eureka community at Xerox. The use of the web-based survey instrument is described in further detail including the pilot survey, survey administration, and the survey objectives, methods and questions designed to

address the variables of interest in the survey questionnaire. Chapter 05 presents the survey reports from the two case study contexts and members' reports on community life. It analyzes information about the individual characteristics of members, their attitudes, expectations of purpose in joining and ways of participating and their reported satisfaction with participation in the respective communities of practice. Chapter 07 presents a further exploration of the data from the case studies, using a correlation analysis on reported behaviours and the propositions derived from the theoretical perspectives. This chapter concludes with a discussion of what the case studies indicate about factors affecting participation in these communities (including similarities and differences between the two contexts). Chapter 08 concludes the study by pointing out its implications for the design and development of knowledge-based communities of practice in different contexts from the ones examined at IBM and Xerox and some directions for future research.

Chapter 2

LITERATURE REVIEW

Theories are nets cast to catch what we call “the world”: to rationalize, to explain, and to master it. We endeavour to make the mesh ever finer and finer.

-- Karl Popper, The Logic of Scientific Discovery

Theory building is the means by which basic researchers hope to expand knowledge and to discover the truth about a phenomenon. In broad terms, a theory can be said to be a body of knowledge, which forms a system, on a particular subject or in a particular field. Theories are sets of interrelated propositions from which certain related hypotheses can be tested in a real situation. Prediction and understanding are the two primary purposes of theory construction (Eisenhardt, 1989). This chapter presents the theoretical framework of the study in four sections.

The first section introduces three interrelated concepts: community, practice and community of practice. Our research focus is on knowledge-based communities of practice in the workplace: some of them are informal as people meet in the community and share information about how they do their job, some are more formal communities of practice that are supported by the organization with goals such as making knowledge available to its members or improving the production process. It is helpful to have an idea about the structure and place of communities of practice within an organization and the first section endeavours to provide an overview of these three concepts from the literature.

The second section describes participation as a multilevel phenomenon. Participation in a community of practice can be conceived as individual behaviour or as an emergent process occurring at the group level. The two aspects about participation in communities of practice on which we focus, joining and message contribution, can be explained in part by looking to individuals' attributes and in part by looking to the relationships among individuals in a group or community.

The third section describes the theoretical approaches to the study. Utilitarian explanations view the dynamics of joining and message contribution behaviour in communities of practice as being analogous to individual and group behaviours that take place during the adoption, introduction, growth and diffusion of innovative technology. Normative explanations accentuate the role of socially communicated beliefs and reciprocal message behaviour and their affect on use of a technology and participation in a community. Theoretical explanations of participatory behaviour from both utilitarian and normative models of behaviour will be reviewed in an effort to understand how these theories conceptualize and explain participation at the individual and group level in knowledge-based communities of practice.

Critical mass theory and the public goods approach address the collective community phenomena and explain joining and contributing behaviour in terms of the reciprocal interdependence among members and a special incentive structure called the dilemma of public goods. An understanding of the dynamics of participation in a knowledge-based community of practice can also be gained by considering an individual members' joining process, their purposes of membership and patterns of participation. Therefore, an approach that looks at the process of participation from the members' perspective was also included in the study. Finally, in the fourth section, the rationale for the research hypotheses is described and presented.

2.1 Conceptual approaches to communities

2.1.1 Community

There is little agreement (yet) among scholars about what constitutes a community. The idea of community as a real or ideal form of social organization occupies an important position in social theory, especially as a tool for assessing the impact of social change and as a counterpoise to the idea of a mass society. In earlier sociological thinking, a community referred to a set of people sharing a place (or some other bounded space), an identity, certain norms, values and cultural practices. Its size was usually small enough for members to know or interact with each other. Other frequently cited features involve elements of status or hierarchy and social organization, if only informal. Bender and Kruger's (1982) definition of community provides a helpful benchmark: "A community involves a limited number of people in a

somewhat restricted social space or network held together by shared understandings and a sense of obligation. Relationships are close, often intimate, and usually face-to-face. Individuals are bound together by affective or emotional ties rather than by a perception of individual self-interest. There is a ‘we-ness’ in a community; one is a member”. (p. 12)

A continuing concept is whether or not a set of people should be treated as a community, social group or simply as a mass of isolated individuals (Ennis, 1961). To qualify as a community, members would need to show conditions of having boundaries, self-awareness, internal interaction, and systems of normative control (Ennis, 1961). This implies there is more to community membership than simply having access and being connected to a network. A community of practice is thought to have many of the features of physical communities, including identification, bonding, shared norms and outlook, even without any physical contact or real personal knowledge of the other members. Members of a community of practice can form close personal associations by participating in community exchanges and discussions. Some features of physical communities can be attained, including interaction, a common purpose, sense of identity and belonging, social support, sharing of resources and reciprocity, various norms and unwritten rules, with possibilities for exclusion or rejection in the community. There may also be rites, rituals and forms of expression. Communities of practice have the added advantage of being, in principle, open and accessible, while physical communities may have limited access.

There have been many attempts to characterize and to define the concept of a community and the descriptions have often reflected the disciplinary perspective of the authors. The three perspectives discussed below are sociological, technological and multidisciplinary perspectives of community.

Sociological perspective: For many years, sociologists have defined and redefined the concept of communities (Wellman & Gulia, 1999). Initially, communities were defined in terms of physical and geographic dimensions – size, location and boundaries. The spread of telephones, airplanes and automobiles have long meant that it was possible to establish and sustain important social relationships outside of one’s immediate physical neighbourhood. With efficient transportation and communication systems, people were able to join multiple communities to satisfy their different needs. The strength and type of relationship among

people became more promising criteria for defining communities than geographic dimensions (Haythornthwaite & Wellman, 1998; Wellman, 2001). Community is now understood not only in terms of physical proximity but also in terms of social networks over a distance.

Relationships that developed to satisfy strong, identifiable needs became particularly potent indicators of community. Wellman and Gulia (1999) conclude that communities of practice in fact meet any reasonable definition of community and that they are not a pale, artificial substitute for more traditional forms of community. According to Preece (2000), the focus on the patterns of social interaction that sociologists bring to communities of practice is a welcome counterbalance to much of the technological hype associated with communities on the Internet.

Technological perspective: In this perspective, the software that supports communities of practice is frequently used as a shorthand way of defining them. It is common to hear technologists use the terms chat, bulletin board, listserver, to refer a Web-based community. These terms are concise and instantly meaningful to insiders and they know immediately the basic structure of the supporting software and how it functions (Preece, 2000, pp 15-16). The language of technologists is of value to those in the know about technology-related issues, but says little about the social organization, interaction and communication within communities.

Multidisciplinary perspective: The report from a brainstorming workshop held at the ACM CHI Conference on the theory and practice of physical and network communities identified the following core attributes of communities (Erickson, 1996; Whittaker, Issacs, & O'Day, 1997, p. 137):

- Members have a shared goal, interest, need, or activity that provides the primary reason for belonging to the community.
- Members engage in repeated, active participation; often, intense interactions, strong emotional ties, and shared activities occur among participants.
- Members have access to shared resources, and policies determine the access to those resources.
- Reciprocity of information, support, and services among members is important.
- There is a shared context of social conventions, language, and protocols.

The need for repeated, active, public participation cited above as part of the second attribute is controversial. Some feel that without repeated public engagement there can be no community development. What does this mean? For example, is it the number of posts or some percentage of posts made by members to the community that is a measure of community?

Definitions of community in online spaces are changing to ones based on fewer and more superficial social interactions. The definition of community that was used in this research has four facets as described initially by Preece (2000)

- *People*, who interact socially as they strive to satisfy their own needs or perform special roles, such as leading or moderating.
- A shared *purpose*, such as an interest, need, information exchange, or service that provides a reason for the community.
- *Policies*, in the form of tacit assumptions, rituals, protocols, rules, and laws that guide people's interactions.
- *Computer systems*, to support and to mediate social interaction and facilitate a sense of togetherness.

2.1.2 Communities of interest

Wenger, McDermott and Snyder (2002) contrast the concept of communities of practice with weaker linked “communities of interest” and formal structures like departments and teams. The purpose of a community of practice is “to create, expand and exchange knowledge, and to develop individual capabilities” compared to the purpose of a community of interest that is, “to be informed” (p. 42). Membership in a community of practice is based on expertise or passion for a topic whereas in a community of interest, membership is open to whoever is interested. Brown and Duguid have proposed the term “networks of practice” to describe a community of interest. “Networks link people to others whom they may never get to know but who work on similar practices. People in these networks may have knowledge and practice in common. Nevertheless, most of the members are unknown to one other.” (p. 142) Membership links are usually more indirect than direct – Web sites, bulletin boards, listservs and so forth to keep them in touch and aware of one another. Network members do not interact with one another to

any significant degree, do not take collective action and produce little knowledge. They can though, share information relating to members' common practices quite efficiently.

2.1.3 Practice

Practice is defined as frameworks, ideas, tools, information, styles, language, and stories that are shared by the members (Wenger, McDermott, & Snyder; 2002). It is the way in which members of a community of practice work in their domain, in the past and in the present, through shared experiences, stories, tools, and ways of addressing recurring problems. This shared practice is dynamic over time because the world in which the members work changes. New people come to work in the community and others leave. They participate in a learning experience by working on new problems and ideas through discussions with practitioners about these problems and others beyond existing practices. Practice is the process and use-in-practice of these frameworks, concepts, language, tools and information involving dynamic learning within the context of practice that takes place while members collaborate on authentic tasks at work (Brown & Duguid, 1996a).

The *practice* activity in a community of practice is specifically geared towards learning and sharing knowledge and it is the value of the continuously evolving, socially distributed knowledge that seems to tie community members together (Orlikowski, 2002). Her emphasis on the productive aspects of practice in workplace studies builds on Giddens' (1984) structuration theory. By participating in this social world, people are shaped by their work experience and from their interpretation of the practice; they form a meaning of their world.

2.1.4 Community of practice

Communities of practice extend the concept of situated learning to groups that purposefully or coincidentally form for the objective of learning and advancement of knowledge in a particular area of concern to the members. Communities of practice are informal groups that manage intellectual capital (Lesser & Everest, 2001). They are emergent and social entities, whose reason for existence is learning to solve authentic problems (Wick, 2000; Wenger, 1998). Lave and Wenger (1991, p. 98) define communities of practice as "a set of relations among persons,

activity, and world over time and in relation to other tangential and overlapping communities of practice". "Communities of practice are groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis." (Wenger, McDermott, & Snyder; 2002, p. 4). They link people that have common interest and expertise in a certain area (Lipnack & Stamps, 2000). Wenger (1998) points out that communities of practice have always existed whether or not they received recognition and support.

Communities of practice are organic in nature, that is, they have lifetimes of birth, maturity, and death (Collier & Esteban, 1999; Wenger, 1998; Wenger, McDermott, & Snyder, 2002). Because of this organic nature, Wenger, McDermott, and Snyder (2002) describe communities of practice in very broad terms. For example, they can be small to very large, ranging from a few members to hundreds of members. Table 2-1 displays the broad ranges of characteristics that apply to communities of practice.

A community of practice is an organic entity, defined by its' voluntary membership and its' self-organized behaviour united around a common work practice. In a company context, it can be a group of people bound by a certain topic about which they are learning and groups of professionals with similar work responsibilities (Wick, 2000). It is a community of practice because it is about work activity not recreational time activity. However, this is a loose description because it doesn't make clear why professionals form a group. Hara and Kling (2002) state that, "communities of practice are informal networks that support professional practitioners to develop a shared meaning and engage in knowledge building among the members". In their description there is a flow from knowledge to practice and to groups of practitioners.

In Orr's account (1996) of Xerox copier service technicians, the work practice of service technicians revolved around working on and talking about copiers to the point whereby the work practice and conversations about working on copiers became inseparable. The service technicians' "know how" to diagnose and repair copiers is not the same as his/her "know that" which may be data, factual information and knowledge. The copier service technicians were able to put the "know that" knowledge into practical use on the job (Orr, 1996). In the

communities of practice studied by Brown and Duguid, (2002) “the talk made the work intelligible, and the work made the talk intelligible. As part of this common work-and-talk, creating, learning, sharing, and using knowledge appear almost indivisible. Conversely, talk without the work, communication without practice is, if not unintelligible, at least unusable.

Table 2-1: Definitions of communities of practice in the literature

<p>Pan & Leidner (2003) Osterlund & Carlile (2003)</p>	<p>A CoP is defined as people bound by informal relationships that share common practices. A CoP is not defined in and of itself (or certain essential characteristics of its members), but through the relations shaped by its practices. CoPs are, thus, probabilistic constructs that should not necessarily be conflated with reality.</p>
<p>Wenger, McDermott & Snyder (2002) Wheatley, (2002)</p>	<p>CoPs are groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis. The concept ‘community of practice’ was developed to illuminate that learning is a social experience. We humans learn best when in relationship with others who share a common practice. We self-organize as communities with those who have skills and knowledge that are important to us.</p>
<p>Hara & Kling, (2002) Andriessen, (2002)</p>	<p>CoPs are informal networks that support professional practitioners to develop a shared meaning and engage in knowledge building among members. CoPs are distributed groups of professionals belonging to separate departments that have a common field of work for which they exchange or develop knowledge.</p>
<p>Wenger, (2001) Wick, (2000)</p>	<p>A CoP is a group of people who share an interest in a domain of human endeavour and engage in a process of collective learning that creates bonds between them. CoPs are groups of professionals with similar task responsibilities.</p>
<p>Collier & Esteban, (1999) Wenger, (1998)</p>	<p>CoPs employ active participation and decision-making by individuals, as opposed to separated decision-making that is present in traditional organizations. CoPs are the social fabric of learning through negotiation of meaning, preservation and creation of knowledge, spreading of information, and as a home for identities.</p>
<p>Sharp, (1997) Brown & Gray, (1995)</p>	<p>A CoP is a special type of informal network that emerges from a desire to work more effectively or to understand work more deeply among members of a particular specialty or work group. They are peers in execution of ‘real work’. What holds them together is a common sense of purpose and a real need to know what each other knows.</p>
<p>Lave & Wenger (1991)</p>	<p>A CoP is a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice.</p>

Become a member of a community, engage in its practices, and you can acquire and make use of its knowledge and information. Remain an outsider, and these will remain indigestible.” (pp 125-126). Members of communities of practice do not necessarily need to be collocated as they can be distributed throughout different departments and geographic locations of the company (Andriessen, 2002). Communities of practice are made up of different members that have different worldviews and communal meaning has to be negotiated. This is a regular, day-to-day, practice that changes the meaning of the stories, the tools, symbolic terms, concepts, and, more generally, the way of working of the community (Wenger, 1998).

Organizations are dynamic systems formed by people - new people enter the organization, people change their position, and eventually they may leave the organization. In this dynamic sense, communities of practice are probabilistic constructs based on the relations shaped by work practices and these may not be the same as found in the formal organizational hierarchy (Osterlund & Carilie, 2003).

Communities of practice work because members interact with each other. Members focus on a domain of shared interest through a shared practice rather than through formal hierarchical status relationships.

The three characteristics - domain, community and practice - are the building blocks of communities of practice according to Wenger McDermott, and Snyder (2002). In their *domain* of shared interest, members can be distinguished from non-members by their level of knowledge, expertise or competence. Within the domain of shared interest, people form relations with each other, engage in joint activities and discussions, help each other and share information. The interaction of people is the crucial point; as long as people have the same kind of job or interests but do not interact with each other they do not form a *community* of practice. There must be a community of people, in which the community has an adequately informal environment for its members to have confidence to ask questions, share ideas, and show ignorance without fear. The community must also contain a *practice*. Practice is defined as frameworks, ideas, tools, information, styles, language, and stories that are shared by the members (Wenger, McDermott, & Snyder, 2002). However, practice is the process and use of these concepts, involving dynamic

learning within the context that takes place while members collaborate on authentic tasks (Brown & Duguid, 1996a). Practice in a community of practice is specifically geared towards learning. Wick (2000) adds that it is not knowledge itself that is so valuable, rather it is the ability of an organization's members to generate knowledge and innovate using that knowledge; in other words, practice.

Communities of practice can serve several functions for members: gather and organize knowledge within the work domain, help upgrade members' knowledge and communicate knowledge that members use every day. In doing so, communities of practice act as knowledge stewards by hosting community forums that enable members to connect with the community, to share and to develop new knowledge and, in some cases, to verify current work practices.

2.1.5 Summary

Current literature stresses the organic nature of communities of practice, and how their continuity exists by remaining within ranges and not drifting too much into the extreme areas of these ranges. The distinction between online and physical communities is becoming increasingly blurred (Lazur & Preece, 1998). Communities that are now described as either solely offline or online will likely become less common in the future as greater numbers of people gain Internet access. As noted by Preece, a lack of physical presence online is still seen as a problem for text communication as one loses the nonverbal cues, like facial expressions and gestures that are obvious in interpersonal communication. Attempts to solve this problem have occupied technologists with various types of emotional icons however textual communication is still the default medium of communication (Preece, 2000, p. 13).

Participation in communities of practice can take a variety of forms but the dominant form uses text messages for posting communication exchanges among participants. Text message exchanges can be made in public within the community and made in private outside the community directly to the recipient.

The most popular method for analyzing an online community is to focus on the communication within it (Eveland & Bikson, 1988). Communication records are archived on message servers as persistent conversation (Erickson, 1999) and this capability enables researchers to objectively analyze patterns of communication within the community by using methods such as content analysis (Eklundh, & Rodriguez, 2004), social network analysis (Rice, 1994) and genre analysis (Orlikowski & Yates, 1994). But focusing only on the internal communication captured on message servers misses much of the potential value of non-public participation in the community of lurkers or passive participants. In one recent study of the roles and the effects of lurking (Takahashi, Fujimoto & Yamasaki, 2005), the authors concluded that lurkers could not be neglected in an evaluation of the value of online communities in a firm because they have a strong and wide influence outside of the online communities.

One means of evaluating passive participation in the community is to ask questions of public and passive participants through an online survey (Andrews, Nonnecke & Preece, 2003). Other methods have also been used successfully. Nonnecke and Preece (2001) have used semi-structured interviews to investigate why lurkers lurk and have classified the results according to a gratification model showing lurkers' needs and the most-mentioned reasons for lurking.

2.2 Theoretical approaches

2.2.1 Normative social theory

The emphasis in normative theory is about how socially communicated and relatively arbitrary beliefs of members affect joining and public participation in communities of practice.

Explanations that emphasize social norms focus less on the objective value of an innovative communication technology and more on the communication contexts and processes through which potential joiners learn about and develop attitudes toward it (Kraut, Rice, Cool & Fish, 1998). People may be persuaded directly by associates in a formal workplace who use the new technology and they may also be influenced indirectly through work associates behaviour or conversations, with the result that they think positively or negatively about the benefits of using a new system. Furthermore, social learning theorists maintain that people are influenced by observing or hearing positive things about other people's experience with an innovative

technology and consequently be favourably disposed to use the innovation (Bandura, 1977). For many years, professional sales representatives have long recognized this effect and it's an important reason why they solicit reference letters from influential people in social structures to favourably influence potential customers about a new technology. A person of higher status and authority in an organizational structure would offer a stronger and more influential reference than someone of lower status and less authority. In a workplace, people's attitudes and behaviour are influential by how media is perceived and used. Media use behaviour becomes shaped by others' overt statements about media and by vicarious learning -- learning that is experienced and realized through sympathetic participation in the experience of others. Rogers (1983) has shown how the adoption of technical innovations in agricultural products and practices, spread faster when influential farmers in a social network acted as test and demonstration sites to other members in the social structure. Besides influencing who and how many people may adopt an innovation, normative processes may also shape the manner in which technology is used. For example, in the early stages of development, members of communities of practice might not know what is considered acceptable behaviour or the depth and breadth of knowledge coverage expected of participants. Over time however norms develop to govern community behaviour. Community norms can be influenced by membership in the company and in ones' profession and these norms will most likely be negotiated over time and settled among members. The attitudes and behaviour of members in a work environment are influential in how communication technology is perceived and used.

2.2.2 Social influence approach

A social influence approach explains participatory behaviour in communities of practice by looking for common patterns of joining and communication behaviours within a group. This approach considers group norms to be influential but not deterministic of members' behaviour. Members' participation behaviour can be both constrained and influenced by social norms of the group depending on the situation. An example of an individual level of analysis of participation is the Fulk, J. Schmitz, J. & Steinfield, C. (1990) application of social influence theory to explain patterns of participation in communities of practice. The immediate antecedents of participation are the individual's perceptions and evaluation of the community as well as the individual's perceptions and evaluation of the task requirements involved. These

perceptions and evaluations are subject to social influence. The central premise of Fulk's et al., (1990) is that social context plays an important role in media-use behaviour and that media perceptions are, in part, "subjectively and socially constructed" (Fulk et al., 1990, p. 121). In their model, social context was operationalized as processes of social influence. These authors criticize traditional research on media use by pointing to some faulty assumptions that:

1. each medium has fixed characteristics and these objective characteristics are salient to users
2. individuals choose media through a rational, cognitive-matching process by assessing the requirements of the task at hand and by selecting a medium with the communication capabilities that match these requirements
3. individuals make independent choices and interpersonal context does not play any role in the decision-process
4. communication behaviour is optimal and efficiently motivated

2.2.3 Reciprocal influence approach

This explanation of participation in communities of practice maintains that it is the communication structure and the communication network that influences patterns of joining and participation and vice versa. A communication structure is the pattern of linkages between people and organizations and the structure addresses the formation, maintenance and dissolution of these linkages. A communication network consists of interconnected individuals who are linked by patterned communication flows (Rogers & Kincaid, 1981). The interplay among interaction patterns and media practices are highlighted in Contractor and Eisenberg's (1990) recursive model of reciprocal influences between media use and social structure. Social context is operationalized in terms of a communication network theory.

This theory specifies how individuals' perception and behaviour with new media are shaped, and how in turn, their patterns of media usage affect social network participation and the network structure. For example, 'key communicators' are important shapers of media perceptions. Having access to a broad range of contacts, they are exposed to new information about new media and being prominent in a given communication network and they are well

placed to introduce these ideas to it. In turn, access to media influences the prominence of individual's communication network.

Media use can change the structure of networks by changing existing boundaries. Markus (1990) has also discussed the issue of reciprocal interdependence among users in relation to the joining and participation process. Prospective and new members of the community of practice need to know that they will have sufficient and relevant communication partners. If these conditions are absent there will be a risk that the communication and discussion will not only fail to spread but will wither and die out. Reciprocal interdependence among members also has another referent besides the joining process and that is the community interaction process among members. Some researchers maintain that it is this interaction process from message exchanges that draws people into the discussions and to contribute messages. Each message has the potential of accomplishing two goals: to communicate content and to stimulate the responsiveness of visitors and passive participants (Rafaeli & La Rose, 1991; Rafaeli, Ravid, & Soroka, 2004). A more interactive community of practice setting is likely to increase participation.

2.2.4 Participation as a multilevel phenomenon

Participation in a community of practice can be conceived as individual behaviour or as an emergent process occurring at the community level. Joining and posting messages can be explained either by looking at attributes of individuals or by looking at the relationships among individuals in a community. According to the social theorist and leading structurationist, Anthony Giddens, "Human social activities, like some self reproducing items in nature are recursive. That is to say, they are not brought into being by social actors but continually recreated by them via the very means whereby they express themselves as actors. In and through their activities agents reproduce the conditions that make these activities possible." (Giddens, 1984, p. 2). An example of a community level of analysis of media use (participation) is Contractor and Eisenberg's (1990) structurationist approach. The focus of this approach is on how patterns of usage affect participation in a social network and the network structure and vice versa. Structurationists see social interaction as a kind of prism through

which individual and community ends are refracted to create social reality. Likewise with the relationships between communication structure and the uses of organizational media - each shapes the other in an emergent pattern of mediated and non-mediated social interaction.

Fulk et al (1990) application of social influence theory provides an individual level of analysis to explain media use and patterns of participation. Before an individual decides to join and to participate, he/she will evaluate the medium and their perception and evaluation of the task at hand. These perceptions and evaluations are subject to social influence. The focus of this approach is on how patterns of usage affect participation in a social network and the network structure and vice versa.

The focus of my study is the community level of analysis because it is the community phenomenon that distinguishes contributing behaviour as well as highlights the importance of reciprocal interdependence among members for message contributions to the community of practice. Prospective and passive members of a community of practice need to know that they will have relevant and sufficient communication partners. If these conditions are absent, there is a risk that group communication will not only fail to spread but will wither and die out.

2.2.5 Utility theory

Utility theory emphasizes that participation in a community of practice is driven by the relative and objective benefits that members derive from their participation, or experience within a community. Two approaches within utility theory are of interest in this study: externality and contingency. An externality approach is essentially a social theory because it lays stress on how the number of members participating will affect the utility value for the whole communities of practice. Details of an externality/critical mass approach will be discussed below in section 2.3.4. A contingency approach emphasizes the fit of stable features and its' functionality with the communication tasks it needs to support, e.g. ease of use of an interface design. According to contingent, utility models of the diffusion of innovations, people will adopt new technologies when the benefits of adoption and use exceed the costs, e.g., a favourable benefit to cost ratio (Rogers, 1983; Tornatzky & Klein, 1982). However, some of the value of communities of practice is intrinsic and is derived from a stable set of features and

functions and how these fit the member's communication tasks. These may be social features of the community discussion as well as the technical features supporting the ease of communication within the community of practice. Examples of some features are interactive or asynchronous messaging, one-to-one messaging or one-to-many messaging, message storage and retrieval features and other factors.

2.2.6 Media richness theory

There may also be other less objective features that affect joining and public participation. A central thesis of Daft and Lengel's media richness theory (1987) is that communication effectiveness will improve if the medium chosen matches the information processing requirements of the task. From this theory one can also derive predictions of the choice of medium that members will make. For example, members who have unequivocal or unambiguous work to perform should find text-messaging mode of communication in communities of practice appealing. All else being equal, media richness theory predicts that members with more complex and unique tasks to get done will use a medium better suited to their purposes -- one that affords more visual clues and nonverbal feedback (e.g. in person meetings or video conferences).

2.2.7 Critical mass theory and public goods approach

Personal costs and benefits derived from the use of an innovative, information technology and or participating in a community of practice are not static -- costs and benefits have a social dimension that is likely to change over time. The number of people who purchase a system, who subscribe to a communication network and who begin using the new technology to communicate on the network, will have a positive affect on the costs and benefits of ownership and usage for members of a community. Larger communities have the potential of more members to receive messages and to contribute messages. Within larger communities, one could also expect to find more people with similar interests as well as greater content diversity in the message topics.

Communication may be considered as social behaviour between and among people. If communication costs are calculated according to the quantity of messages read, posted and received within a community, the higher the message volume the lower the cost per message processed. Across many kinds of innovative technology, costs are lowered and benefits increased as more people join or subscribe to an interactive community. The market availability and the number of various software add-ins and extensions typically increase as the total size of the market expands for a software application. Economists describe this phenomenon as *positive externalities* (Samuelson p. 891) while researchers in information systems often describe the same phenomenon as a *critical mass* of participants or users. The concept of critical mass been applied in different fields of inquiry and in different problem areas. It has been used to explain success or failure of the adoption of communication technology; for example, of a BITNET communication network in major universities in the USA (Rice, 1994) and of an electronic messaging system by a US government office (Rice, Grant, Schmitz, & Torobin, 1990). Critical mass has also been used to explain participation in computer-supported cooperative work (CSCW), groupware systems (Ackerman & Starr, 1995) and the adoption of video telephony (Kraut et al, 1998). According to Schelling (1989), the concept shows up in studies about fashion, epidemiology, survival and extinction of species, language systems, jay walking, political movements and virtual communities, etc.

This use of the concept of critical mass developed historically to explain the adoption and growth of telephone services in a community. A telephone call was placed in expectation that a conversation would take place or the call will be returned. In this respect, a telephone conversation and or a returned telephone call were reciprocal communications. The value of renting a telephone service was positively related to the number of people you wished to contact who also had access to the telephone service. As a social communications technology, the growth of telephone users was impacted by the number of people in a community one wished to speak to who also rented a telephone. The more people in a community who had telephones, the more people one could speak to and the value of telephone service was largely a function of the size of the community one could make calls to and receive calls from. In communities of practice, message contributions correspond to efforts to reciprocate communication among members.

Positive externalities are especially important to participation levels in communities of practice. The ability of members to communicate with others within the community of practice is intrinsic to their value and viability. Markus (1990), Nonnecke, Preece and Andrews, (2004), Rafaeli (1991, 1993, 1998, 2004) and others, have theorized that the value of a communication system rises as a “critical mass” of members begin to interact by posting new messages and by responding to each others messages. The size of critical mass required to develop and sustain public participation may vary depending on the purposes of the community. Potential members of a community of practice may perceive a community worth joining and contributing to if there is a sufficient number of members and enough relevant activity to make it interesting and worthwhile to join and to participate (Markus, 1987; Morris & Ogan 1996; Rice, 1994).

Too few members, and there will not be sufficient duration and quality of discussion to retain members interests and to draw them back another time. In this regard, there exists a reciprocal interdependence among members of a community of practice. Early joiners influence late joiners in terms of their message contributing behaviour and their interaction within the community discussions. In the marketing literature, this phenomenon is referred to the affect early product adopters have on late product adopters. For most innovations, late adopters are influenced by early adopters but not vice versa. Work associates already using a specific software application, for example, are more influential to a new associate deciding to use this software application than the potential number of users at some time in the future.

In an interactive community of practice, influence goes both ways: early joiners and message contributors can be influenced by later joiners and message contributors and vice versa. If early joiners do not have their messages reciprocated or if only a few follow them into community membership, they can leave, thus beginning a process of membership decline and exit. On the other hand, if early joiners have their communication responded to and new members participate; early joiners can be stimulated to stay and to increase their participation. They in turn will generate more benefits to potential and current members thus beginning a cycle of

attracting new members and growth in the community. Passive participation or lurking may also not prove worthwhile unless there is a critical mass of members to generate interesting content (Morris & Ogan, 1996; Nonnecke & Preece, 2003). Thus, according to an externalities account of participation, the most important influence affecting members' participation will be the total number of people of interest that active participants (joiners and message contributors) can reach within communities of practice. Conversely, as people cease to participate in the community discussion, its' potential value drops for the remaining community members.

Member of a community of practice share a reciprocal interdependence with respect to message contributions. Reciprocal interdependence means that individual members cannot achieve the potential benefits offered by participation on their own. Besides the joining process, reciprocal interdependence among members can also impact the public community interaction process. Some researchers trying to explain participation in online communities have highlighted the online interaction itself as the attraction that draws people in to contribute messages (Rafaeli & La Rose, 1993) Each message contributed has the potential to communicate content and to stimulate passive participants and browsing transients to respond. A more interactive community of practice is therefore more likely to increase participation.

In the case of competing communities, one community is likely to drive out or predominate over the other because each additional member increases the potential value of the community to new and current members. While social scientists have observed the existence of tipping points associated with network externalities, there currently is no widely accepted theory to predict when they will occur. (Gladwell, 2004; Katz and Shapiro; 1994; Schelling, 1970, 1976). Critical mass is dynamic, changes over time and is likely to become a self-reinforcing mechanism within the community. For example, telephone networks and communities of practice gain value as they connect more people, and systems that are equivalent to each other in functionality (e.g., software, interface, usability) are more likely to compete for participants on the basis of the number of members they can connect. Indeed, Markus takes the view that participation on bulletin boards and list servers may be an all-or-nothing affair. "Either usage spreads to all members of the community, or no one will use the medium for communication

within the community because no one started using it or because early users defected” (Markus 1990, p. 199).

Critical mass has been described as “a small segment of the population that chooses to make big contributions to the collective action while the majority do little or nothing” (Oliver et al., 1985). “Big contributions” in this reference may refer to size, volume, or frequency of public contributions while the reference to “little or nothing” refers to passive participation. A critical mass approach addresses the joining process in a community of practice. The main question in this approach is: what are the factors determining the likelihood of the joining process spreading from early joiners to the whole community of practice? (Markus, 1990) Three principal concepts in this approach are: 1) public goods, 2) group collective behaviour and 3) critical mass. According to Markus (1990) public goods are “benefits that individuals cannot be prevented from enjoying, whether or not they helped to secure them”. Collective action is member efforts to create or obtain public goods and it concerns the degree of activity or passivity that can be attributed to members’ participation (Eastman, 1998). Individual choices of media, attention and response may also be more or less active, in terms of degree of motivation, attention, involvement, pleasure, critical or creative response, connection with the rest of life, etc. There appears to be an implicit tendency in the IS literature, to view active media use as “better” than passive.

Markus (1990), maintains that the key factors influencing joining rates and membership growth in an “interactive medium” like communities of practice are:

- costs born by participants - the time, effort, attention, and discipline required
- heterogeneity of participants
- variation in knowledge contributed by and available to members (heterogeneity of knowledge) through participation.

Costs that are borne by participants and affect message contribution behaviour are the

- time used for browsing, reading, posting
- effort made to prepare and compose messages
- attention, personal discipline and readiness to share ideas and to reciprocate posts

Markus theorizes that higher contribution costs will lower the level of message contribution. Passive participants incur some of these costs but do not commit as much time and effort to participate as public participants in knowledge-based communities of practice.

The heterogeneity of participants increases the likelihood of joining and contribution because of the differential ability to derive benefits and to contribute knowledge resources increases the likelihood that there will be some people more willing to contribute than others. A group of highly interested and resourceful people willing to contribute, even if others do not, may get message contributions started and flowing. Successive contributions increase the possibility of more members obtaining benefits and more members contributing, and thus becoming frequent participants in the communities of practice. The benefits of public participation increase with the number of active participants therefore getting higher contribution rates and higher rates of new members joining is more likely in larger groups.

Another implication of the viewpoint that the value of an information system depends on the number of people it connects is that organizational structure and a potential member's location within this structure may be crucial factors in explaining joining and continuing participation in communities of practice. Community members will benefit more from participating in a community of practice if other members who are important to them (in terms of their pool of knowledge resources) contribute to the community of practice, than if others, who are perceived to have less valuable pool of knowledge resources, contribute messages to them. A study by Rice et al. (1990) shows that adoption of an email system is strongly determined by the others with whom one communicates in a work group or network to share ideas and to complete tasks before implementation of the system. The relevant referent group may be defined by formal organizational membership in (Xerox Eureka) or through patterns of most frequent communication behaviour (IBM).

2.2.8 Public goods approach

Public goods benefit all members of a community regardless of the costs born by certain individuals or groups to obtain or produce them. The distinction between public goods and private goods has nothing to do directly with whether goods are paid for with public money. Rather, the nature of public goods hinges on two critical properties: (1) a public good is *nonrivalrous* in consumption, and (2) a public good is also *nonexcludable*. These two properties have significant implications for participation in communities of practice because the knowledge exchanged in an online discussion benefits all members of the community not only the intended receiver of the message. Its' value is not diminished by the number of community members who will read and benefit from the knowledge it contains. In contrast, private goods like food or medicine, whether consumed by a person or a group of people, do not exist after consumption any longer for public benefit. (Samuelson, Nordhaus & McCallum, 1988; Graves, 2003).

The properties of messages contributed to communities of practice may be viewed as public goods. Individual contribution to a public good is based on a special incentive structure embedded in the nature of public goods called the dilemma of public goods. A dilemma of message communication that becomes a public good, within the context of communities of practice, is that the communication content is available to all members of the community regardless of whether or not individuals contributed effort, attention or knowledge to create the community message resource. Thus, the incentive to contribute knowledge resources to the community (and by doing so increasing the likelihood of getting the whole community to participate) is minimal, and an economically rational member would tend to withhold making knowledge contributions to a public good. In light of the benefit of the communication content being available to all community members regardless of time, effort and attention expended by individual community members to make contributions, this situation can lead to a free riding phenomenon whereby many members benefit from the efforts of a few members.

Passive or non-public participants are those members who do not make their knowledge public to the community. These members have the same access to the ebb and flow of knowledge posted to the community discussion as active participants who make public their knowledge and ideas

by posting messages to the community. In the worse case scenario, if all members were to remain passive participants and to refrain from contributing their knowledge to the public discussion, there will be little or no knowledge content in the community of practice and a situation described as the “tragedy of the commons” may result. Member public participation is critically important to success of communities of practice because it’s message contribution behaviour that forms the foundation on which thriving and flourishing communities of practice are built. A critical mass theory of public goods was chosen because it models this reciprocal interdependence among members of communities of practice for community message content.

2.2.9 An application of public goods-based theories - laboratory and field studies

In 1990, Thorn and Connolly conducted an experimental study of public goods theory. They tested hypotheses in a laboratory experiment with a number of small groups (4-8 students per group). Participants were given the role of a production manager in charge of the agricultural production of an imaginary country. Participants could contribute their estimates of consumer demand in their own country to a database, available to other players, and they incurred a charge for doing so. Participants also had access to a common database of information about the demand of each nation. Estimated country demand were estimates made by other participants. The researcher’s predictions were confirmed: the higher the group’s contribution costs the lower the rate of contribution. Another finding was that the variation information contributed (asymmetry in the quality of resources) and lower benefits to members reduced the contribution rate. The group size prediction however was not confirmed and the researchers explained this absence as a result of the small group size in the experiment. The subjects were a small group of undergraduate college students and the costs of contributing affected their contribution rate. Their study confirmed an economic relationship between price charged and quantity demanded however the more interesting finding was the relationship between the asymmetry of resources and benefits and the reduced contribution rate. One criticism of the study was the small number of participants - the study would have had more external validity if it had a larger number of students in each group.

Rafaeli and La Rose's (1991, 1993) early field studies of electronic bulletin boards were the first to apply public goods-based theories to this area of communication research. To combine the two theories they developed a concept of media success that was defined in terms of adoption, contribution, usage and longevity. Rafaeli and La Rose derived four hypotheses from public goods theories:

H 1: "Bulletin boards success will be negatively related to access restrictions placed on users" (Rafaeli & La Rose, 1993; p. 382).

H 2: "Bulletin boards success will be positively related to the diversity of content available" (Rafaeli & La Rose, 1993; p. 382).

H 3: "Group size will be negatively related to other measures of bulletin board success" (Rafaeli & La Rose, 1993; p. 383).

H 4: "Symmetry in contribution levels will be positively related to bulletin board success" (Rafaeli & La Rose, 1993; p. 383).

They operationalized dependent variables as follows:

- *contribution level* as the ratio of files contributed or uploaded in a week to the total number of weekly file transactions;
- *adoption rate* as the ratio of regular users (who call at least once per week) to the total number of users;
- *longevity* as the time that the board was in existence;
- *usage* as the average number of calls per day.

Independent variables were operationalized as follows:

- *ratio restrictions* as a dichotomous variable, scored 1 if the board operator has upload-download restrictions, 0 if not;
- *content diversity* as the percentage of the board content that was not computer related; *group size* as the total number of users;
- *symmetry* as the percentage of users characterized by the board operator as being "givers" or "exchangers" (sharing resources or participating in a fair exchange) as opposed to "takers" (those looking for something for nothing).

It is important to note that all of these measures were not direct measures and were estimates by the board operator about the users. Data were collected through a questionnaire and uploaded to the system operator for the sample. The findings of their study partially supported two of the hypotheses. Concerning hypothesis 2, Rafaeli and La Rose found that contribution levels were significantly related to diversity of content; the relationship between diversity of content and longevity was in a predicted positive direction but was not significant. A negative relationship was found between diversity of content and adoption and usage. In regards to hypothesis 4, they found that symmetry in the exchange was positively related to the four measures of bulletin board success but the relationship was statistically significant only for contribution level and adoption rate. The authors concluded that public goods theory better predicts contribution levels than other theories of successful participation in bulletin boards.

2.2.10 From information - centered to user-centered

Traditionally, users of technology have been studied in terms of their demographic characteristics, psychological characteristics, their access to technology and their technological literacy, and other factors. This viewpoint about users corresponds to the transmission-oriented and objectivity-oriented models of communication whereby “sources are seen as creating, storing, and retrieving messages and disseminating them to receivers” (Dervin, 1989; p. 217). Dervin holds that media and messages cannot be understood merely as channels for conveying information and that meanings are not transmitted from head to head. Further, she criticizes what she calls the concept of absolute information; that is, information conceived as existing independent of the observer, as a commodity rather than a process. Dervin maintains that meanings are co-constructed in the process of communication. For these reasons, it seems important not to neglect the experiences of individual members of a community of practice in order to capture the specificity of communities of practice. I also consider it necessary to uncover members’ purposes in joining and their patterns of participation in order to better understand the ebb and flow of participation in knowledge-based communities of practice. A theoretical approach focusing on members’ views in conceptual terms as well as in methodological terms was selected.

New ways of studying participation may be necessary for knowledge-based communities of practice wherein the knowledge community is both the creator and the receiver of the message communication. Other communication researchers (Dervin, 1989; Preece, 2000, 2002) advocate an approach that focuses on users' perspectives and their use and understanding of the medium. Dervin's approach (1989) brings into focus participation as a socially situated process and looks at the process from a member's viewpoint. She developed an approach that enables research to move from questions arising from observers' perspective (that leaves out the experiential world of users) to questions arising from actors' perspectives. Dervin began with the assumption that the uses a person makes of an information or communication system arise from their intention of making meaning, of making sense and of bridging gaps in their knowledge. She also developed categories that enable investigation of "universals" of human experience in relation to communication. These alternative categories involve entering the world of users from the inside, from the actors' situations. The categories are:

- a) the actor's situation - category designed to understand what in a situation induces a person to use a communication medium;
- b) gaps in sense making - category designed to uncover gaps that the communicator is attempting to bridge;
- c) actor-defined purposes - category that deals with the actor's expected outcomes from using the system;
- d) information-using strategy - category referring to strategies for seeking and using information;
- e) information values - category designed to describe the user's criteria for evaluating information;
- f) information traits - category referring to the information characteristics that would match the users needs.

These open categories are a tool enabling an exploration of members' day-to-day usage from their own perspective and they are particularly appropriate for investigating the process of joining a community of practice because they ask questions of why members participate and how they interact within a community of practice.

2.2.11 Summary

Two levels of analysis were considered to study participation in communities of practice. At the group level of analysis, a public goods based approach was decided because it models one important characteristic of membership growth: the reciprocal interdependence among members. Critical mass theory explains joining and contributing behaviour in terms of an incentive structure called the dilemma of public goods. It considers the importance of members' diversity of knowledge resources and the size of the community of practice as independent variables that influence members' joining and message contributory behaviour. At the individual level of analysis Dervin's (1989) approach to study of media participants was applied because it allows for an understanding of participation behaviour in communities of practice from actors' perspectives.

Chapter 3

RESEARCH AND SURVEY DESIGN

Research design is the plan and structure of investigation so conceived as to obtain answers to research questions. A research design expresses both the structure of the research problem and the plan of investigation used to obtain empirical evidence on relations of the problem. (Kerlinger, 1986; p. 279)

In this chapter I describe the research design as a descriptive case study with some exploratory elements to the inquiry. Aspects of community membership are described from categories of questions developed to explore how members discovered the community and their expectations for joining, modes of participation, message contribution, membership stability, type of involvement in the community message exchange, their sense of attachment and membership stability in the community. The chapter begins in section 3.1 with a discussion of the formation of the research question that the study seeks to answer. Since a defining feature of a community of practice is that the membership is the primary source of communication content as well as its receiver, it follows that public message contributing behaviour and the factors regulating this behaviour should become the principal focus of the inquiry. The theoretical basis of the study is reviewed briefly in section 3.2 to explain how the structure of the research problem affects and guides the selection of sources and types of information in the research design. In section 3.3, the research design and data analysis will address the collection, measurement and analysis of data, in sections 3.4 and 3.5 the web-based survey is described in some detail and finally the research methods and analysis are described.

3.1 Formation of the research questions

The concept structuring this study is public participation in a community of practice. Since the defining feature of communities of practice is that the membership is the primary source of communication content as well as its receiver, it follows that public contributing behaviour and the factors regulating this behaviour should become the focus of the study. Participation can also be viewed as the outcome of joining a community of

practice. Questions about how participants become members of these communities; their purposes in participating and their patterns of public participation in the community – were also important in understanding participation in communities of practice. An understanding of member’s experiences from the inside, from the actor’s perspective was also necessary since the question “what leads members to contribute to the community” had been framed within a theoretical approach centered on group interaction – an observer perspective.

3.2 Theoretical approaches to the research problem

Media use is known to be a function of a number of facilitating factors, such as media accessibility, availability of communication partners, experience with the medium, personal style in using media, time and cost advantages, and communication task requirements (Funk, Schmitz & Steinfield, 1990). Media use theory proposes that individuals choose media through a matching process that involves assessing the requirements of the particular communication task at hand and selecting a medium with communication capabilities that match these requirements. Efficient communication takes place when the match is perfect: the medium has neither more nor less capability than the task requires. Furthermore, individuals are understood to be making rational choices in their selection of communication medium. Daft, Lengel and Trevino (1987) have described some determinants of individual media utility in their media richness theory (MRT). It is founded on the assumption that individuals, groups and organizations process information to reduce uncertainty and unequivocalty (Davis, 2006, Galbraith, 1977). Uncertainty is “the difference between the amount of information required to perform the task and the amount of information already possessed,” and the equivocality is defined as the ambiguity inherent in the task caused by conflicting and inconsistent interpretations and expectations. From an MRT viewpoint, communication media are arrayed along a continuum to remain ambiguous to disambiguate. “Information richness” is based on six criteria: speed of feedback, types of channels employed, personal source, richness of language carried, context and formality. A face-to-face meeting between participants is “rich” because gestures, facial expressions, surrounding contexts, and

other sensory cues provide rich supplementary information beyond the spoken or written word. Richness is characterized by the ability to provide feedback, multiplicity of cues, variety of languages usable, and ability to provide personal focus. In this theory, a hierarchy is presented from the richest media, which is face-to-face, to telephones, to written, addressed documents; and to the least rich media, unaddressed documents. MRT has been applied to explain preferences between email and voice mail (El-Shinnawy & Markus, 1997), and between different technologies for computer-supported workgroups (Burke, Aytes & Chidambaram, 2001). The key criterion for media choice is message ambiguity. Ambiguous tasks should be completed using rich media while unambiguous tasks require lean media. Individuals are understood to be rational and efficient in their choices of matching the medium selected to the ambiguity of the communication task.

Media richness theory is a highly acknowledged theory for agents' media choice that focuses on the fit between the task and the medium. An alternative class of research focuses instead on availability of communicators and social environment as determinants of media choice (Markus, 1987, Saunders & Jones, 1992). Important within this class is task closure theory (TCT). This theory posits that the ability to effectively "close" a task is a key driver for an individual's media preference and adoption (Parrish, 2006, Straub & Karahanna, 1998). In particular, the availability of the recipient and the sense of social presence supported by the medium affect the perception that the task is closed. For example, closure is achieved by clicking on the "send" button in email. In contrast to MRT, face-to face may not be preferred, not because of costs, but because closure cannot be achieved unless the recipient is available. The basis of this theory is that enhanced ability to achieve closure will lead to lowered task fragmentation and job stress. The need for closure however may be moderated by the degree of social presence deemed required. For example, as much as it may be desirable to bring closure to an unpleasant task such as delivering bad news to an employee, it is not socially acceptable to do so via email or voice mail. Task closure theory has been applied to explain preferences and adoption of email (Karahanna & Moez, 2000) and groupware (Robertson, Sorensen & Swan, 2001). By combining elements from these two theories, we can extract the following factors that affect adoption of information technologies:

- From media richness theory – feedback capability, multiplicity of cues, language variety, personal focuses and cost in terms of time, effort, attention and discipline.
- From task closure theory – recipient/participant availability and social presence.

Another means of exploring use of media has been recommended by Rice (1984, 1992). He recommends dealing with new media like bulletin boards and newsgroups at a group level of analysis rather than at an individual level of analysis. Agreeing with his recommendation, a public goods-based approach to participation in communities of practice was decided upon to frame the contribution behaviour question. In doing so, I followed in the steps of research by Rafaeli and La Rose (1993) who used this framework for studying public participation in electronic bulletin boards.

A central concept in a public goods approach to participation is the reciprocal interdependence of members in an interactive community (Markus, 1990, 1994). Joining and contributing behaviours are considered to be a relational phenomenon resulting from an incentive structure in the community. Individual public contributions or lack of contributions result in community outcomes: more participants become members and/or contribute messages to the community or to the disappearance of the community. When an individual participant contributes public messages s/he creates benefits for the other participants and his/her contribution increases the likelihood of further contributions by other participants. However, the ongoing utility of public contributing behaviour has a cost that is borne by the individual participant. Since the individual participant could enjoy the benefits of other participants' message contributions without having to invest one's time, effort, attention and knowledge, an individual's effort utility to participate will be low. A rational, economic participant is more likely to follow a strategy of withholding his/her public message contributions.

The economic bias in this conception is that it considers message contribution behaviour to be exclusively rational, instrumental behaviour. It does not consider the social, expressive and playful dynamics of participation in an interactive community of practice. Because meaning and use of a software technology such as email and public participation

in a community seem to be contingent on the social and organizational factors surrounding the technology and the community, people will try to define its place and use in their existing relationships. People as users will ultimately reach an accommodation with it and an expected form of communication (Dervin, 1989, Orlikowski & Yates, 1994). In an attempt to include this social aspect of community participation, I included Devin's approach (1989) that brings into focus participation as a socially situated process from the member's perspective and configures joining and participation in a community as a members' intention of making meaning and bridging gaps in their knowledge or understanding of a phenomenon.

When people communicate, they perform social acts that are regulated by organizational norms and thereby come to have meaning within an organizational context. Thus they simultaneously enact existing and new relationships with one another as they communicate over networks and within communities. It seemed to me that Devin's emphasis on members' experiences was an advantageous entry point to enhance the focus of the study and include members' purposes and patterns of participation.

This research study entails a scientific study of information systems that almost by definition are innovative and dynamic. It may be situated within the field of communities of practice as a subset of information systems research and within the burgeoning field of service science as an application domain (Chesbrough & Spohrer, 2006). As well, the research may also be situated specifically as an investigation of new business models and service innovations enabled by emerging information technologies (Sheehan, 2006).

3.3 Research design, measurement scales and data analysis

A number of different research design approaches exist but as Cooper and Schindler point out, "no simple classification system defines all the variations that must be considered" (Cooper & Schindler, 2003, p. 146.). The discussion that follows is based on the "descriptors of research design" provided by Cooper and Schindler (p. 147).

According to the degree of crystallization of the research question, a study may be viewed as exploratory or formal. A formal study begins with a research question and hypotheses.

The research study in this thesis uses an exploratory case study method. This case research methodology has been used extensively in studies of knowledge management, software engineering, communities of practice, learning organizations, work teams and groups, and in learning communities within online distance education programs. (Berge, 1994, Hiltz & Wellman (1997), Dingsoyr & Conradi, 2002; Lindvall & Rus, (2002), Ruuska & Vartiainen, (2003). In an interrogation and communication study, a researcher questions subjects and collects their responses by personal or impersonal means. The data collected in this study were from a self-reported survey instrument that was accessed via a hotlink from the community sites at IBM and Xerox Eureka to an online survey service. Also, certain data were collected by an inspection of archival server message traffic at the IBM and Xerox Eureka. This latter method of data collection according to Cooper and Schindler's classification is called monitoring. With an ex-post facto design such as this one, I had no control over the variables in the sense of being able to manipulate or vary them and can only report what has happened. The time dimension was a cross-sectional study carried out only once and it represents a snapshot of one point in time under two actual field conditions.

The tight interweave between the phenomenon of public participation and the context of online communities of practice in this study led to the choice of case study methodology. According to Yin (2003), a unique feature of the case study research methodology is its ability to investigate a contemporary phenomenon within a real-life context, especially when the boundary between them is not clearly evident. An exploratory case study research method is preferred when "how" or "why" questions are being posed, when the researcher has little control over events, and when the focus is on a contemporary phenomenon within some real-life context. "The case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident. The case study

inquiry copes with a technically distinctive situation in which there will be many more variables of interest than data points, and so as one result relies on multiple sources of evidence, with the data needing to converge in a triangulating fashion, and as a result benefits from the prior development of theoretical propositions to guide the data collection and analysis.” (Zin, 2003, pp.13-14). For this study, the multiple sources of evidence were collected and examined as follows:

1. Archival usage logs from message servers
2. Statistical correlations of variables of interest
3. Responses to survey questions and further comments by respondents in text boxes
4. Statistical correlations

The data gathering methods available in the case studies are not sufficiently rigorous to validate experimental hypotheses. Instead, we have derived propositions from the theories and applied them to the partial data obtained from the case study methods. Our intent is to use these results to suggest which theoretical perspectives may be applicable for providing insight into the factors affecting participation (and whether more rigorous experimental study of these theories is likely to be prove useful).

3.3.1 Measurement scales

The topic of measurement scales continues to be controversial in the academic literature about research methods and statistics (Mitchell, 1986). Some writers think the level of measurement of a variable is crucial to the choice of statistical procedures and others think it is irrelevant. Foremost among those who see measurement scales as crucial to the choice of statistical procedures was S.S. Stevens (1951). Essentially, Stevens defined four types of measurement scales: nominal, ordinal, interval and ratio. These scales are distinguished on the basis of the relationships assumed to exist between items having different scale values. Nominal scales are not really scales at all; they do not scale items along any dimension but rather label them into categories. Ordinal scales order objects, events and people along some continuum. An example of this scale is employment ranks in the Army or city police department. Interval scales measure differences between scale

points. The typical example is Fahrenheit scale of temperature where a 6-point difference has the same meaning anywhere along the scale but placement of the zero on the scale is arbitrary therefore a ratio measurement is meaningless. For example, we cannot claim that 30 F degrees is half as hot as 60 F degrees or twice as hot as 15 F degrees. Unlike interval scales, ratio scales have a true zero point. We can say in physical terms that 20 seconds is twice as long as 10 seconds.

Applying these measurement criteria can be more complex with data resulting from self-reports in surveys than with data resulting from instrumentation producing objective measurements of physical phenomena. It is not always obvious what kind of scale one is working with especially in management and social science research. A marathon, for example, may be measured using a ratio scale in minutes to complete the race or with an ordinal scale in terms 1st place, 2nd place and 3rd place to record the order of finish for the race. In a related study about the magnitude of estimation of interval properties of three commonly used marketing research studies, Crask and Fox (1987) found that when descriptors are evenly spaced on a questionnaire, the labels connote a continuum and the check lines are equal distances apart. Ideally, respondents should perceive and respond to the scale as having equal intervals.

Howell (2007), in his textbook on statistical methods for psychologists, offers an example about scale of measurement on an anxiety questionnaire administered to a group of high school students. “You might argue that this is a ratio scale of anxiety. You would maintain that a person who scored 0 had no anxiety at all and that a score of 80 reflected twice as much anxiety as did a score of 40. With certain questionnaires you might be able to build a reasonable case and someone else might argue that it is an interval scale and that, although a zero point was somewhat arbitrary (the student receiving 0 was somewhat anxious but your questions failed to detect it), equal differences in scores represent equal differences in anxiety. A more reasonable stance might be to say that the scores represent an ordinal scale: a 95 reflects more anxiety than an 85, which in turn reflects more than a 75, but equal differences in scores do not reflect equal differences in anxiety.” (Howell, 2007, p.8)

More common is the situation in which the measure appears to be equal-interval but is actually questionable. The definition of interval data does not follow the strict criteria. For example, an examination test in which there were 15 easy questions and 4 very difficult questions and tests of spatial ability and intelligence. In such situations, Shavelson states that, “While we are not always sure that these measurements have equal intervals, *we proceed as if they did.*” (Shavelson, 1988. p.19) How do we know, for example, that a scale marked “1 = Disagree, 2 = Mildly disagree, 3 = Mildly agree, and 4 = Agree” is really equal-interval? Even in these cases, it is clear that the results are meaningful as rank-order information - certainly, 2 shows more agreement than 1, 3, more than 2, and 4 more than 3. Some authors argue that even with true rank-order measurement, parametric statistical tests have been found to do a reasonably accurate job and that changing all the data to ranks can lose valuable information (Aron and Aron, 1994, p. 462).

Other authors argue that in most cases, we should not assume that we have equal-interval measurement. We should convert our data to ranks and use a rank-order significance test. In Chapter 07, I have followed this more strict definition of interval data. The ordinal measure of the participation variable is transformed into ranked data and the Spearman rank correlation coefficient test of ranked data is used to test the propositions. Also, I calculated Pearson product-moment correlation coefficients and found that for this data, the two methods lead to the same conclusions.

The challenge is one of interpreting the results of the statistical analysis with respect to the attributes of objects measured in the study. According to Hays, “The experimenting psychologist [management scientist] must face the problem of the interpretation of statistical results within *psychology [management sciences]* and on *extra mathematical grounds*” (Hays, 1973, p. 89; italics in original). The long-standing debate about levels of measurement and the appropriate statistical procedures remains largely unresolved today.

Before leaving the discussion of levels of measurement and appropriate statistical tests, a brief distinction will be made concerning parametric and nonparametric statistics. A body of statistical methods exist that require relatively few assumptions about the population distribution. These methods are called nonparametric statistics. They contrast with the traditional (so-called parametric) methods that require assumptions such as normal populations. Nonparametric methods are useful, for instance, when the normality assumption required for methods using the t distribution is badly violated. They are primarily useful for small samples, when parametric methods commonly require extra assumptions such as normality. The chi-squared test is a nonparametric method. A large value for chi-squared in the test of independence suggests that variables are associated. It does not imply, however, *that the variables have a strong association*. This statistic measures how close the observed frequencies are to the frequencies expected if the variables were independent. It merely indicates, however, *how certain* we can be that the variables are dependent, not how strong the dependence is. Large chi-squared values can occur with weak associations, if the sample size is large. In this thesis, the research propositions were stated in terms of the relationships between variables of interest, their strength dependence and their correlation. For this reason, chi-squared statistics were not considered to be appropriate to test the research propositions of the study.

In Chapter 07, I follow the more strict definition of interval data. The ordinal measure of the participation variable is transformed into ranked data and the Spearman rank correlation coefficient test of ranked data is used to test the propositions. I have also calculated Pearson product-moment correlation coefficients and indeed for this data the two methods lead to the same conclusions.

3.3.2 Data analysis

Purposive sampling is used to select the sampled communities for purposes of survey data collection. The sample elements are selected from the larger set of possibilities because it is expected these communities can serve the research purpose. Every effort is made to insure that the sample elements are representative of the population of interest

(corporate, technical communities of practice) while offering the contributions sought, that is, those who can offer some perspective on the research question (see Chapter 04 for further details on the selection criteria and sampling procedure).

Each data set, IBM-based communities and Xerox Eureka community, is analyzed as a separate entity, along similar dimensions. Although these communities have similarities and differences along multiple dimensions, the research focus and objective of the data analysis at this stage of the research program is not to compare findings as one would do in a comparative study of two or more communities. Each community is regarded as a separate case study from which to make analytical generalizations back to the theoretical perspectives and practical advice to managers which frame the research study.

Non-responses and missing values from the survey questions can be problematic in survey research. Fortunately, there are not many missing values; between 2% on some survey questions and 1% on other questions therefore the researcher used the data as originally collected. Multiple-responses questions, e.g., initial attraction to the community, are regarded as individual variables and each individual choice is coded separately.

Data analysis was completed using statistical software, SPSS v.15. Figures describing frequencies and counts on individual questionnaire items are computed and displayed using MS Excel spreadsheet software. Using SPSS statistical software, the theoretical perspectives are examined and tested using correlation analysis and multiple regression analysis. The theoretical perspectives are analyzed using correlation analysis and multiple regression analysis. Correlation analysis involves measuring the closeness of the relationship between two or more variables; it considers the joint variation of two measures. The Pearson product-moment correlation coefficient is the most widely used measure of association and it can be used when the dependent measures are scaled on a interval or ratio scale. (Aron & Aron, 1984, p. 458) The Pearson product-moment correlation coefficient test provides an index of the direction and magnitude of the relationship between two sets of scores and the degree of the linear relationship between

two variables. Regression analysis refers to techniques used to derive an equation that relates the dependent (criterion) variable to one or more independent (predictor) variables. With linear regression, one can estimate values of a variable based on knowledge of the values of others. The best fitting straight line is the one that minimizes the sum of the squared distances between each data point and the line, as measured along the y-axis (ordinary least squares criterion).

The Pearson product-moment correlation coefficient test is used when both variables are measured along a continuous scale. With ordinal measures, the variables need to be correlated when one (or both) of them is not measured along a continuous scale. Special correlation coefficients are designed for these purposes and one, the Spearman rank order correlation coefficient test, is used to analyze the rank-ordered data in the tests of propositions in Chapter 07. The Spearman rank order correlation coefficient test is relatively easy to calculate and can be interpreted in much the same way as a Pearson product-moment correlation coefficient test. However, in this particular situation, the median is the measure not the mean. Data transformation and rank-order methods were performed within SPSS v.15 statistical software and followed the guidelines discussed by Aron and Aron (1994, pp. 454 - 462) and Barnard and Ehrenberg (1990).

A comment is in order on the distinction between correlation and causation. The use of the terms dependent (criterion) variable and independent (predictor) variables to describe the measures in a correlation analysis stems from the mathematical functional relationship between variates and does not imply dependence of one variable on another in a causal sense. Nothing in a correlational analysis, or any other mathematical procedure, can be used to establish causality. All these statistical procedures can do is measure the nature and degree of association or covariation between the variables in this research study. Statements about causality must be based on an understanding of knowledge and theories about the online communities of practice under investigation, not the statistical or mathematical methods.

3.4 Web-based survey: A new tool in data collection

In order to collect data for testing the propositions derived from utilitarian and public goods approaches to participation in communities of practice, a web-based survey was utilized. The research propositions to be tested in the study are as follows:

- The degree of correspondence between member's expectations on joining and topics discussed in the communities of practice affect public message contribution behaviour of members.
- A high degree of correspondence between a member's work specialty and interests and the community discussion topics will lead to more active message contributing behaviour.
- Costs and benefits of membership affect participation: the lower the cost of contributing (time, effort, and attention), the higher the rate of joining and public message contribution behaviour. The larger the benefits obtained from membership, the higher the number of regular contributors. The higher the diversity of knowledge resources contributed to the community, the higher the number of regular contributors.
- Benefits of participating increase with the number of active contributing members thus getting higher message contribution rates in larger communities of practice from new members is more likely.

In this section, I discuss: 1) the web-based survey and 2) the way I approached the response rate issue for a self-administered, web-based survey questionnaire.

Surveys on the Internet are comparatively new, so there is not the same body of field experience that exists for postal mail and interview surveys. According to Fowler (2002), "the current frontier for data collection is the Internet. At the moment, its use is limited because many people lack Internet access. However, access is increasing rapidly, and the Internet will no doubt soon be a frequently used mode of survey data collection" (Fowler, p.7). Today, however, there is more literature available on administering a survey over the Internet and requests for survey participation do appear frequently in communities of

practice. Many of the revised publications from the 1970s on survey research methods make an updated reference to the uses of web-based surveys and offer little guidance. Nesbary (2000), King (2000), Zhang (2000), Shachtman (2001), Neustadl (2002) have written specifically about conducting web-based surveys. These authors were helpful in the early stages of the survey design with a selection of question types including matrix-format queries with multiple rows and columns, examples of survey templates and a question library that could be adapted and customized for a web-based survey questionnaire.

In terms of this study, the web-based survey solved two logistic problems: 1) high costs of reaching the target population by postal mail service since this was not a funded research project, and 2) locating the target population. Accessing the postal addresses or phone numbers of members of the IBM communities of practice would be cumbersome and unreliable and access to personal information was impossible at Xerox Eureka. The web-based survey was administered to populations that have wide access to and feel comfortable with computers and the Internet. The interactive format of the Web-based survey makes it easier for the respondent to enter the responses.

3.5 The response rate issue

One of the problems with surveys is uncertainty about the response rate. Mail surveys with a return of 30 percent are often considered “satisfactory,” but there are instances of response rates that exceed 70 percent (Dillman, 2000, p. 6). Kiesler and Sproull (1986) reported a response rate of 67% for the electronic survey in a pre-spam era on the Internet. Two factors mentioned in the literature (Schwartz and Sudman, 1996; Fowler, 2002) as positively affecting the response rate were likely to be in play in this situation: 1) a population who could be interested in the survey topic because they were participants in communities of practice and 2) participation was likely related to professional activities. In order to maximize the probability of response, the survey was designed following the total design method (Dillman, 2000) and followed Lockhardt’s model about survey respondent’s process of decision in completing a survey instrument and stages of returning behaviour for postal mail questionnaires (Lockhardt, 1984).

3.5.1 A total design method

There are two parts to the total design method advocated by Dillman. First, the researcher must identify the aspects of the survey process that affect the response rate, either quantitatively or qualitatively. Each aspect must be shaped to obtain the best response. Second, the researcher must organize the survey effort so the design intentions are carried out in detail. The results achieved in 48 surveys using total design method showed response rates of 50 to 94 percent, with a median response of 74 percent. (Dillman, 2000, pp. 22-24). Total design procedures suggest minimizing the burden on participants by designing surveys that:

- Are easy to read and take little time to complete
- Offer clear response directions
- Provide information about the survey in a cover letter and endorsement letter
- Guarantee confidentiality
- Achieve the approval of the University of Waterloo Office of Research Ethics (ORE)

In this study some of these procedures have been adapted and modified for the web-based survey.

3.5.2 Models about the respondent's process of decision

Some researchers have addressed the problem of maximizing the response rate to mail surveys by theorizing about those factors that inhibit or stimulate respondents to answer (Kanuk & Berenson, 1975; Lockhart, 1984). I adapted Lockhart's analysis of the stages of returning behaviour, modified it for the web-based survey and integrated it in a respondent decision tree. It follows the decision junctures at each step in the process and the effect of the respondent's decisions on the response rate.

3.5.3 Stages in the web-based survey completion behaviour

Posting and reading the message

Posting an invitation message to a community does not mean it will get noticed and read. The member may decide to select the message and read it or to discard it. An appealing subject line can help in this decision. Next, the member has to decide if s/he will continue reading the message after the initial few sentences. A brief introduction to the survey topic, its importance and sponsorship can help the member to continue reading.

Getting the member to decide to link to and open the survey

Offering a positive written incentive and assuaging negative perceptions can help the member to make the decision to participate in the survey. The University of Waterloo Office of Research Ethics (ORE) approval for the research study is one means of assurance. After this decision is made, the member can decide if s/he will respond immediately or later. Thus, s/he can bookmark the site for reference later.

Getting members to start completing the survey

Once a member has opened the survey, s/he can begin responding to the survey. Responses are collected sequentially as questions are responded to and with no loss of data on partially completed survey questions. Respondents may answer any questions they choose to and skip any questions they choose not to answer.

Getting the member to complete the survey

If the member had interrupted the responding, the survey can be resumed as long as the respondent did not log off the survey site.

3.5.4 Description of the survey instrument developed to gather individual responses

The general philosophy underlying the design of the questionnaire was a) to elicit respondents' answers on a five-point interval scale and b) to supplement some of the more relevant questions with an open-ended section (text box) in which respondents are asked to elaborate on the other reasons for the rating expressed in the response. A copy of the questionnaire is in Appendix B.

The questionnaire is organized as follows. The first section gathers demographic information, including members' initial attraction and reasons for joining the community of practice, when they joined, their level of satisfaction with their membership experience. Members are asked to rate on a five-point interval scale (1=very unsatisfied, 2=satisfied, 3=neutral, 4=unsatisfied, 5=very unsatisfied) their satisfaction with the community in terms of message contents, their participation process, and the interaction process. The second section of the questionnaire has a set of questions that, broadly, address the following topics: frequency of participation, participation patterns, and feelings of community membership, contact within the community, message quality and relevance to work interests and range and depth of discussion topics. The third section has a set of questions about individuals contributing messages and their interaction within the community and the fourth section asks questions about other forms of participation activities. Further details about categories of questions are discussed below.

All the questions were formulated to be non-leading. The questionnaire was pilot tested online with 27 Eureka subjects and it required about 25-30 minutes to be completed. It was anonymous and confidential and its purpose was clearly stated in the front cover. The questionnaire was structured, tested and consequently adapted to the needs of the specific populations targeted in the study. Some basic problems occur when conducting an Internet survey: the universe of Internet users is basically undefined; the sample is self-selective and therefore cannot be regarded as being representative. Statements about "non-participants" in the survey cannot be made. The questionnaire was administered over the Internet using the web survey firm Survey Monkey and was introduced with a statement of approval from the Office of Research Ethics (ORE) at the University of Waterloo.

Categories of questions were initially developed to investigate member's expectations of membership, reasons to join and to participate and to leave communities of practice.

Questions of interest to the inquiry were participants'

- goals of community membership
- message browsing and contribution behaviour

- time, effort and attention required to participate
- patterns of participation and relationship to the community
- interest and attachment to the community
- stimuli and deterrents to participation

Four conceptual categories were derived from the initial question categories as described below.

Membership stability category was initially conceptualized as patterns of attachment to the community.

A mode of participation category is related to the mix of purposes to participate and to the degree of interactivity in the message flow (initiating messages and responding to others).

Involvement in the community exchange category initially started with a focus only on public message contribution behaviour and was expanded to include activities of reading, posting, cross-posting, filing messages offline, emailing and discussing messages offline or outside the community directly with members.

Strength of member's attachment to the community (sense of community membership) category may be related to contributing behaviour and may intersect other categorical concepts. The category may enable one to follow the movement into and out of community in terms of membership churn and attrition.

Hierarchical relationships may exist among these categories. Involvement in the community exchange may be related in ascending order to the modes of participation. Modes of participation and membership stability may be related in ascending order to the core category of strength of members' attachment to the community (sense of community membership). In the following sections, conceptual categories will be developed with survey questions for membership stability, members' relationship to the community, patterns of participation and involvement in the community message exchange.

3.5.4.1 Membership stability

Some reasons for leaving the community may be disappointment with message content, the online interaction, interference from outside events, changes in work focus and interests, among other reasons.

Content disappointment

Participants may have started in the community expecting to find a certain type of content and found something that differed from expectations. Much of the content of the community discussion may have become irrelevant after a time period. Content irrelevance may be more important in technical work communities than in others having more social purposes for membership. Participants are more likely to remain sustaining members in communities that are more directly related to their current job interests.

Interaction disappointment

Participants may not like the ongoing interaction (tone, message content, etc.) and participants may have received too many messages to manage (information overload and fatigue).

Interference by external events

Participants may become frustrated with technical mishaps, incurred absences from the community discussion due to holidays, business travel, conferences and meetings out of town, job changes as well as some indecision about career path to follow, etc.

Changes in work focus

For some participants, switching among communities (being in and out of the community) may be a style of accessing community resources.

Major message contributors disappeared

The community may have lost several major message contributors who contributed frequently and authoritatively. (How does one assess a new major contributor in a community to replace one who has moved on?)

Participants' relationship to the community can be described from a time dimension such as length of time in the community and from a community interaction dimension. Two survey questions about member's relationship to the community are as follows:

Question – How long have members been in the community?

Question – How do members participate and interact within the community to obtain information, to find knowledge resources, to ask questions, to discuss ideas, to get feedback, to make contacts, to advertise their expertise and work interests?

Question – For those who participate in the community as message receivers only, why is their participation restricted to only these activities? A survey question was constructed to ask respondents as follows:

Question: Select the phrase that best matches your reasons for not posting messages.

- I have other priorities
- I am uncomfortable with the community and lack familiarity with the community dynamics.
- I am unsure about my level of knowledge relative to the community discussion.
- I am unsure about how I will be viewed by the community
- I may not get anything back for my effort
- Other (text box)

Activities – Retrieving documents only

- Members may only download documents and message fragments that look interesting.
- Members may download archive materials to assess and evaluate what people discuss in the community. This behaviour may occur when one is assessing the suitability of the community to their needs and when making decisions about staying and contributing.
- Members may forward interesting messages to friends outside the community.
- Members may save and file messages that look useful and interesting (create database).
- Members may print messages and file hard copy documents.
- Members may keep names and addresses of members in files or on hard copy to contact later.
- Members may try to plan or organize files in a database for use at work.

3.5.4.2 Sources of information for selecting and joining communities

These sources may be along a continuum of informal to formal sources.

Question: I learned about the community from

- An announcement
- Colleagues and friends
- Supervisors
- Inquiry I search engine
- Another members invitation
- Other

Question: How many communities are you subscribed to as of today's date?

- 1-4 (few)
- 5-10 (several)
- 11 or more (many)
- Other

Question: If you are subscribed to several (1-4) communities, are these directly related to your work interests?

Question: If you are subscribed to any communities (5-10), are the discussion topics inside the community related directly to your job or technical work interests or to your personal or recreational interests outside the community?

Question: Is there any difference in the nature of involvement in the communities of these three groups (few, several, and many) listed above?

- Active in terms of message reading and message posting
- Inactive in terms of message reading and message posting

Question: Rank on a scale of 1 (most important) to 4 (least important) how do you evaluate the usefulness of the community discussion in meeting your needs?

- Quality of topical information received
- Possibility of meeting interesting people
- Quality of the online discussion
- Quality and timeliness of relevant messages to your questions
- Other comments (text box)

Question: Please check those items that best describe the focus of the community from your viewpoint.

- Focus is to share technical information
- Focus is to share relevant work experience on technical problems
- Focus is on innovative solutions to problems
- Other (text box)

3.5.4.3 Non-public and reluctant participants

Question: As of today's date, how many communities are you subscribed to?

1-4, 5-10, 11 + Actual number _____

Question: Is your membership voluntary?

- Yes, my goal is to keep updated
- No, employer requirement
- Supervisor recommended that I join
- Colleagues recommended that I join

Question: Membership in this community implies that:

- I make connections with others in the community
- I trust others and feel safe to make my knowledge public
- I try to appreciate and understand the viewpoints of others
- I make a commitment by contributing messages
- I cooperate and share ideas
- Other comment (text box)

Question: Do you have any doubts or ambivalence about the community?

- Yes_____ No_____ Undecided_____

Question: Select the item(s) that describe your doubts and ambivalence toward the community.

- Doubts about benefits of membership
- Complaints about the time commitment and energy required to participate
- Characteristics and tone of the online interaction

- Other (text box)

Question: Despite your doubts/reservations/perception about the usefulness of the community, are you prepared to try new communities that

- May have a more specific focus Yes___ No___ Undecided_____
- May be more related to your work duties/interests Yes___ No___ Undecided_____

Question: In your opinion, more satisfactory communities would have:

- More defined purposes
- More defined/focused community of participants
- Require less time to participate
- All of the above
- Other comment (text box)

Question: Indicate which of the following intrinsic rewards you have received from public participation in the community:

- Recognition from colleagues
- Praise from colleagues
- Sense of belonging to the community
- Gratitude
- Respect
- Other comment (text box)

3.5.4.4 Modes of participation

Seeking information, following the discussion, social networking and specific purposes: non-interactive and interactive modes.

Seeking information mode

Question: Indicate how you participate in the community.

- Asking questions and getting answers
- Getting pointers and answers to questions
- Discuss technical issues/work problems

Question: Please rank order (1 – 5) a contact you are most likely to approach for information in the community.

- Friend or acquaintance
- Colleague at work
- Frequent poster with expertise
- The whole community
- Other (text box)

Question: How would you describe your use of the information?

- I copy some of the message information for future use
- I file the entire message in a folder for use at work
- I browse to get an overview of the technical discussion
- I receive much useful information and seldom post messages to the community
- Other (text box)

Following the discussion mode

Question: Rank and order how you would describe the way you participate in the community (rank most often to least often).

- Listen mostly to others in the discussion
- Express my own views
- Express my own views and sometimes debate ideas with others
- Other comment (text box)

Social networking mode

Question: Rank and order (most often – least often) how you describe your use of the community.

I use the community primarily to:

- Network with others who have similar interests
- Meet new people working in this area
- Keep up contact with others
- Build on contacts I met at meetings and technical conferences
- Other comment (text box)

Question: For people that you meet in the community, check all activities that apply.

- I record their names and email address in a directory
- I follow up and exchange ideas off line by personal email
- I attempt to develop relationships with people met in the community at in-person meetings and conferences

Other comment (text box)

3.5.4.5 Specific Purposes – Non interactive to interactive mode (a non-interactive to interactive measure)

Many members may use the community because they are primarily seeking information.

Seeking information: answers to technical questions, finding out what's new, information about applications you may need to prepare at work, keeping updated on technical developments, seeking information that is technically relevant to your work.

Distributing information: making announcements, organizing a meeting, workshop event or conference event.

Feeling part of the community, taking the pulse, keeping in touch (passively)

Question: I feel part of the community by: (check all that apply)

- Following the community discussion
- Keep up contact with people I know
- Contacting new people who share my interests
- Finding and contacting others who share my work interests
- Collaborating with members on projects
- Other comment (text box)

Question: Will the feeling of contact within a community that shares work interests be amplified by the international dimension? (being part of an international work community?)

Summary

Non-interactive purposes: 1) seeking information 2) distributing information 3) learning about the medium 4 other (text box)

Interactive purposes: 1) discussing/bouncing ideas 2) social networking 3) Other comments (text box)

3.5.4.6 Involvement in the community message exchange

Browse, read, initiate messages, respond to messages, contact members, recommend and refer others off line, search archives, create a database, print messages, etc.

Reading message involvement

Question: What is your estimate of the message volume received each day from the community?

___ 5-30 ___ 31-65 ___ 66 -100 ___ 101-200 ___ 201+

Question: How do you handle messages if you're too busy to read them?

- Discard most messages using subject headings to decide
- Read first few lines of message body and then discard them
- Read sender's name and make a decision
- Other comments (text box)

Question: How often do you do any of these activities with community members? (never, hourly, daily, weekly, monthly, never)

- Email messages
- Telephone call
- Face to face meeting
- Collaborate on a project

3.5.4.7 Message contribution

Are most people non-involved in posting messages? Are they passive observers or participants? Do they primarily read messages?

Question: What do sporadic contributors do in the community?

- Initiate questions
- Respond to factual questions
- Respond to experience-related questions
- Other comments (text box)

Question: What are some reasons for regular members to participate?

- To follow the discussion
- To use the community for social networking purposes
- To offer opinions during ongoing discussions

- To ask and respond to more complex questions
- To make elaborate comments
- Other comments (text box)

Question: Have regular contributors transferred face-to-face sociability to online communities?

Question: Are participants using these communities to enhance their professional reputation, to network, to compare and to exchange their ideas with peers?

Question: Will there be any difference in contribution rate between recent and more experienced members?

Question: What are the positive incentives to contribute?

Question: Is there an undercurrent of feeling responsible or obliged to reciprocate messages?

Possible deterrents to contributing messages

Time investment required – contributing requires much time, effort, and attention.

Bad timing – inconvenient, too busy at work, deadlines to meet

Awareness of potential risk to one's reputation

Easier to request information than to post information (social loafing, free riding)

Level of knowledge required

Other comments (text box)

Non-interactive purpose of participation

Learning about the communities of practice.

Question: I visit the community to:

- Learn about communities of practice
- Keep up with technical developments
- Becoming more important to share knowledge and discuss ideas in industry
- Other comments (text box)

Interactive purposes

Social networking (building contacts, meeting people)

Question: I visit the community to:

- Keep up to date with people mainly in this topic area
- Strengthen existing contacts and to stay in touch with them

- Make direct contact outside the community
- Discuss ideas and topics offline
- Initiate collaboration on a project
- Other comments (text box)

Discussing, following and bouncing ideas in the community

Question: I visit the community to:

- Bounce ideas off people I would not otherwise meet at work
- Contact people more easily
- Follow the quality of the discussion
- Other comments (text box)

3.6 Summary

Multiple approaches were implemented in three aspects of the study: 1) in the question formation - observer's and actor's perspectives were considered; 2) in the theory selection - public participation was approached as a relational and individual phenomenon and 3) the research design – an descriptive method was employed using two case studies of corporate communities of practice; one at Xerox Corporation and the other sponsored by IBM Corporation. In Chapter 04, there is a description of the process of selecting community within corporate communities, the purposive sampling strategy, the development of the survey instrument and the survey variables.

Chapter 4

SELECTION OF CASE STUDY WEB BASED COMMUNITIES

In this chapter, I describe

- the process of community selection
- community message statistics from Eureka and IBM-based communities
- in summary form, the demographics of community membership for Eureka and IBM-based communities and compare the purposes of each community of practice
- the iterative stages in the development of the survey instrument and the survey variables.

4.1 Method

4.1.1 Purposive sampling strategy

A purposive sampling process was employed as the magnitude of the community of practice universe precluded a representative sample of communities. A judgement sample design was devised to select 12 communities of practice.

4.1.2 Community selection

4.1.2.1 Corporate partners

IBM has been supporting a large number of practice-based communities for many years and over this period had supported a sufficiently large number of software communities of research interest to choose from. The researcher made contact with an IBM manager whose area of responsibility was the development of selected online IBM-based communities of practice. Eleven communities of practice with a content of interest to software programmers were selected from a listing of over three hundred communities available from news.software.ibm.com. Membership in the IBM-based communities is open to public subscription and membership is drawn from the general public as well as from IBM employees. The IBM-based communities are strategic to its business development strategy and user support activities. Unlike Xerox Eureka, no single IBM-based community is as dominant and they do not have the same degree of public documentation.

The nature of messages in the IBM-based communities largely concern problems with software: upgrades, enhancements, installation, “work around” procedures and recommended solutions to these problem-based questions from the community. Messages typically begin with a brief description of the

problem followed by a question for timely assistance. The message that follows was from the IBM-based community ibm.software.websphere.studio.

EXHIBIT 4-1

gilgantic@gmail.com wrote:

My Eclipse 3.1 debugger is not suspending at a breakpoint while running my WebLogic 8.1. server in Debug Mode in my Eclipse Test Environment. I am not trying to perform remote debugging, I just want to run on my local server (<http://localhost:7001>). My debug port is set to 8453 (default debug port). Any ideas or Eclipse bugs I need to know of?

From: "vjg" <virgil.green@gmail.com>

Newsgroups:comp.lang.java.programmer,comp.lang.java.help,weblogic.developer.interest,weblogic.developer.interest.servlet,ibm.software.websphere.studio

Sent: Friday, June 23, 2006 3:26 PM

Subject: Re: Eclipse Debugger Fail to Suspend at Breakpoint

If you're running a server locally, that's still running in a separate JVM and you still need to connect to it. For that, you need to use the remote debugging. "Remote" can be misleading. FWIW, I do this almost daily from Eclipse for debugging ATG Dynamo applications that I have running on my development machine.

Xerox Eureka had its origins during the early 1980s in the USA. The present day Eureka community evolved from an experiment at Xerox Palo Alto Research Centre (PARC) designed to measure the value of a codified field experience of customer service engineers who repaired copiers and printers installed on customer premises. It developed largely into its present structure and function through field experiments undertaken at smaller Xerox USA subsidiaries in France and in Canada during the early 1990s and mid 1990s respectively. After measurable results were demonstrated in improved customer service operations in these smaller subsidiaries, Xerox corporate service management opened the Eureka community to membership from Xerox USA field service engineers in 1997. Initially, it opened the community to membership with several pilot locations throughout the country however the demand for access to the Eureka community among field service engineers became so intense that management accelerated its deployment and by 1998 Eureka was available throughout the USA and at other Xerox companies in Europe, Latin America and Asia (Bobrow & Whalen, 2002 p. 55).

Membership in the Eureka community of practice is comprised of Xerox field service engineers and it is one of multiple communities of practice at Xerox Corporation. The Eureka community is mission-

critical for Xerox and has been much studied at least during its earlier evolution and development (Brown, 2000; Brown & Duguid; 1991, 2000, Bell, Bobrow, Falkenhaimer, Fromherz, Saraswat & Shirley (1991), (Bell, Bobrow, Raiman & Shirley; 1997; Bobrow & Whalen, 2002). Membership is open *only to Xerox field service employees* with access privileges to the Global Service Network (GSN). Eureka is not open to general public subscription and membership.

The nature of Tips (messages posted to the Eureka community) reflects the work practices and the mandate of the field service workforce. The work done by field service engineers follows a cycle of activities on customer premises such as equipment commissioning, regular maintenance and emergency repairs, equipment upgrades/replacement and decommissioning. Software upgrades, parts retrofits and replacements are installed on Xerox systems in the field as is final equipment decommissioning and removal from customer premises.

Unique or original Tips are messages submitted to the Eureka community that are validated by product service specialists called Validators. Validators test the Tip for practicality, quality assurance and originality. Upon approval, the Tip is posted to the Eureka community under the name of the service engineer who authored the unique Tip. What is the typical content of these Tips? The Tips messages are written and structured by headings of *symptom*, *cause*, *test*, and *action*. What do the field service engineers get from these Tip documents? What do they consider important to share? The Tips include some crucial diagnostic information, but also much more varied content. For example:

Diagnosing unusual, costly failures – “Bimetallic corrosion builds up on A and causes intermittent failures that seem to be B. Replacing B makes the problem seem to go away because A is moved in installation. First clean A, and later replace by new gold-plated AA, available as Part #1234.”

Workarounds – “Paper curl in a dry environment causes excessive jams on baffle Q. Putting Mylar tape from tool kit on edge will ease problem.”

Easing the job – “To make it easier to adjust M, paint white-out on a back wall near M.”

Tips such as these above are written up and submitted over the GSN network in a standard nomenclature of problem - cause - solution (Bobrow and Whalen, 2002, p. 52).

My initial interest in the Xerox Eureka community was developed from industrial work experience and from descriptions and references in the literature on communities of practice and knowledge

management. Eureka has been much studied during its early evolution in the early 1980s. Empirical research into the Eureka community was done at Xerox Parc in Palto Alto, California and reported by John Seeley Brown, Paul Duguid and others. Decades later, the global development coordinator of the Eureka community was an employee at Xerox Canada in Montreal, Quebec. From early into the dissertation project he shared my enthusiasm and research interests in the Eureka community of practice.

4.1.2.2 Selecting communities within our corporate partners

There were multiple online communities within our two corporate partners that could have been candidates for further study. Information was collected on the date of initiation of the community, the existence of archives, the number of members in the community and messages contributed over a 12 month time period in order to set minimum criteria for community selection. A number of IBM-based communities of practice were discarded for the following reasons:

- 1) community had gone inactive, was amalgamated or no longer existed
- 2) communities did not respond to subscription requests
- 3) community archives were no longer available
- 4) communities had less than 12 months of existence
- 5) communities had small membership and infrequent message exchanges.

Inactive communities were identified in the server message statistics. Public notices were posted indicating if and when they were amalgamated with other communities. If a community did not respond to a subscription request, further searching at the site lead to finding notices of either extinction or amalgamation with other communities. Public messages were also posted by the community coordinator stating that community archives were no longer available. Communities of short life duration were determined by inspecting summary data, as were the message and membership statistics that are posted monthly. (See Exhibit 1 for a description).

A WWW Google search under the heading IBM groups returned 696 general interest groups. A refined search within these groups under the IBM software returned 100 IBM software communities of interest from which 12 communities were selected and these appear in Table 4-1 below. (See Exhibit 2 for a complete listing of ibm.software communities.) A table of the communities of practice (Table 4-1) that

follows displays information about the number of community members, the average number of messages contributed to the community on a monthly basis, the total number of messages contributed, message content diversity and the number of months that each community had been in existence.

Table 4-1: Message Contribution and Heterogeneity Judgement

Community	Origin date	Active Member August 2005	Total msgs August 2005	Active Member July 2006	Total msgs July 2006	Number of messages contribute monthly	Average July 2006 Contribute rate	Total members Oct 2006	Total messages Oct 2006	Heterogeneity judgement
ibm.software.d b2. udb. beta	Nov-02	5	1323	11	1561	20	1.8	43	628	low c & m
ibm.software. websphere application server	Dec-98	246	73486	908	80897	618	1	1177	33789	high c & m
ibm.software. websphere application	Apr-00	16	8070	10	8394	27	2.7	82	3100	low c & m
ibm.software. websphere portal server	Oct-02	277	9911	165	13679	314	1.9	611	6755	high c & m
ibm.software.d b2	Jun-95	411	106166	344	115324	763	2.2	1564	736	high c & m
ibm.software.d b2. mvs	Jan-99	11	2326	31	2783	38	1.22	14	2940	high c & low m
ibm.software.d b2. udb.	Nov-00	25	5167	23	5612	37	1.61	47	6788	low c & m
ibm.software. websphere.	Sep-01	27	1689	14	1889	16.6	1.18	210	2059	high c, low m
ibm.software. websphere.mq programming	Sep-01	17	8179	29	8582	35.5	1.15	140	8729	low c & m
ibm.software. websphere. studio.applicat ion-site- developer	Sep-01	28	14905	14	15460	46	2.19	19	11582	low c & m
ibm.software. websphere. studio	Jan-99	30	10748	39	11495	62.2	1.6	313	11630	low c & m
ibm.software. websphere. devicedevelop er	Mar-02	34	5669	38	6647	81.5	2.14	82	6785	high c & low m
Eureka Community		Members	Total Tips Oct 05	Members contrib	Total Tips 12 months	Tips	Average Tips per active		Total messages Nov 2006	
	Dec-96	20000	0	1297	4916	410	4	20000	47308	

c = content diversity is related to the variety of topics discussed in the community.

m = members diversity is related to the professional variety of participants in a community.

active member is one who contributes 1 or more messages between August 2005 to July 2006.

The researcher had followed many of the IBM-based communities of practice for a number of months within the last three years and some of the communities only for a number of months within years 2005-2006. The goal was to select a heterogeneous set of communities from the listings of `ibm.software` communities in Exhibit 2. Candidate communities for selection that were judged to have met the selection criteria were entered into a spreadsheet. The objective was to have a mix of community types in terms of age, growth and development: new and growing communities, stable and mature communities. Twelve communities on the spreadsheet were selected from those that met the selection criteria. Heterogeneity was judged according to two criteria: content and member diversity. Content diversity was related to the variety of topics discussed and membership diversity was related to the professional variety of participants in a community. Heterogeneous sets of communities were selected based on content and membership diversity. As a final check on the selection of communities, we wanted to insure a heterogeneous selection of communities, i.e. that we would not just have a single type of IBM-based community 12 times. This would have limited the insights to be gained from the survey data on the community involvement, motivation to participate, and other variables of interest. Therefore, a final heuristic check was undertaken to insure that the selected sets of communities were diverse in message content and professional membership. The researcher rated the communities on these characteristics based on a textual analysis of messages and company affiliation. Of the 12 IBM-based communities, six were assessed as High in both forms of diversity, three were assessed as Low in both forms of diversity, and three were assessed as High in Content diversity and Low in Membership diversity. (No communities were assessed as High in Membership diversity and Low in Content diversity.) This level of heterogeneity was deemed satisfactory in providing an adequate base for collecting data. Twelve communities were selected from the multiple candidate listings on the spreadsheet.

4.2 Survey participants

This section begins with a summary description of the survey participants so the reader can gain an understanding of the membership in the two communities and an appreciation of what kinds of communities the later survey results represent. The demographics of the IBM-based community and the Xerox Eureka community will be described in section 4.2.2.1 and section 4.2.3.1 respectively.

4.2.1 Data about community participation

Data were collected through a web-based survey questionnaire and through file retrieval from server archives at IBM-based communities and the Xerox Eureka community. There were 100 surveys returned from the IBM-based communities and 336 surveys returned from the Eureka community.

4.2.2 IBM-based survey respondents

4.2.2.1 Demographics

IBM-based survey respondents were employed in the IT industry on a global basis. These public communities were *open not only to employees of IBM but for public membership* from any interested software professionals working with IBM software technology worldwide. About seventy-two percent (71.9%) of the IBM-based survey respondents were male and twenty eight percent (28.1%) were female. The majority of respondents were middle aged: sixty-two percent (62.5%) reported ages between 50-64 years, about nineteen percent (18.8%) were over age 65 and close to seventeen percent (16.7%) were between 30-49 years of age. Members of the IBM-based community are college educated with almost seventy-eight percent (77.9%) reporting a college degree or higher level of education. Community membership is international with fifty percent (50%) from Europe, thirty four percent (34%) from North America, eleven percent (11%) from Asia and five percent (5%) from other locations. Further details by country are included in Table 3d (Appendix A). IBM- based community members have reported joining many communities. Almost half the members (47%) reported joining between 6-10 communities and about twenty percent (20%) of respondents have joined 1-5 communities and 11-15 communities. The number of community memberships reported is as follows: 1-5 communities (20%), 6-10 communities (47%), 11-15 communities (21%) and 16-20+ communities (5%).

4.2.3 Xerox Eureka survey respondents

4.2.3.1 Demographics

Eureka survey respondents were members of a private network and employed as field service engineers on a global basis by Xerox. Community membership was private and restricted to service engineers who had access to the Xerox global service network (GSN). Over ninety-five percent (95.4%) of the Eureka survey respondents were male (see Table 3a). The high percentage of males in the Eureka survey is

representative of the occupational category within the firm. Field service engineers are primarily males although this is changing albeit primarily in some urban centres.

The age distribution for Eureka members is skewed to over 30 years of age with fifty-nine percent (59%) of respondents between 30-49 years of age and thirty-five percent (35%) over fifty years of age. Company pension and retirement policies at Xerox may explain why so few respondents in the over 65 age category in full-time employment during the survey period.

Educational data from the Eureka community were not collected on the survey in compliance with a Xerox privacy policy about collecting employee information. Xerox has hiring guidelines for field technical representatives and typically requires a high school diploma followed by a two or three year technical college diploma. Initial Xerox technical product training for customer service engineers (CSEs) can extend to over one year period depending on product categories and regular update training is undertaken on a continuous basis. In this sense, field service engineers would perhaps have the equivalent of a three or four year college diploma. Survey responses were received from Eureka participants in 24 countries. Thirty eight percent (38%) responded from the USA (122 respondents), eighteen percent (18%) from Canada (58 respondents), fourteen percent (14%) from the Netherlands (44 respondents) and six percent (6%) from Germany (19 respondents). Other smaller response percentage details are listed in Table 37c below.

Data presented in Table 3d below was collected with survey Eureka survey question number A10. The survey question A10 asks respondents to indicate the number of communities of practice in which they have participated. Responses were entered from a drop down menu with choices as follows:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11-15, 16-20, 21-25, 26-30, 31-40, 41-50, 51-100, 101+

Eureka members reported having multiple memberships in other communities of practice. Seventy-six percent (76%) of the respondents reported belonging to between one to three communities with the greater number responding to membership in one community (31.5%) and two communities (14%). A similar question was asked for IBM respondents.

4.3 The survey questionnaire

4.3.1 The variables

This section repeats earlier content from section 2.5.2 that described the independent variables. Data for the independent variables were collected through the survey questionnaire.

Independent variables

Benefits are described as recognition, praise, and a sense of belonging to community, gratitude and respect from the community. These were operationalized as the average number of benefits received by members of the community and summed.

Contribution costs refer to the time, effort and attention required to compose and post messages. This variable was operationalized as the average level of time for members to prepare and post messages. There are five ordinal levels: low-0 (have not posted), 1(write and post immediately), 2 (write, edit and post immediately), 3 (write, edit-sit-on-it, and post later), high-4 (write, edit, sit-on-it, and edit before posting).

Knowledge asymmetry is the percentage of members who compare their knowledge on a five-point scale as 1) much lower level, 2) lower level, 3) same level, 4) higher level, 5) much higher level.

Level of involvement is defined as the degree of involvement in reading messages and the frequency of posting messages. *Message reading involvement* has four levels: 1) low involvement- scan headings, 2) scan headings and sender's name, 3) scan headings, sender's name and number of responses, 4) high involvement-scan headings, sender's name and number of responses and message body.

Message posting is the frequency that a member:

- posts questions
- posts replies to questions
- posts comments
- posts replies to comments
- posts announcements

For each of these variables there were five decreasing frequency levels of contribution: 1) hourly, 2) daily, 3) weekly, 4) monthly 5) never

Message content diversity refers to the relationship of message content to job interests. This variable has five ordinal levels: 1 (unrelated) to 5 (much related).

Membership stability is defined as the degree of permanence in the community of practice and was operationalized as three variables: time in the community since joining, plans to stay or to leave the community and message reading involvement. Length of membership: 1) less than 1 month, 2) 1 month, 3) 2 months, 4) 3-6 months, 5) 7-12 months, 6) 13-24 months, 7) over 25 months. *Plans to leave or stay*: 1) will be leaving soon, 2) will not be leaving soon, 3) prefers to stay, 4) definitely will stay, 5) usually leaves and rejoin (transient members).

Size refers to the total number of participants appearing in the roster of the community of practice.

Dependent variables:

Participation involves message browsing, reading, posting questions and posting responses to the community discussion and it was operationalized as the number of messages contributed monthly by the community. The value was calculated by subtracting from the total number of messages on the server in July 2006, the total number of messages in August 2005 on the server and dividing this by twelve to get an average monthly figure.

Joining rate is the numerical growth of members of the community and was operationalized as the percentage increase of total number of participants from August 2005 to July 2006. Data about participation in the community of practice were collected using two online survey instruments hosted by the survey firm, SurveyMonkey. Survey respondents accessed the survey via a hot link posted to the community of practice. The survey instrument is described in the following section.

4.3.2 The survey instrument

Two online questionnaires were designed. One was posted to the IBM-based communities and one to the Xerox Eureka community. Each survey requested similar information and was customized to reflect the language of the working domain for both communities. There was a slightly fewer questions on the Eureka survey due to Xerox personnel policies concerning collection of employee information and reporting; i.e. education, questions about finding and locating the Eureka community were redundant as the community is integrated with standard training and work practices of the Xerox field service organization.

The Xerox Eureka questionnaire contained 55 questions. The text of the questions was customized to reflect the nomenclature of the community. Messages were labelled as “Tips” and related Xerox communities were referred to as CHAT, CONFERENCE and GSN.

The IBM-based questionnaire contained 63 questions. A multiple-choice format was chosen for most questions. Questions were also constructed on a Likert scale format (1- most important to 5- least important). There were 19 open response questions for respondents to provide “other details” in a survey text box.

4.3.3 Questionnaire piloting

In the exploratory phase of the IBM questionnaire development, questions were derived from research literature about online communities and these informed the iterative development of the questionnaire. Survey questions were refined and tested with a user pilot, pen and paper study involving 15 people at the University of Waterloo. The objective was to test for user understanding of questions, ease of response, time involved to complete and to make improvements where warranted. A follow-up survey was posted to the website and three people completed the online survey with feedback that lead to further refinement in the questions. Measure development followed the general approach set out by Churchill (1991, 1979). Independent variables were measured using items already developed with further development of measures as deemed necessary. Further editing was required to ensure the wording of items was as precise as possible and suited to the working environment of each community of practice. Experienced and knowledgeable people on my thesis committee and from other university departments were contacted to provide opinions and comments relating to the face validity of the measures. Further refinement of these items also resulted from the pilot study. These steps were repeated until a satisfactory survey instrument was developed.

The Xerox Eureka questionnaire was reviewed in fine detail with a Xerox service manager in Montreal, Quebec and changes were made to question wording to enhance understanding and to reflect the operating circumstances of Eureka respondents. The revised questionnaire was submitted later to another Xerox manager in Rochester, New York for further review and suggestions for improvement. Following a conference call with the researcher and two Xerox managers, further changes were made to

enhance respondents understanding, ease of responding to the questions and time required for questionnaire completion. Revisions were completed and submitted to Xerox legal affairs for approval. After approval from Xerox legal affairs, the Eureka questionnaire was pilot tested online with 28 people employed in field service operations at Xerox. After the Xerox pilot, minor changes were required with wording on four questions to further differentiate those items from related questions in the survey. Some questions differed from the IBM-based survey because of differences in corporate policy with respect to disclosure of personal information. Other descriptions of questions were also modified to reflect the nomenclature of the work environment and to enhance respondent's question comprehension and response accuracy. The time to complete the questionnaire was estimated to be about 25-30 minutes by some participants in the pilot.

4.3.4 Questionnaire administration

The stages in completion of a web-based questionnaire discussed in section 3.4.2.3 were applied in the administration of the questionnaire as a means of enhancing the likelihood of potential participants responding to the survey.

Reaching the members of the communities was a critical issue and timing of the invitation to participate was important in order to avoid peak work periods. The IBM survey was posted on July 06, 2005 until August 01, 2005 and the Xerox Eureka survey was posted on July 12, 2005 until August 07, 2005. To ensure that the invitation message was read and not deleted, three factors were considered:

- a) the day of the week: Wednesday and Thursday were selected as best days (people would be more overloaded with work and messages the first days of the week);
- b) message subject line: an appealing subject line was devised; it said "invitation to participate in research study about online communities".
- c) a hotlink to the survey website.

Prompting the member of the community to make the decision to participate in the survey was also critical. To ensure the member's interest a cover letter was prepared. It described the topic of the survey, the benefits of the study, assurance of confidentiality, ethics clearance and the promise of a summary report as an incentive to participate. The expected completion time, multiple-choice format of the questions and the nature of the doctoral research study were also stated in the invitation. The

questionnaire was designed in a multiple-choice format to diminish time for response survey completion. It was included in the same invitation message as the cover letter and the instructions to give the respondent the opportunity to peruse it and to facilitate immediate response.

Encouraging the IBM and Eureka community members to start responding to the questionnaire and to complete it was carried out with two reminder messages that were sent out six days and twelve days after the first invitation. For the first reminder, its subject line read “a reminder” and for the second reminder its subject line read “last opportunity to participate in research survey”.

4.3.5 Response rates

The response rate is a telling parameter of the data collection process. Fowler (1989) conceptualizes a survey response rate in a number of ways and he recommends reporting a range of response rates. One calculation corresponds to the number of people who return the questionnaire divided by the number of people sampled. In another calculation, he excludes those sampled units who have been screened and not incorporated in the study population, for example, vacant lots and houses, telephone numbers that are not working and households where no eligible persons reside. Fowler’s recommendations were for surveys distributed largely in physical, geographic areas. Surveys carried out over the Internet need to recognize the fluidity of membership composition and the difficulties in establishing the sample frame/comprehensiveness for participants in online communities of practice.

Survey response rates for active members during the survey period may be a more meaningful number, as passive participants are unlikely to respond to requests for survey information. The category, active member, refers to members who contributed at least one message during the survey period. There were 100 IBM surveys returned from 1612 active members during the survey period for a response rate of six percent (6.2 %). Lower response rates within the IBM-based communities may mask the effect of duplicate memberships in these communities. i.e. if the active IBM respondents were involved in multiple communities within the survey, they may have self selected and completed only one survey. This will produce a misleadingly low response rate among active members. If every active individual member were active in at least two communities, the response rate would be more like twelve percent (12 %). Given the work domain of the software communities in general and the IBM software products

in particular, it appears likely that survey respondents could be members of multiple IBM-based software communities. Almost fifty percent (47%) of IBM respondents reported belonging to 6-10 communities of practice and over 20% of respondents also reported memberships in 11-15 communities. The estimated time-to-complete the survey was 25-30 minutes and from a time management viewpoint, it appears unlikely that busy software professionals would have the necessary time and/or interest to complete multiple surveys. Active members in the Xerox Eureka community were 1297 and they completed 336 questionnaires for a response rate of near twenty six percent (26%). The number of questionnaires returned for Xerox Eureka was 336 of the 20,000 eligible members for a response rate of one percent (1.68%).

4.4 IBM and Xerox Eureka Server statistics

Server statistics for the IBM communities were collected for twelve months beginning in July 2005 and ending August 2006. Xerox Eureka statistics were tabulated from October 2005 to November 2006. There was a short delay in posting the Eureka survey due to time required for a legal clearance at Xerox in Rochester, N.Y. before the survey link could be posted on the Xerox global service network.

For Eureka, *an active member is one who contributes at least one unique or original Tip during a twelve-month period.* For purposes of verification, practicality and quality assurance, unique Tips are considered to be only new and original Tips validated by Xerox product specialists during the period. For example, Unique Tips may not be simply adaptations and extensions of previously validated Tips applied to a different Xerox product model.

In 1999, Xerox USA had 10,000 field service engineers that authored 2000 Tips (Bobrow & Whalen 2002, p. 55). The number of Tips per field service engineer in the whole Eureka USA community was .20 in the 1999 study. This contribution rate per member compares to .24 Tips contribution per member in the global Eureka community (20,000 members) in 2006. The Tips contribution rate per member has been relatively stable over five years later

in the global Eureka community – a community that has twice the number of members as Eureka USA.

Table 4-2: Message contribution rate

Community	Origin date	Active member August 2005	Total messages August 2005	Active member July 2006	Total msgs July 2006	Number of messages contribute monthly	Average July monthly contribution rate	Total member Oct 2006	Total messages Oct 2006
ibm.software.db2.udb.beta	Nov-02	05	1323	11	1561	20	1.8	43	628
ibm.software.websp here application server	Dec-98	246	73486	908	80897	618	1	1177	33789
ibm.software.websp here application server-as400	Apr-00	16	8070	10	8394	27	2.7	82	3100
ibm.software.websp here portal server	Oct-02	277	9911	165	13679	314	1.9	611	6755
ibm.software.db2	Jun-95	411	106166	344	115324	763	2.2	1564	736
ibm.software.db2.mvs	Jan-99	11	2326	31	2783	38	1.22	14	2940
ibm.software.db2.udb.beta	Nov-00	25	5167	23	5612	37	1.61	47	6788
ibm.software.websp here. studio400	Sep-01	27	1689	14	1889	16.6	1.18	210	2059
ibm.software.websp here.mq programming	Jan-99	17	8179	29	8582	35.5	1.15	140	8729
ibm.software.websp here. devicedeveloper	Mar-02	34	5669	38	6647	81.5	2.14	82	6785
ibm.software.websp here. studio	Jan-99	30	10748	39	11495	62.2	1.6	313	11630
Total		1099		1612				4283	
Eureka Community		Member	Total Tips Oct 05	Member contribute Tips	Total Tips 12 months	Tips	Average Tips per active member		Total messages Nov 2006
	Dec-96	20000	0	1297	4916	410	4	20000	47308

During 2005-2006, there were 1297 active Eureka members who submitted 4916 unique Tips over the twelve-month period. The average number of Tips per active member was near four (3.8). This rate of contribution per active member was twice the number as compared to IBM-based communities wherein the average number of messages contributed per active member was close to 2 (1.64) over a twelve-month period.

What factors might account for the larger number of Tip contributions per active member in the Eureka community?

- Quality and timeliness of working knowledge that is relevant to some of the hardest problems not covered in company product support documentation. Almost a hundred percent (99.7%) of Eureka survey respondents indicated that they could expect to find quality knowledge and practical information to solve some of the hardest work problems encountered in the field.
- Access to and participation within Eureka is *fully integrated into the daily, routine work practices* of Xerox field service engineers. The online search tools and access to the Eureka database enable members to search for related problems and to do an initial problem diagnosis from within Eureka prior to arrival on customer premises.
- Expectations and ownership. Eureka is a community of practice created by peers, for peers and lead by the community. Over forty-five percent (45.5%) of Eureka survey respondents stated that they expected to contribute ideas to the community from work experience in the field.
- Validators are product specialists and full-time field service engineers. Knowledge is field-tested and validated. Also, peers give timely validated feedback for Tips and current knowledge is more readily available.
- Member's names are visible on Tips. This encourages peer recognition and the contribution of practicable and actionable ideas in the field base of equipment.
- Eureka community has evolved over 11 years, is supported with information and people resources by Xerox management and is lead by field service engineers.

In Chapter 05, members report on the community life experience within Eureka. The report begins with members' attraction to the community, their expectations and reasons for joining the community. This is followed by a report on the frequency and duration of community visits, member's modes of participation and sense of community. Finally, there is a report on the time, effort and attention expended to participate fully in the Eureka community.

Chapter 5

THE SURVEY AND MEMBER REPORTS ON COMMUNITY LIFE

In this chapter, there is a description of the

- web-based survey objectives, method, and message statistics
- survey data and report of findings from the IBM communities of practice
- survey data and report of findings from the Eureka community of practice

5.1 Survey objectives

The web-based survey was conducted in order to:

- 1) test the hypotheses derived from public goods-based approaches to communities of practice and
- 2) gain insight into the attraction to and reasons for joining the community, to learn about forms of community participation and associated job benefits, and to collect reports about community interaction experience from a members' point of view.

5.1.1 Survey method and question design

An invitation to participate in the survey the web-based survey was posted to the IBM-based communities and to the Xerox Eureka community and a hotlink directed respondents to the covering letter of the survey at a web hosting survey service called SurveyMonkey. (See Appendix A for copies of the surveys). The survey had about 54 questions and was organized in 4 sections – A, B, C, and D - with headings describing the contents for each section. Each of first two sections, A, B, had 12 questions, section C had 10 questions and section D had 20 questions. Respondents could choose the sequence of survey questions to answer and were able skip questions or sections of the survey and go forward and backward throughout the survey. Survey responses were collected automatically for each question as completed online by the respondents. Questions could be answered with check boxes and radio buttons and there were optional text boxes for further comments to most questions. There were 100 surveys returned from the IBM-based communities and 336 surveys returned from the Eureka community.

5.1.2 IBM and Eureka message statistics from servers

Message contribution rates are computed for active members in the Table 5-1 below. Active members contributed one or more messages to the community discussion during a 12-month period.

Table 5-1: IBM and Eureka Message statistics

Community	Active Members August 2005	Total msgs August 2005	Active Members July 2006	Total msgs July 2006	Average messages contributed monthly	Average message contributions per active member July 2006
ibm.software.db2. udb. beta	5	1323	11	1561	20	1.8
ibm.software.websphere application server	246	73486	908	80897	618	1
ibm.software.websphere application server-as400	16	8070	10	8394	27	2.7
ibm.software.websphere portal server	277	9911	165	13679	314	1.9
ibm.software.db2	411	106166	344	115324	763	2.2
ibm.software.db2. mvsv	11	2326	31	2783	38	1.22
ibm.software.db2. udb. v7beta	25	5167	23	5612	37	1.61
ibm.software.websphere. studio400	27	1689	14	1889	16.6	1.18
ibm.software.websphere.mq programming	17	8179	29	8582	35.5	1.15
ibm.software. websphere. studio.application-site-developer	28	14905	14	15460	46	2.19
ibm.software.websphere. studio	30	10748	39	11495	62.2	1.6
ibm.software. websphere. devicedeveloper	34	5669	38	6647	81.5	2.14
Eureka Community	Members	Total Tips Oct 05	Members contrib Tips	Total Tips 12 months	Tips	Average Tips per active member
	20000	0	1297	4916	410	4

The IBM message statistics were calculated from August 2005 until July 2006. Eureka message statistics were calculated from October 2005 to October 2006. For twelve (12) IBM-based

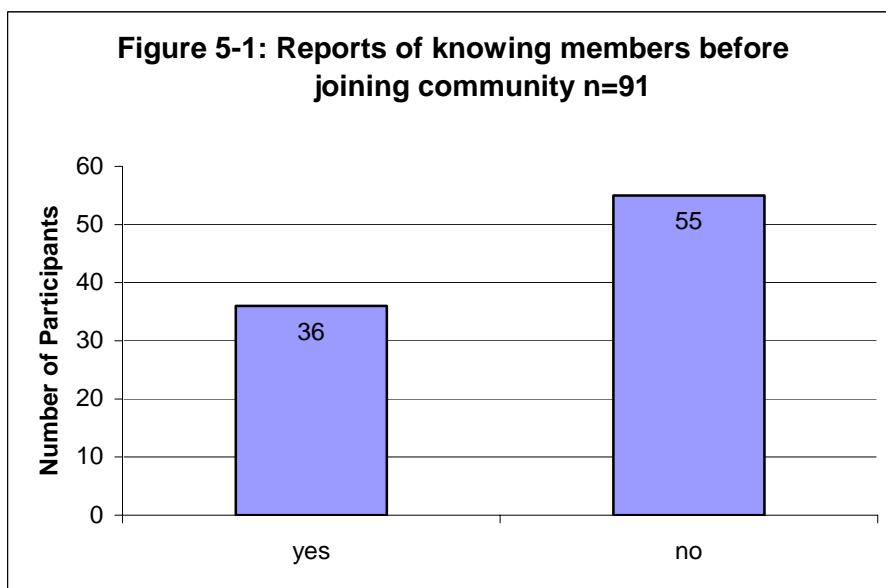
communities, average message contributed was less than three (3) per active member for July 2006 and less than 2 messages per active member for July 2006 in eight (8) of the twelve (12) IBM-based communities. In the Eureka community, active members contributed four (4) messages (Tips) per month during the 12-month period.

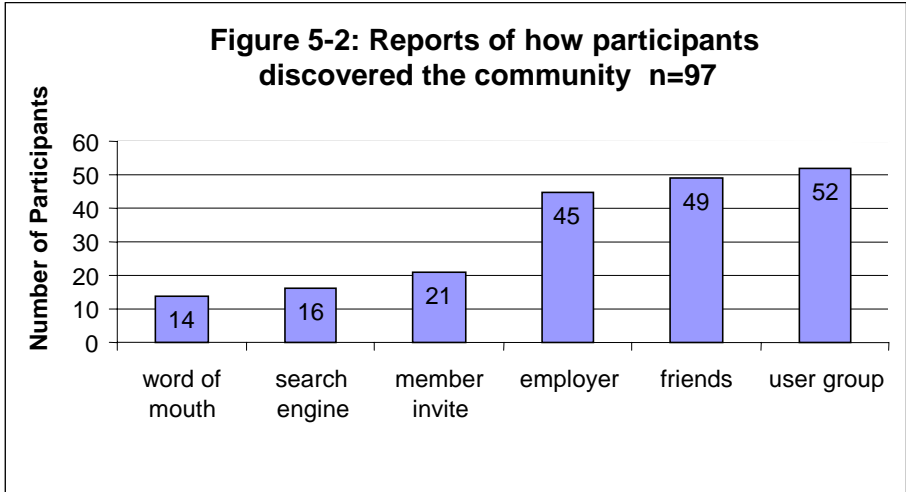
5.2 Survey data from IBM-based communities

The survey data will be reported in three parts for each community. The first part begins with a report of how members discovered the community, length of membership, memberships in other communities, and a report of how members describe interaction in the community. The second part describes activities members reported doing in the community and how they participated in the public message exchange. Finally, the third part concludes with a description of member's reports of the experience of community membership, how they felt about participating and any plans for ongoing levels of participation in the community.

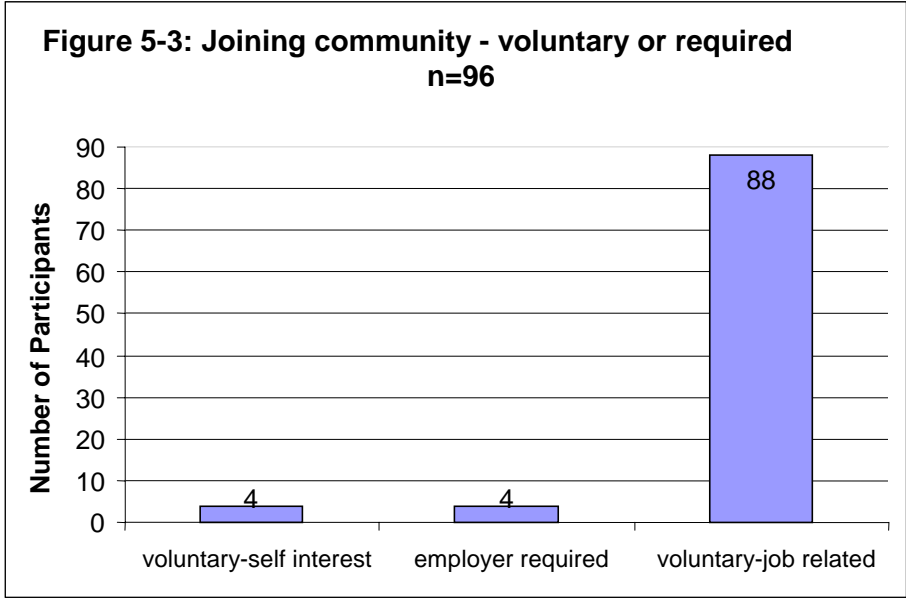
5.2.1 Sources of information for joining a community

Informal sources of information used for selecting and deciding to join communities predominated over formal sources. Most of the respondents (55) did not know members before joining and learned about the community from members of a user group (52) and from friends (49) who told them about it and how to join. Other people (45) learned from their employer; some received an invitation from a member (21) or learned via a search engine (16) and by word of mouth (14).





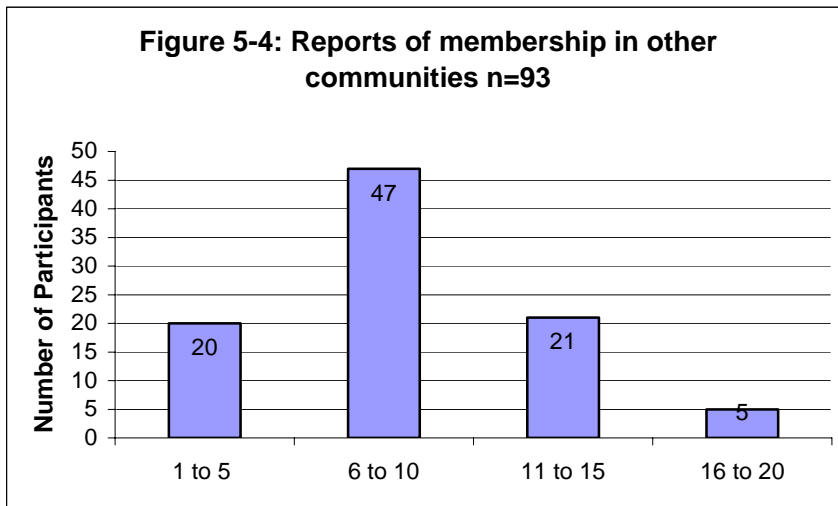
Overwhelmingly, people reported that they joined the community voluntarily (88) because the contents of the community discussion was related to their job interests.



5.2.2 Multiple community memberships

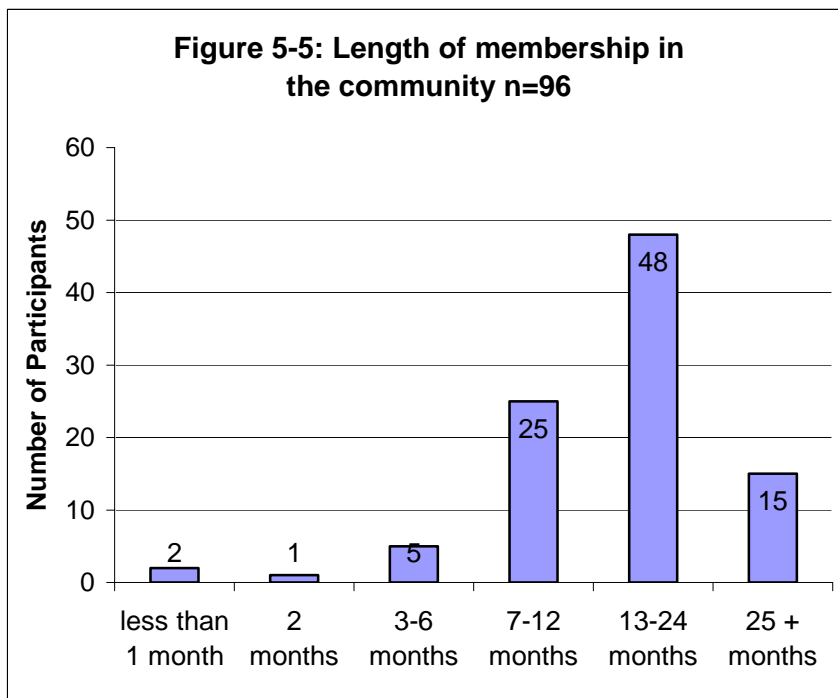
Respondents reported multiple memberships in other communities. Forty-seven percent (47%) of respondents reported joining 6-10 communities, twenty-one percent (21%) of respondents reported joining 11-15 communities, and twenty percent (20%) of respondents reported joining 1-5 communities. A smaller number, only five percent (5%) of respondents, reported joining between 16-20 communities. The majority of people who joined multiple between 6-15 communities may signal the growing importance of multiple community memberships in the software technology

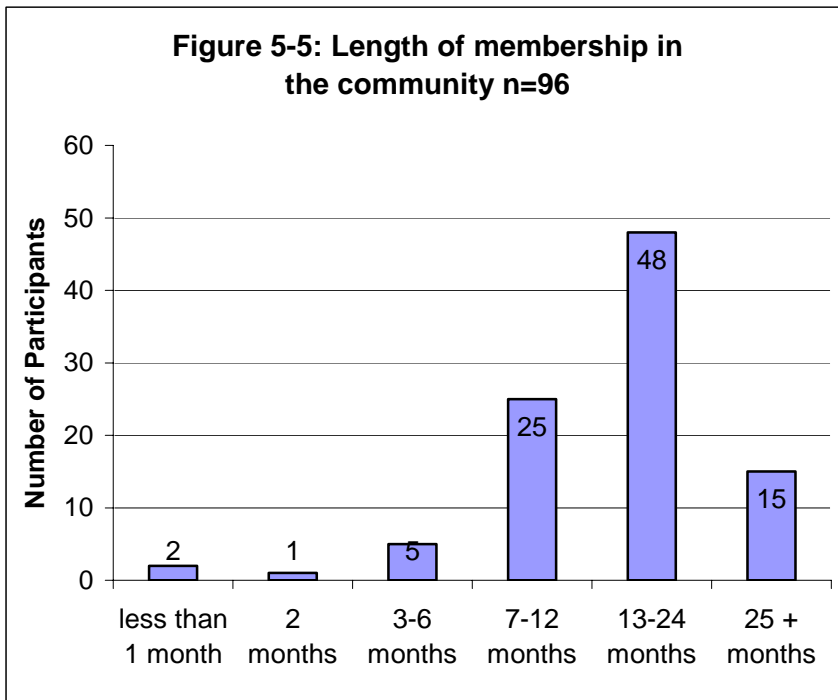
industry.



5.2.3 Length of membership in the community

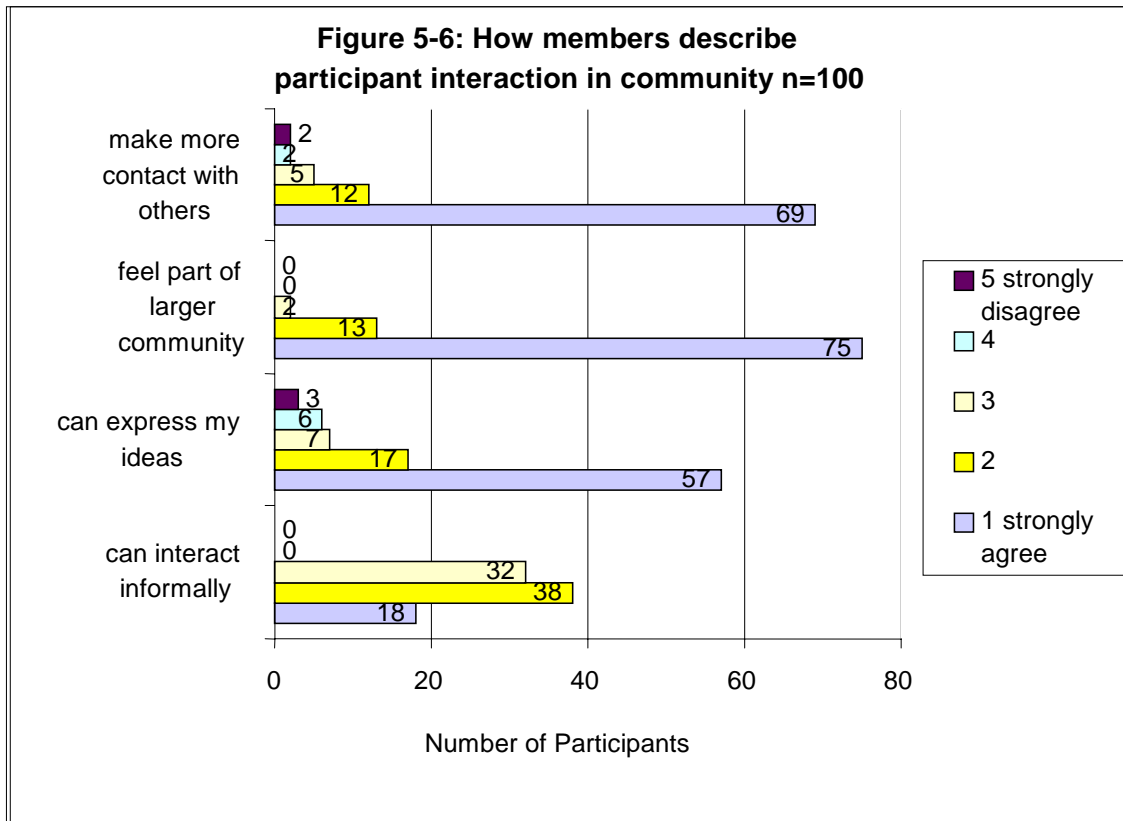
Thirty three (33) members reported being in the community for 12 months or less, forty-eight (48) members reported being in the community between 13-24 months and fifteen (15) members reported being in the community for over 25 months. There appears to be signs of longevity and stability of membership. Thirty-three percent (33%) of respondents have been members for 1-12 months and almost fifty percent (48%) have been members for 13-24 months in the community. Other members, fifteen percent (15%) reported being in the community over 25 months.





5.2.4 Interaction within the community

There are reports of strong agreement about positive and supportive interaction dynamics within the message exchange and reports of strong agreement about feeling part of a larger community.

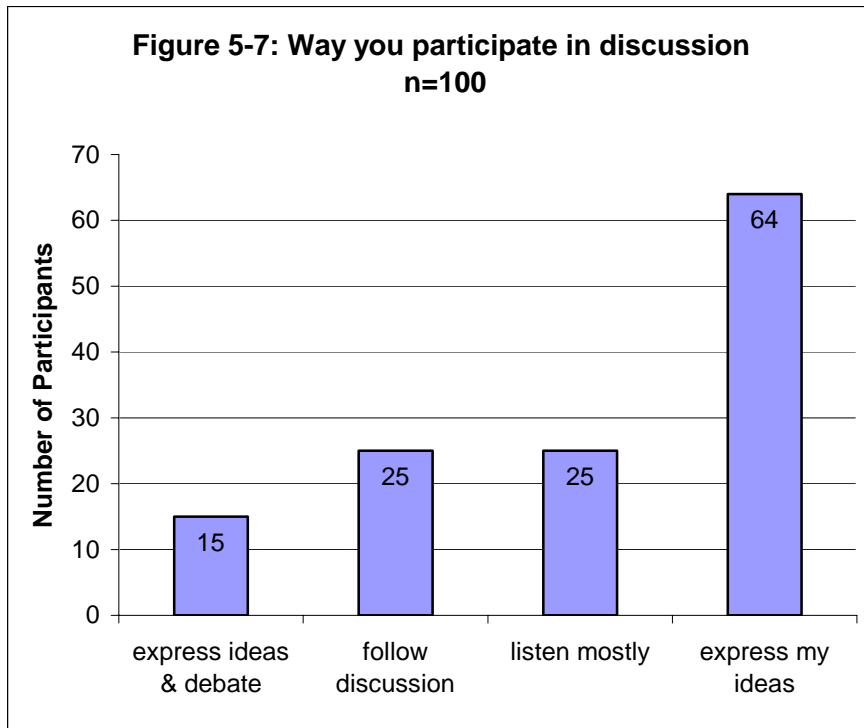


Members reported feeling part of a larger community, being able to express ideas and being able to contact others with similar interests. Also, there was agreement that one could interact informally in the message exchange in the community.

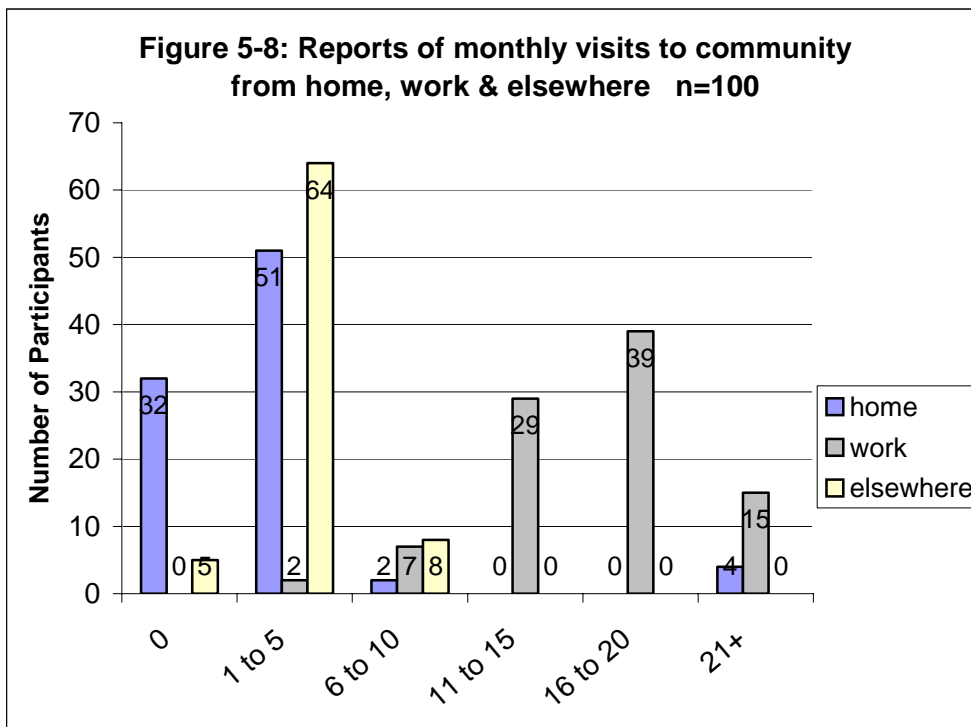
5.2.5 Reports of participation activities

Members reported how they interact and participate in the community. Most members stated (64%) that they express their ideas and twenty five percent (25%) of members reported that they mostly listen to or follow the discussion. Fewer members (15%) reported that they express their ideas and debate with members.

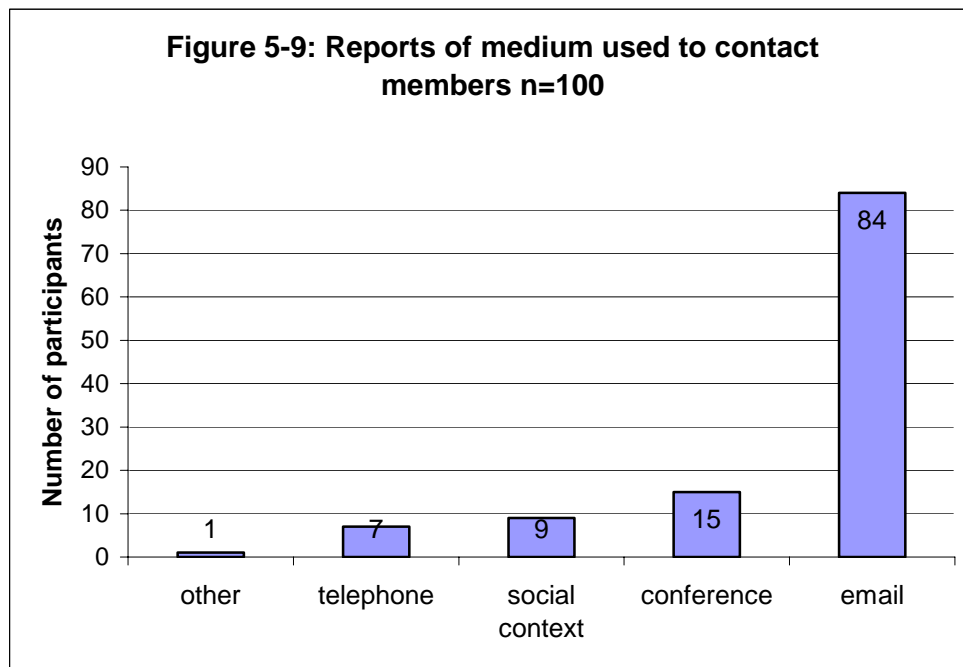
Members reported different monthly patterns of access to the community from home, work and elsewhere. A majority of members (64%) make 1-5 visits per month from places other than work and home. Fifty-one percent (51%) of members reported visiting 1-4 times per month from home compared to thirty-two percent (32%) of members who reported never visiting the community from home.



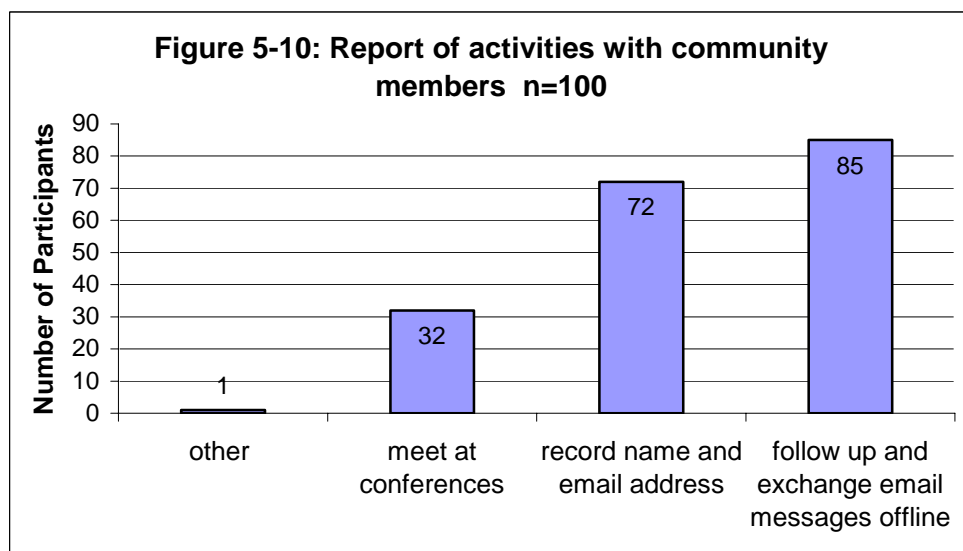
More frequent monthly visits, between 11-15 visits and between 16- 20 monthly visits, were reported taken from the workplace.



Members contacted each other primarily through email (84%), by meeting at conferences (15%), by meeting at social settings (9%) and by telephone (7%).

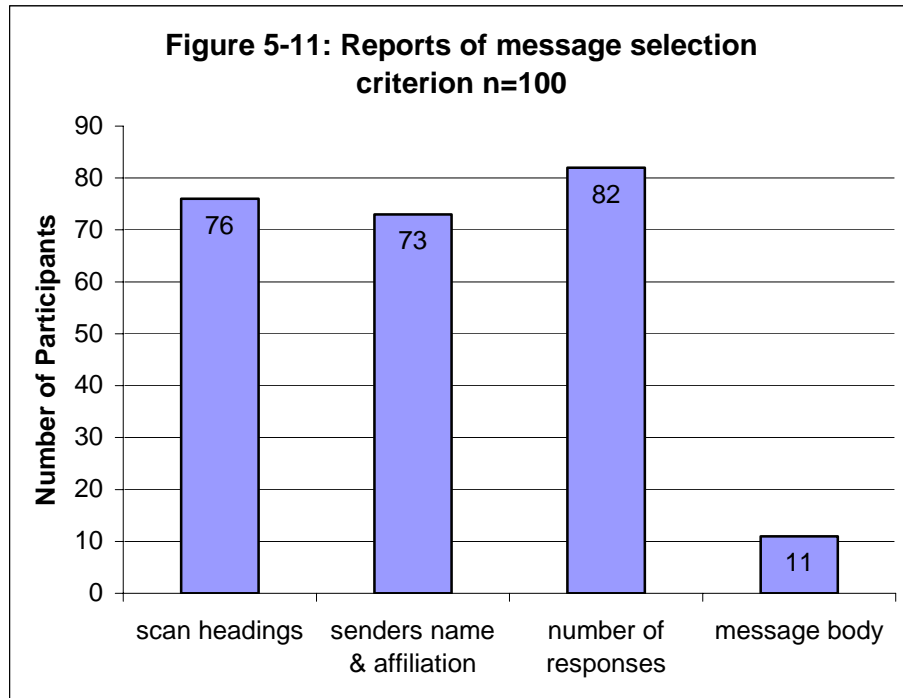


Members reported that new contacts within the community were followed up with email exchanges and with meetings outside the community. A majority (85%) of respondents contacted members directly via email outside of the public community discussion. Over seventy percent (72%) of respondents recorded the member's name and email address for future reference. A smaller number of respondents, thirty-two percent (32%), reported meeting community members at conferences.



Handling a large volume of daily messages from a large community or from multiple communities

can be time consuming. Messages that generated more responses and related interaction activity are noticed more readily. Members reported filtering large volumes of messages by the number of responses to the question (82%), by scanning the message heading (76%) and by filtering messages by the sender’s name and affiliation. Only eleven percent (11%) of respondents filtered messages by examining the message body.



A number of respondents offered further comments about handling and filtering large volumes of messages (in survey text boxes) as follows:

“I just download them.”

“look for information that I am interested in finding out more (about), problems I have had, situations I have seen”

“just download, read titles and use when I need them.”

“read and save.”

“read the first few lines and save them for searching later.”

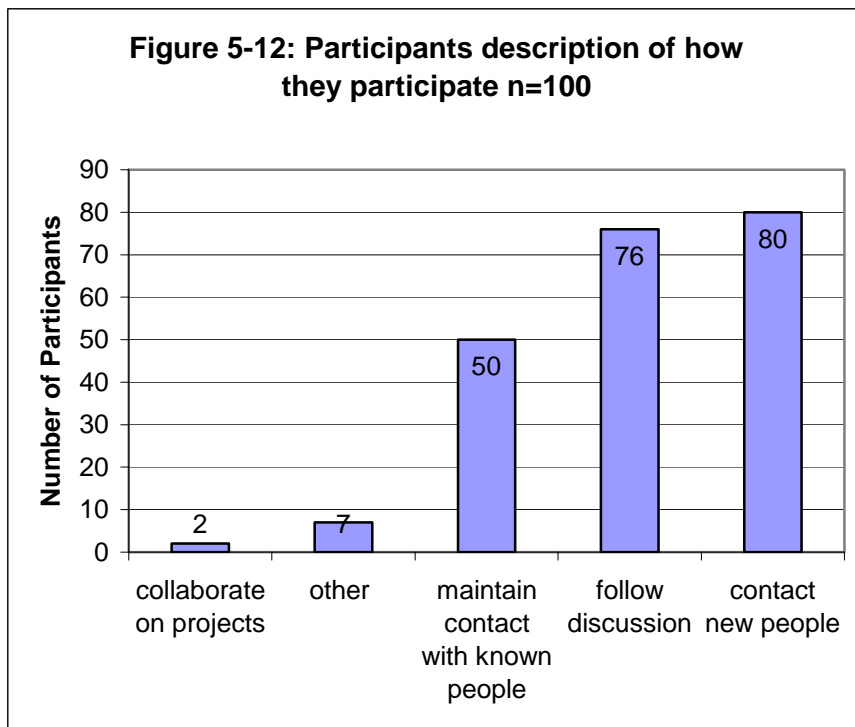
“read them all.”

“read first few lines of the message body and then saved them.”

“read headlines of what interests me the most, read the rest later by sorting on date.”

“read as many as I can based on message body and time available.”

Participants described how they participated in the community in terms of activities. Activities reported such as contacting new people (80%), following the discussion (76%) and maintaining contact with people known (50%).



Participants offered further comments about how they participate as follows:

“The forum is for help with issues for db2.”

“Read only the ones that have merit.”

“Only the must reads.”

“I read all that interest me at the moment.”

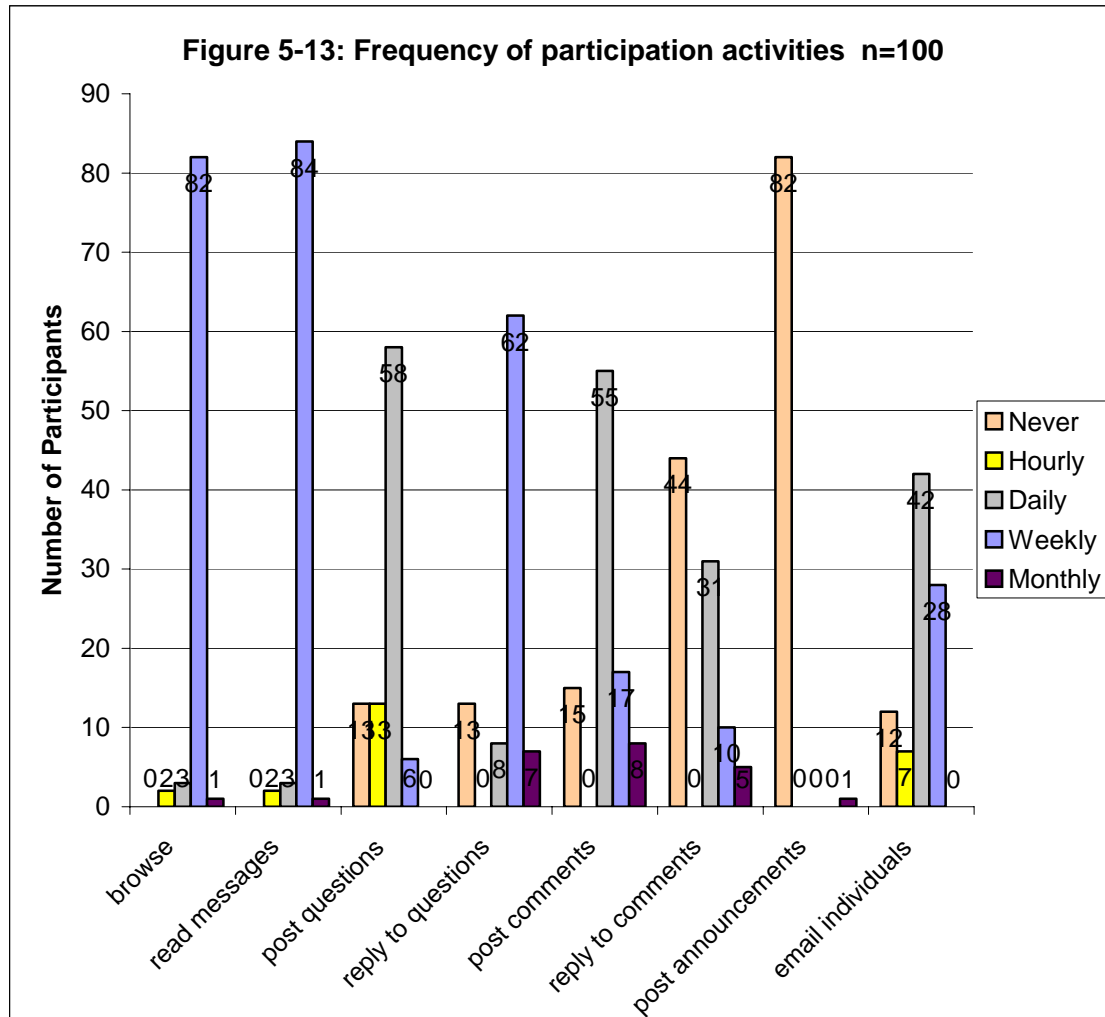
“I read only if I got time.”

“Items that sound of interest and use for past situations.”

Members reported participating in specific activities more frequency than others during the month. Browsing messages, reading messages and replying to questions are done weekly. Ninety-three percent (93%) of respondents indicate that browsing and reading messages is done largely on a weekly basis. Posting comments, posting questions and sending email to individuals outside the community are done daily. There appears to be a small group of participants (under 10% of respondents) who are more active across all categories of participation. For example, these members reported browsing and reading, posting questions and sending email on an hourly basis.

If members are very busy and didn't have time to go through their messages, they reported discarding most messages except the interesting ones. Also, members reported scanning messages according to the number of responses (by 85% of respondents), by the sender's name and affiliation (by 75% of respondents) to decide whether to discard or to save the message. If time permits, some respondents (77%) will file the entire message for future work use and other participants (12%)

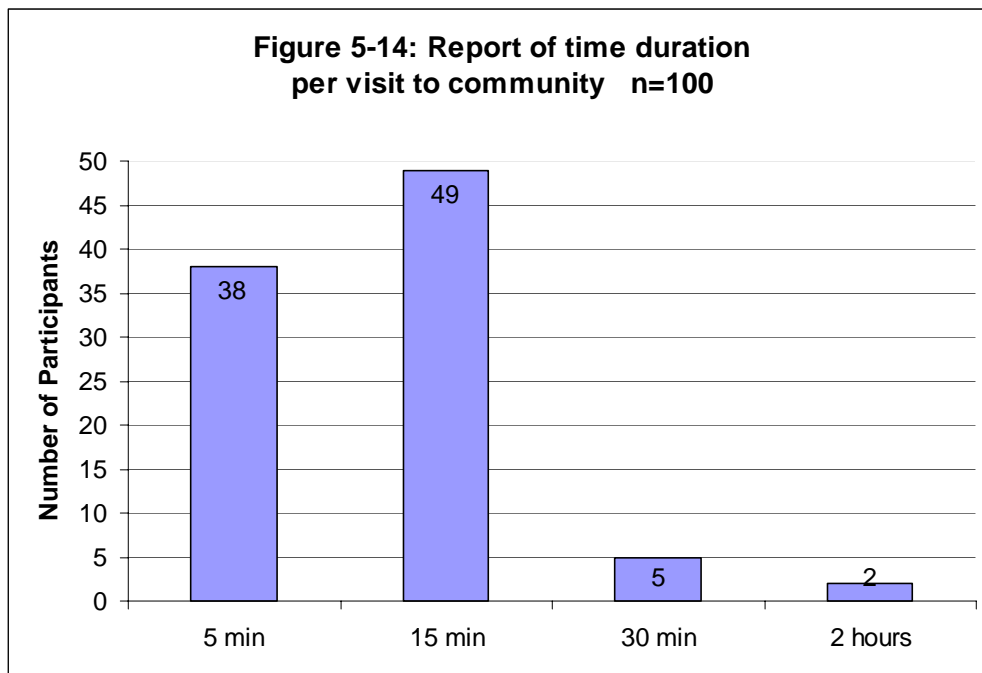
copy parts of the message and send directly to members outside the community. A varied range of external events could provoke participants to stop reading the entire community discussion for a time period. If many messages had accumulated, members reported discarding most to avoid spending too much time on them, though nearly all respondents (93%) review their email on a weekly basis.



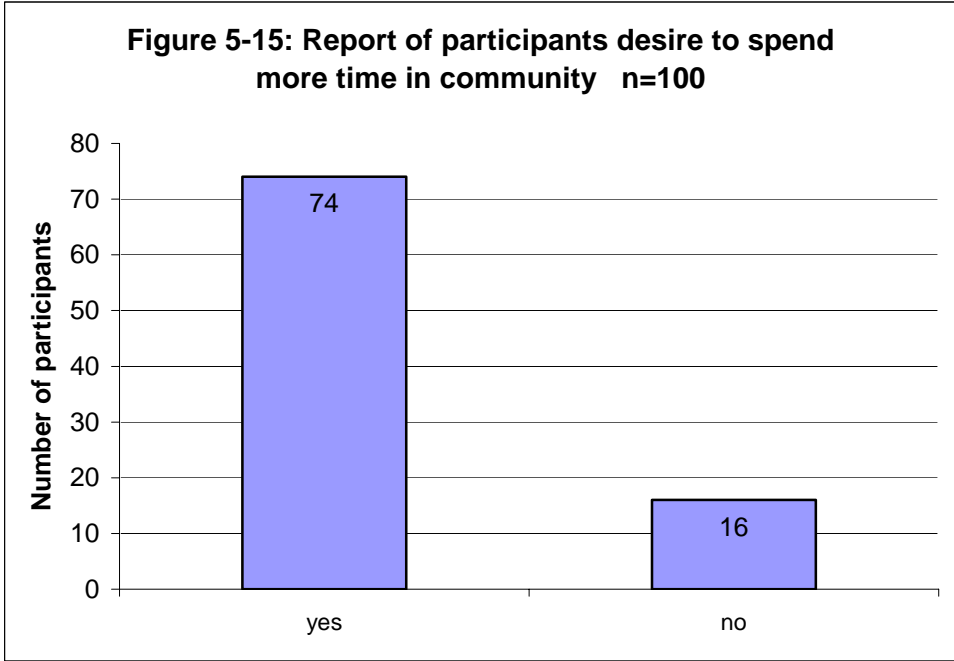
Many respondents indicated an awareness of how much time is involved in daily visits to the community. An average visit took fifteen minutes for forty-nine percent (49%) of respondents and took five minutes for forty percent (40%) of respondents. Some respondents indicated in text boxes on the survey, that they felt overwhelmed with the task of keeping up with a large volume of messages and organizing this information for future use. Some comments are as follows:

- “I have difficulty just keeping up.”
- “I’ll file and then check it out to see if it works.”
- “I print them off and file it for later.”
- “I keep it on my desktop until I can check it out.”

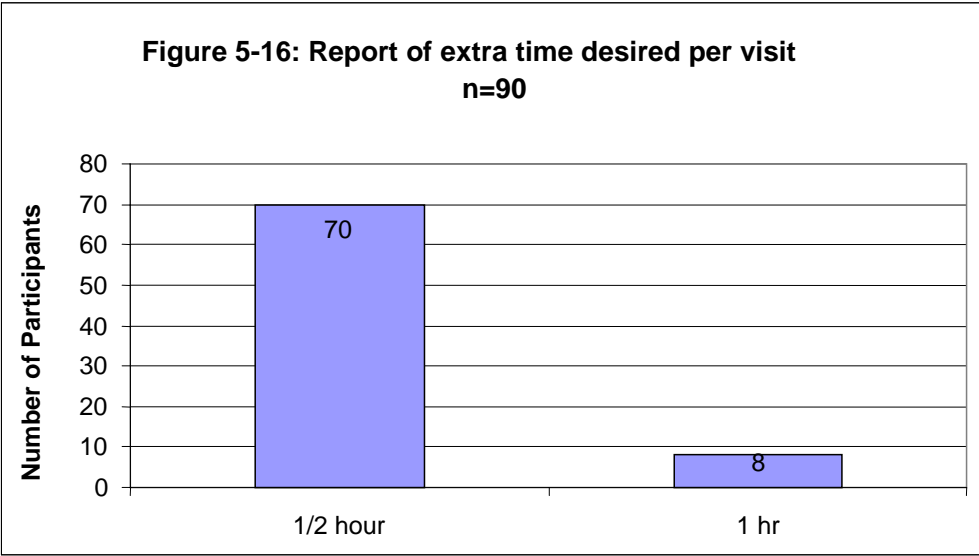
Members reported taking an active stance on counteracting the feeling of information overload. They reported using information handling strategies to reduce the amount of messages to be read and seem to have set limits on the amount of time they are willing to spend reading messages. One strategy reported was to browse and to read messages on a weekly basis and another strategy reported was to reduce or limit the number of community memberships to those strictly relevant to their current work interests.



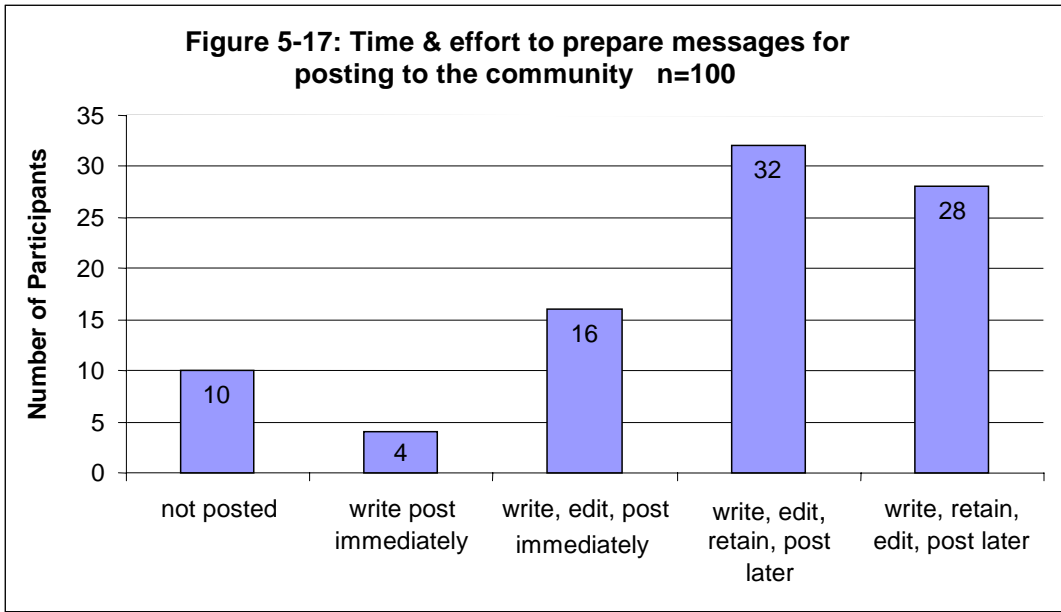
Seventy-four percent (74%) of respondents would like to spend more time in the community. On average, members reported making 18 visits each month to the community (3 visits from home and 15 from the workplace) and the average visit duration was 10 minutes. Also, members reported spending about 3 hours per month visiting the community and the majority of respondents would like to spend more time in the community.



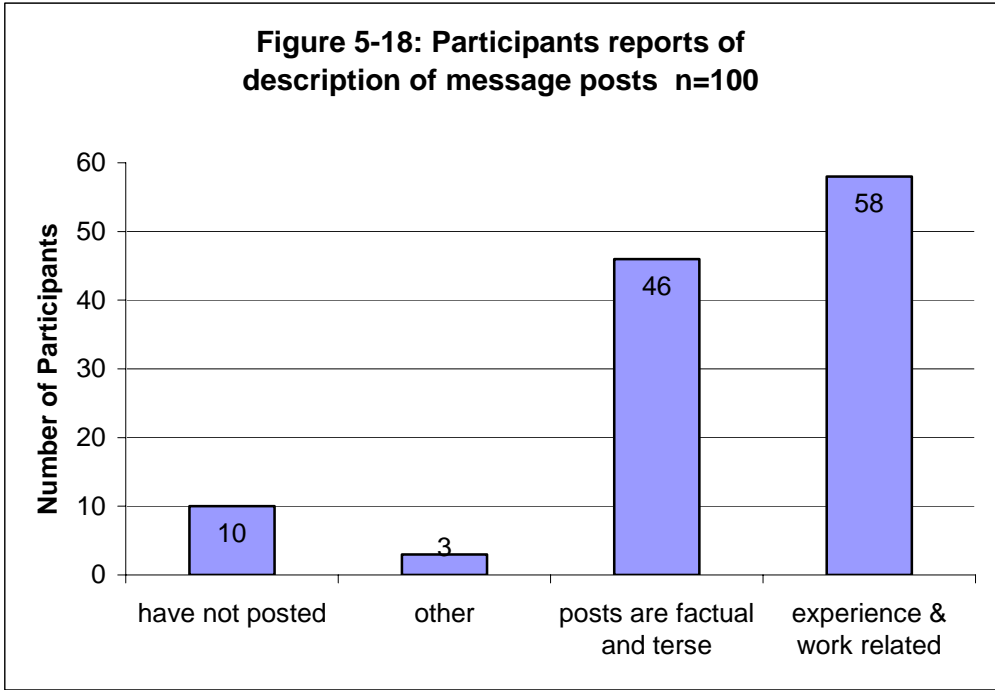
Seventy-seven percent (77%) of respondents would like to spend an additional 30 minutes per visit in the community. Including the desired extra 30 minutes per visit, members would like to spend up to 12 hours per month on community activities.



Preparing messages for public posting is a careful and deliberate activity for the majority of respondents. Close to sixty percent (60%) of respondents indicated that they edit and hold back their messages for posting later. Only four percent (4%) of respondents indicated that they write messages and post immediately.

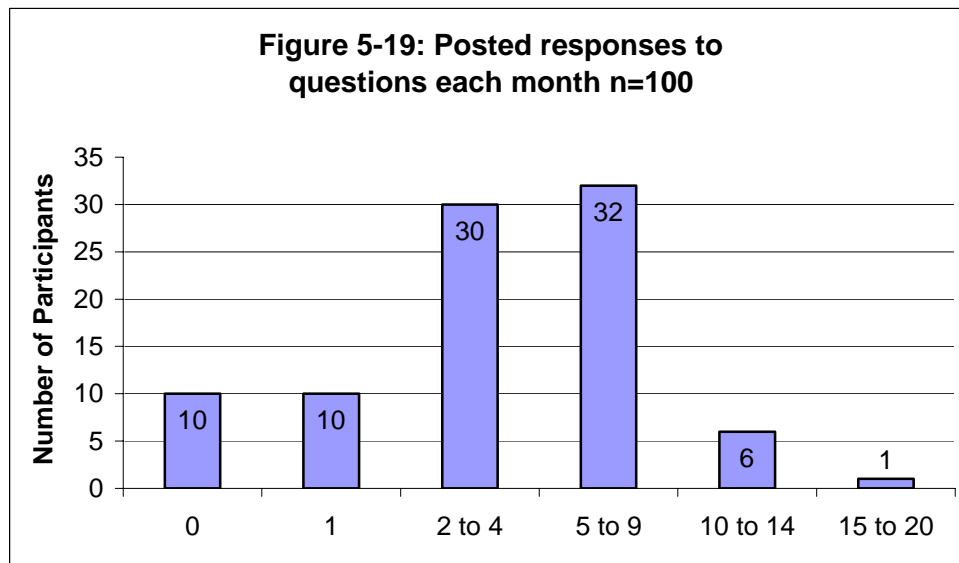


Message posts are written tersely and focused on the question topic. Fifty-eight percent (58%) of respondents describe their message posts as being work related and forty-six percent (46%) of respondents describe their message posts as being factual and terse.

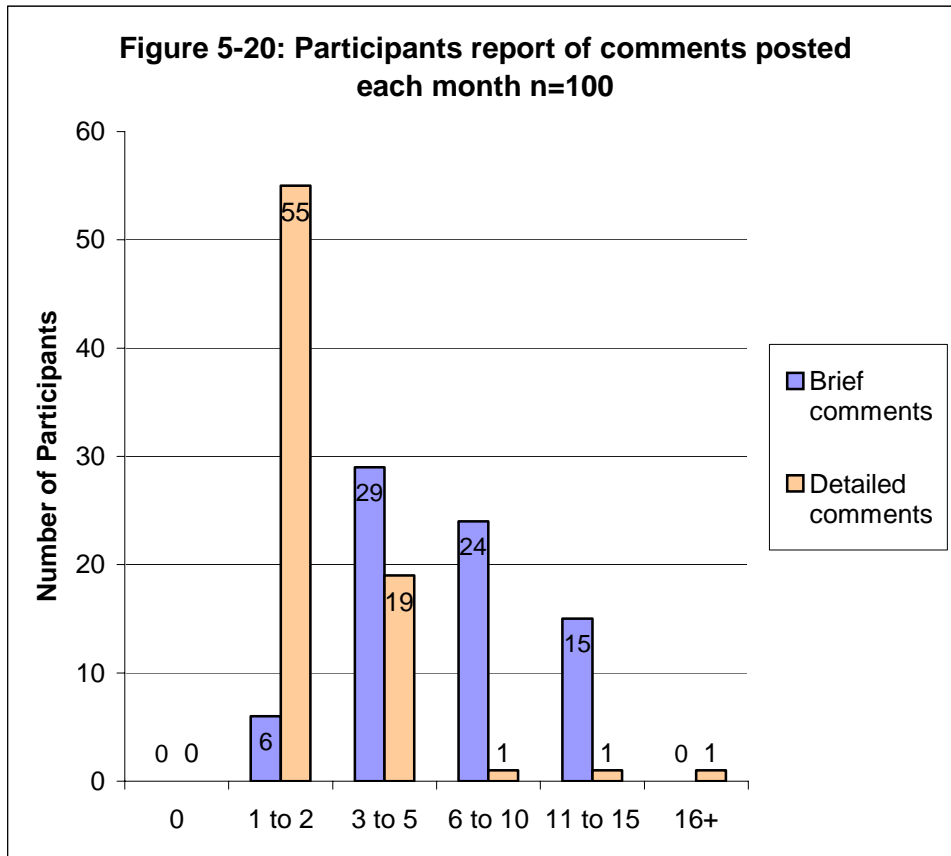


Members reported to be less involved in contributing messages. Most respondents describe themselves as observers in the community who participate passively by following the discussions (78%) and by listening (25%). There were some who reported daily message contributions, mainly to ask questions (64%) or to respond on a weekly basis to factual or work-related questions (69%).

These members indicated that they are more likely to post daily comments (61%) than to reply to daily comments (34%). Some members contribute sporadically, mainly 1-2 detailed comments each month. More common however are monthly posts of 3-5 brief comments in response to other messages (30%). Twenty-five percent (25%) of members reported making 6-10 brief comments each month. There appears to be no apparent difference in message contributions between recent and long time members of the community. Among those who rarely or never contributed there were experienced members as well more recent members.



Fifty-five percent (55%) of respondents reported posting between 1-2 detailed posts and about twenty percent (19%) reported posting between 3-5 detailed posts each month. Participants indicate that incentives to contribute came from within the community and from one’s own sense of what community membership entailed. Positive incentives reported to contribute messages were: (a) being interested in the topic, (b) identifying with or knowing people in the community; (c) feeling comfortable about one’s own knowledge of a topic, (d) feeling the obligation to reciprocate, (e) one’s conception of the community their role in it. A large majority of respondents (77%) indicated that their conception of community participation is about cooperating and sharing ideas with other members. In this way members reported they, “give back”, “share knowledge and experience”, “...helps others with their questions”, “gives something back to the group and shares experience”, “writes messages if one has something useful to say”, “respects others needs for help to get work done on time.”

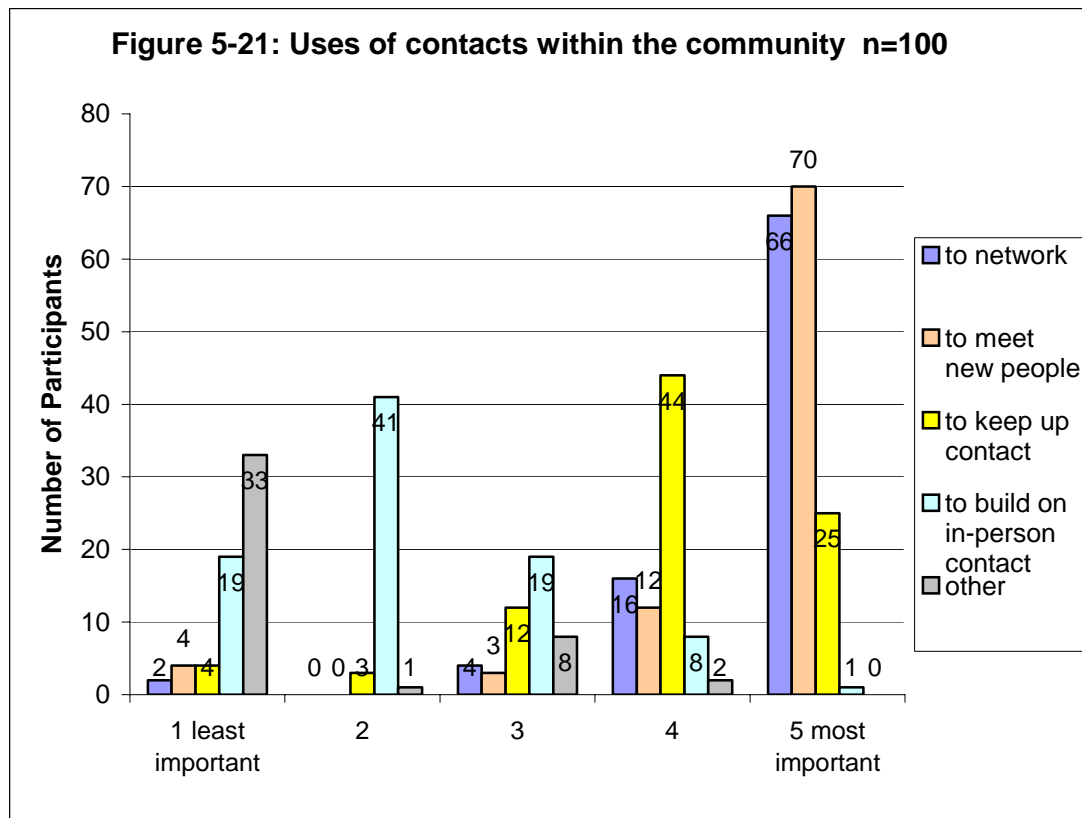


Although most participants contribute rarely or never, there was an undercurrent of feeling somewhat responsible to reciprocate and to contribute messages. Some members reported participating mainly as recipients of broadcast messages and gave explanations for their behaviour and/or indicated their willingness to be available to answer at least factual or experience related questions. Many members indicated that they felt a sense of community from helping others and, in fact, had joined initially expecting to discuss ideas about work topics and to contribute to the community discussion. As well, these members consider message contributions to be a form of public participation in the community.

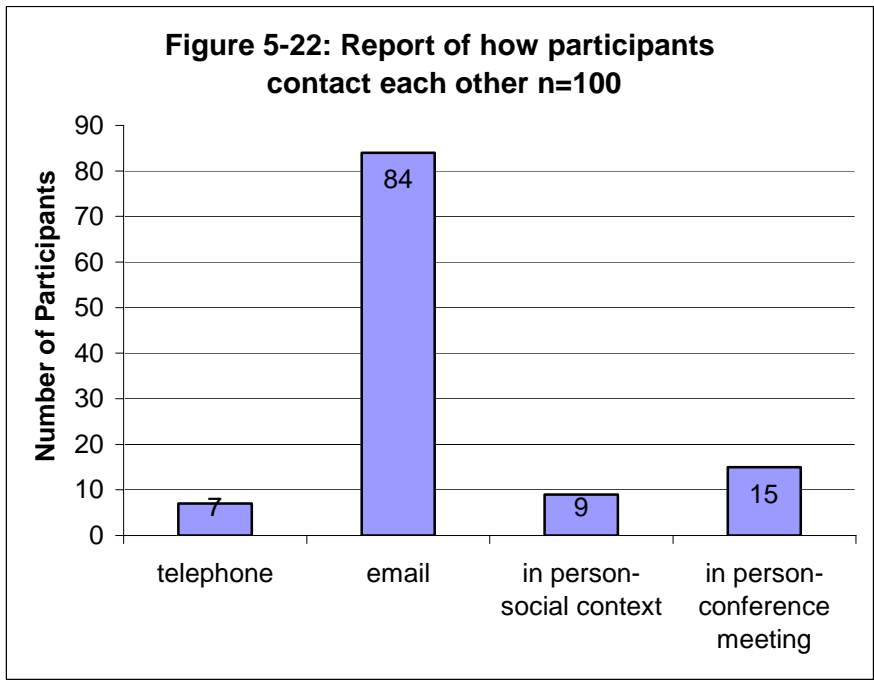
Participants commented about their sense of community and obligation to participate as follows:

- “I write messages if I have something useful or pertinent to say or to add.”
- “You give back, help others with questions.”
- “Share experience and know how and give back.”
- “Give feedback and makes an effort to share and to help.”
- “Puts something back into the forum discussion.”
- “I respond to specific requests for information.”

Participants reported accessing the community to meet new people, to network with members and to keep up contact with people. Using community access to meet new people and to network was reported as the most important use of contact information. Seventy percent (70%) of respondents indicated that using contacts to meet new people was most important followed closely by sixty-six percent (66%) of respondents that reported by using contacts to network was most important. Using access to the community to maintain relationships was reported as important by forty-four percent (44%) of respondents. Using access to the community to build on in person contacts was reported as a less important use of the community.

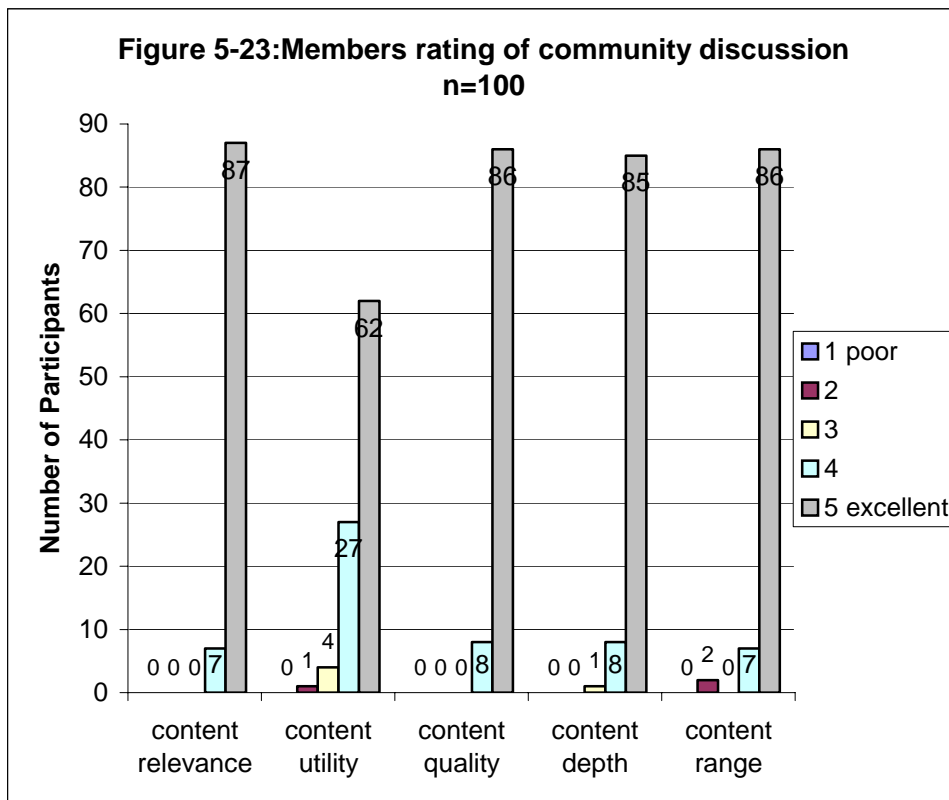


Email was reported as the dominant form of contact within the community. Contacting community members by email was preferred by eighty four percent (84%) of respondents, followed by meetings at conferences - preferred by fifteen percent (15%) of respondents and at social meetings for nine



percent (9%) of respondents and meetings by telephone for seven percent (7%) of respondents.

The quality of the community discussions was rated excellent by over eighty-six percent (86%) of respondents. This very high quality rating may also contribute to very high overall satisfaction level reported by respondents. Almost eighty-seven percent (87%) of respondents reported an excellent alignment between the relevance of the community discussion to their work interests. The message content range was also rated excellent by eighty-six percent (86%) of respondents and likewise for the content depth of the discussion (85%). Sixty-two percent (62%) of respondents rated the content utility of messages as excellent.



Although it may be difficult to estimate the message volume posted to the community, some respondents (42%) estimated that they receive between 31-65 daily messages. Thirty-four percent (34%) of respondents estimated receiving between 66-100 messages daily.

5.2.6 Benefits of public message contribution

Respondents consider message contribution to be a form of public participation and indicated that they accrue personal benefits from their public involvement in the message exchange. Foremost of the personal benefits derived was feelings of gratitude and appreciation conferred by individual message recipients and by the community at large (75%). Also reported, was a sense of belonging to and membership in the community (69%) and, to a lesser extent, feelings of respect (13%) and of recognition (8%) as a result of public participation.

Other benefits that members reported may be categorized as public goods benefits. In terms of frequency of public goods benefits, the ability to access timely, expert, work-related information (91%) and to get relevant answers to work-related questions (97%) are reported as the two most important benefits of membership in the community. Further benefits reported are access to general knowledge (87%) of the community, an opportunity to increase contact with others (90%) and,

particularly, an opportunity to build professional relationships (77%). Some members reported that having access to expert, timely, work-related information in this community meant they are not disadvantaged by the geographical location and/or the size of their local workforce community.

Additional comments entered in survey text boxes also describe how respondents value the benefits of participation as follows:

“Getting help quickly when I need it.” “Getting expertise by looking at other peoples’ issues.” “Searching for answers.” “I do it to share what I have learned just like others share what they learned so it saves time.” “All of the above...but I’m not a glory seeker. If I can help...that’s OK, no praises necessary.” “Just being able to offer a solution to a tough problem for someone.”

The relative rating in importance of community activities offers an interesting assessment of the interaction experience from a participant’s perspective. Being able to meet people and being able to discuss work problems were reported to be two most important activities undertaken in the community. Meeting people was reported to be a *most important* outcome for seven percent (7%) and an *important outcome* of the community interaction for seventy-six percent (76%) of respondents. The message interaction was reported to be *most important* for twenty-two percent (22%) of respondents and *important* for fifty-seven percent (57%) of respondents. Both activities were reported to be an important community activity for about eighty percent (80%) of the respondents.

Members were also asked whom they approached in the community for information and help with questions about their work tasks. Approaching the whole community was indicated as likely for eighty-four percent (84%) of respondents and most likely for twelve percent (12%) of respondents. The most likely members to be approached with questions were frequent expert message posters according to ninety-two percent (92%) of respondents. Approaching friends was reported by seventy-seven percent (77%) of respondents. Work associates were the least likely to be approached by eighty-five percent (85%) of respondents. This may not be too surprising given the earlier reports about members’ concern for message posting and revealing of one’s knowledge and expertise in public.

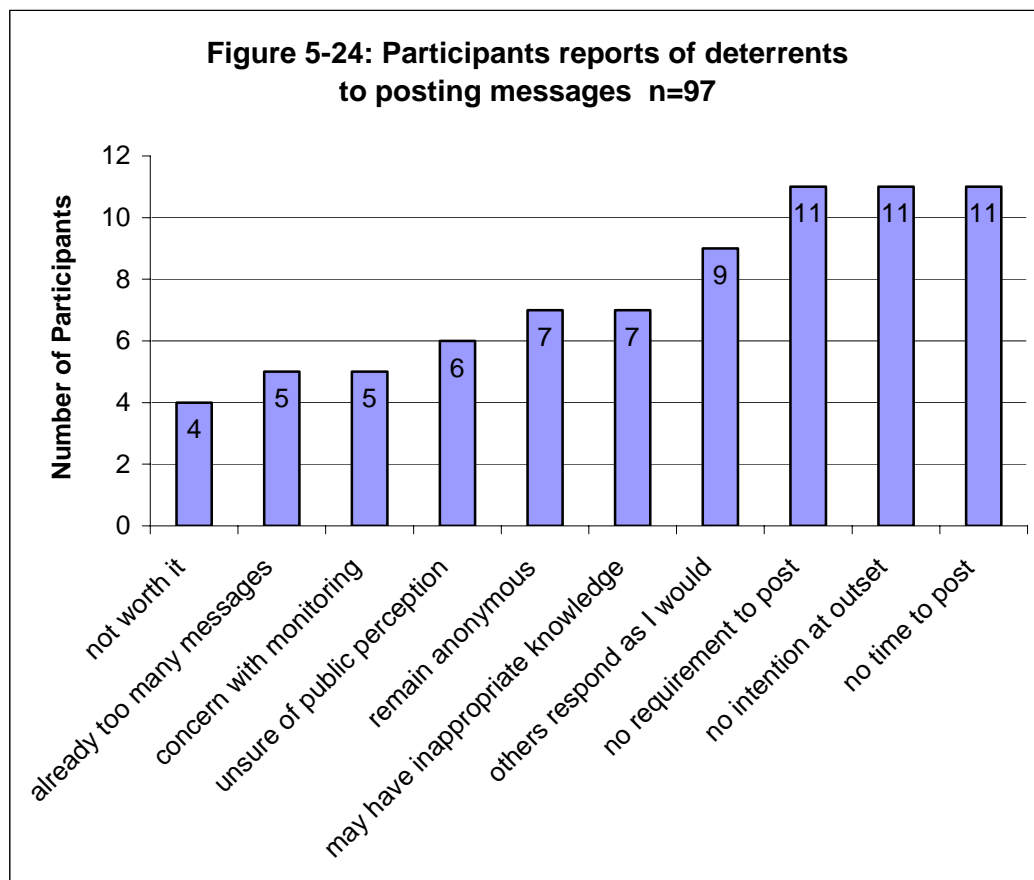
In summary, one’s general purpose for being in the community and his/her sociability are reported to major factors in one’s message contribution behaviour. Reports of relevance of the discussion topics to one’s work duties, reports of one’s wish to keep up contact with the community, reports of feeling comfortable about one’s own knowledge of a subject, reports of feeling a need to reciprocate

(give back) and reports of member's conceptions of what membership in the community is about are connected with participation activities in the community for many members and for an important core group of members.

In the next section, there are reports about deterrents to public message contribution. There are reports about the majority of members who choose not to make public contributions to the message exchange and, ultimately, to the lifeblood of the community.

5.2.7 Deterrents to message contribution

Members reported three types of negative incentive to message contribution: (a) investment of time, effort and communication discipline required; (b) bad timing, (c) awareness of risk to one's reputation in public.



- Time, effort, attention & communication discipline needed

Members reported being very aware of the time investment required for more frequent participation, in general, and message contribution, in particular. Communication discipline is needed to follow the discussion on a daily basis and to be prepared to make relevant contributions to a topic on a

timely basis. Some (11% of respondents) express that they are not prepared or willing to commit extra time in otherwise busy work lives. Some representative comments to these points are reported as follows:

“I have difficulty just keeping up...” “It’s hard to keep up with everything coming at you now.”
“It’s hurry, hurry up. Always the same...no time during regular hours.”

- No requirement to post, no intention to ever post

About eleven percent (11%) of respondents indicated that they felt no need to contribute messages because it was not required of members. A similar explanation reported for not contributing messages was that eleven percent (11%) of respondents joined with no intention to contribute messages at the outset. Additional comments were offered as follows:

“I have not been asked.” “When I have a good suggestion to make.” “Not involved.” “I am not authorized to do so.” “There are no reasons for me to do it.” “Never crossed my mind to.”

- Bad timing

About eleven percent (11.3%) of members reported being too busy to contribute at the time when an interesting topic got posted and during a particular message exchange. Members reported that during these circumstances, they typically filed the entire message for future use (77% of respondents) and for those members who did have time to post, they posted 3-5 brief comments per month (40% of respondents) and posted 6-10 brief comments per month (32% of respondents) and 11-15 brief comments (20% of respondents).

- Awareness of reputation risk

A great majority of respondents (81%) reported that public messages were self-revelatory. Furthermore, about seventy percent (70%) expressed a concern about message content and self-portrayal in the community. In general, many reported being concerned about making a mistake in public. Other reports offered for not contributing to the message interaction are as follows: people post as I would have (9.3%), may have inappropriate knowledge (7.3%), wish to remain anonymous (7.2%), unsure of public perception (6.2%), too many messages already (5%).

A few additional comments are as follows:

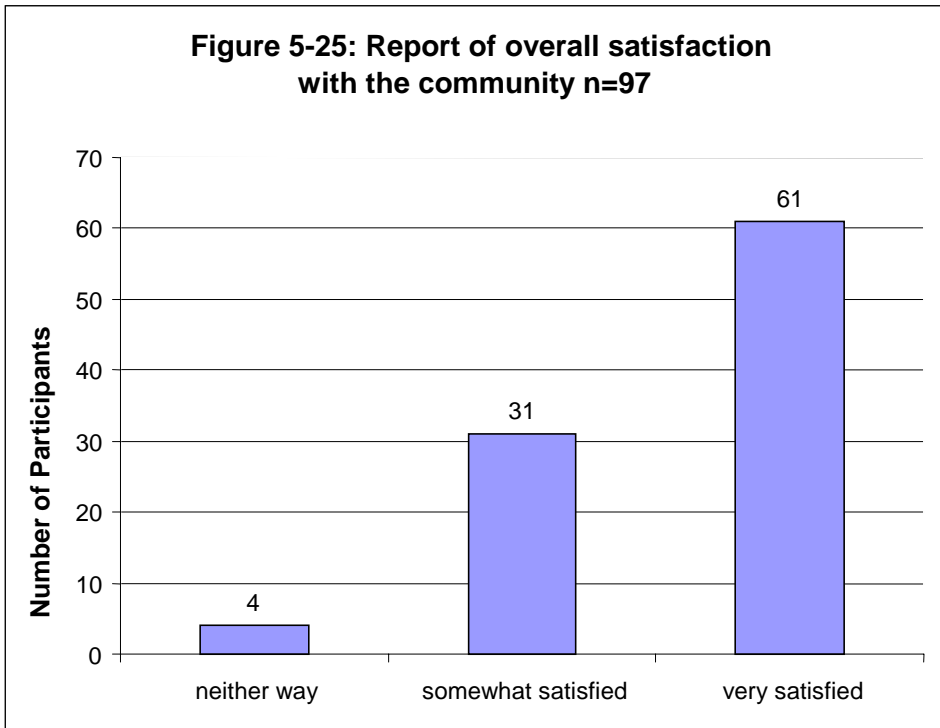
“Don’t have the level of knowledge of the new product yet to offer much wanted information, exception on areas of previous I.E. work.” “I’ll do it when I have a good suggestion to offer.”
“Most things have been said before. Is there anything new to add?”

There appears to be a temporary, fragile quality in member's attachment to the community as reported in reports of multiple community memberships and reports of not participating in the message exchange. However, these same members reported joining the community and many report a reluctance to contribute messages in public to the community. Members reported exhibiting various levels of participation: for some members who report participating in a wide range of activities to others who report perceiving and accessing and the knowledge resources of the community as a rich database from which to extract timely, expert assistance to do their jobs. Members reported participating in three ways: participating by searching for information, participating by enjoying the discussion, and participating by social networking. The community is reported to be a place for (a) obtaining information, (b) distributing information, and (c) a community that is not available locally wherein newcomers can enjoy the experience and benefits that come with membership. Participation in the community message exchange either by reading messages or contributing messages was reported to be weak for many members. At most, there are reports of sporadic message contributions, mainly to ask questions or to respond to factual, work related questions. However, some members reported taking a more active stance and contributing their opinions, responding to or asking more complex questions and making more elaborate comments in the community discussion.

5.2.8 How members felt about participating in the community

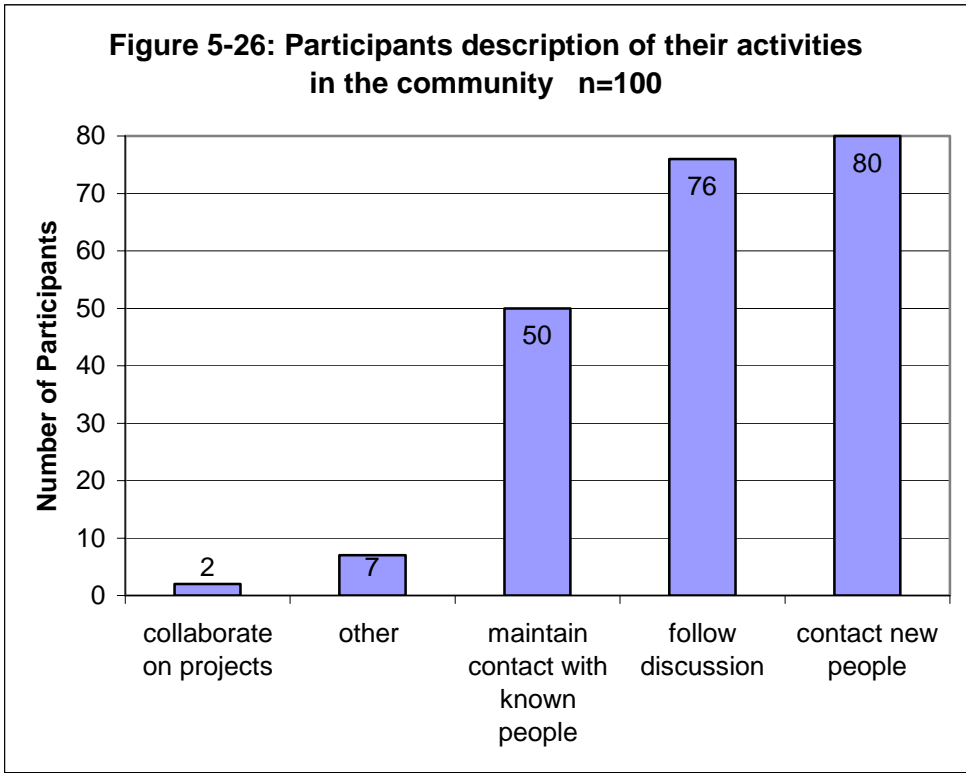
When asked about they felt about participating, most members reported very high levels of satisfaction with their experience in the community. Overall, a majority of members reported to be very satisfied. Ninety-two respondents (92) reported that they were satisfied with their community experience. Of this amount, sixty-one of the respondents (61) were *very satisfied* and thirty-one of the respondents (31) were *somewhat satisfied*.

Members reported that participating in the community enables them to reach out, to make relationships and to feel part of a larger community. Seventy-five percent (75%) of respondents *strongly agreed* with the statement that participation enabled them to feel part of a larger community, followed by thirteen percent (13%) of respondents who

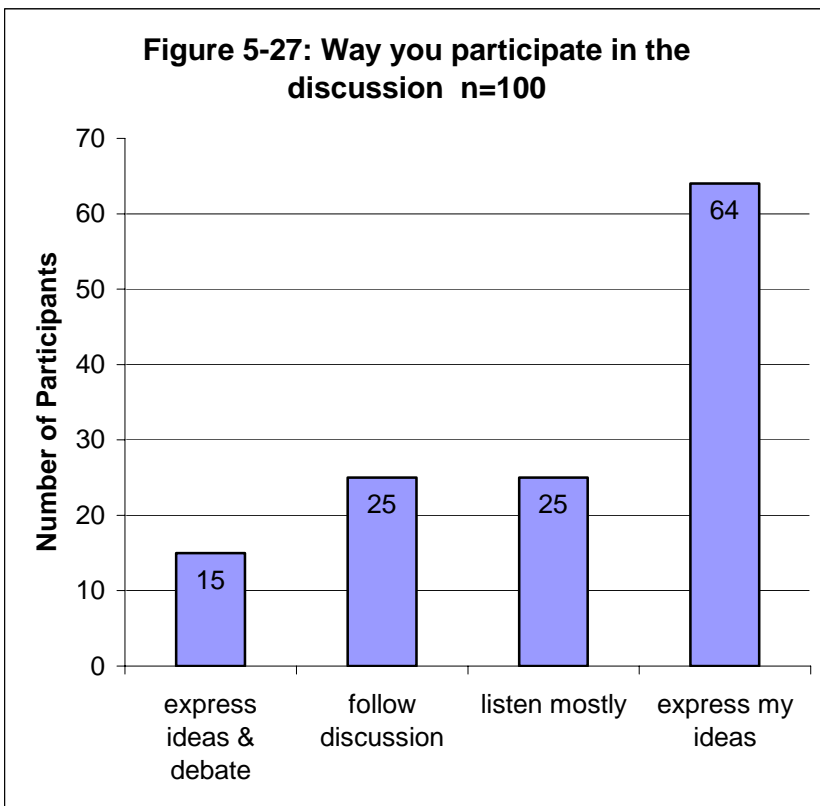


agreed with the statement.

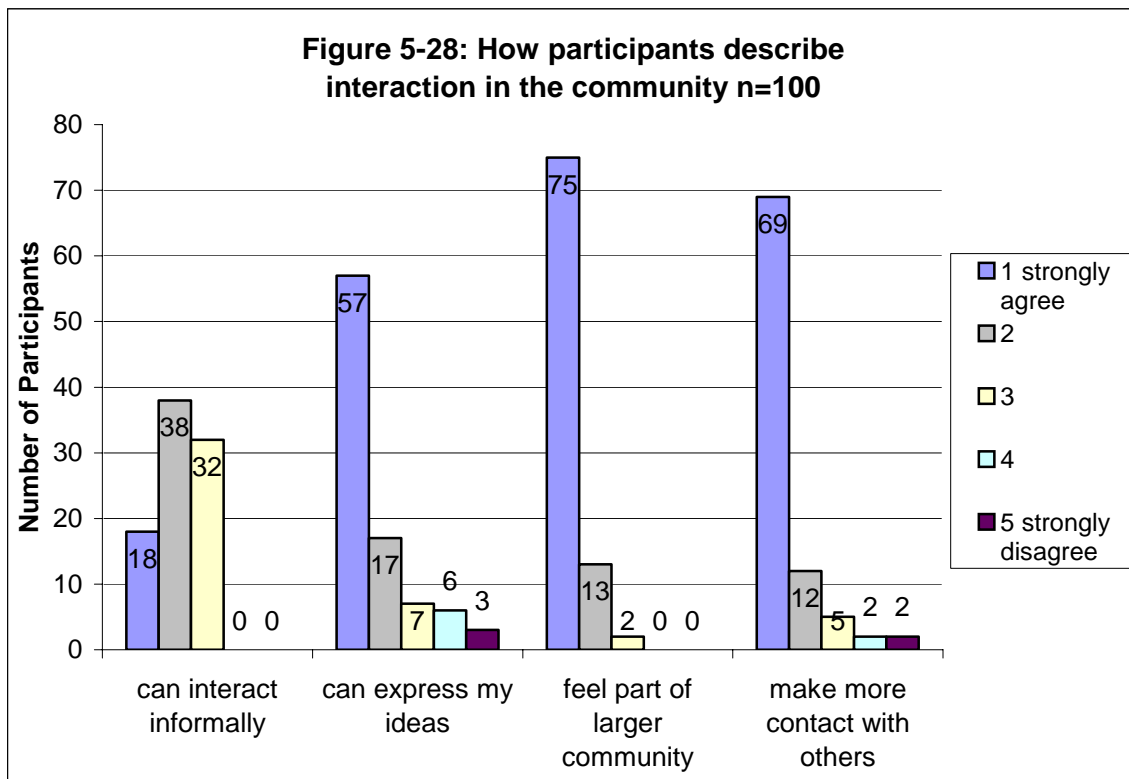
Networking and meeting new people in the community was reported a most important (75%) and important (18%) source of satisfaction for most members. Community participation afforded an opportunity to make more contact for ninety percent (90%) of respondents. Furthermore, being able to keep up contact with members was reported to be a *most important* source of satisfaction for seventy-five percent (75%) and an *important* source of satisfaction for fifty percent (50%) of respondents respectively.



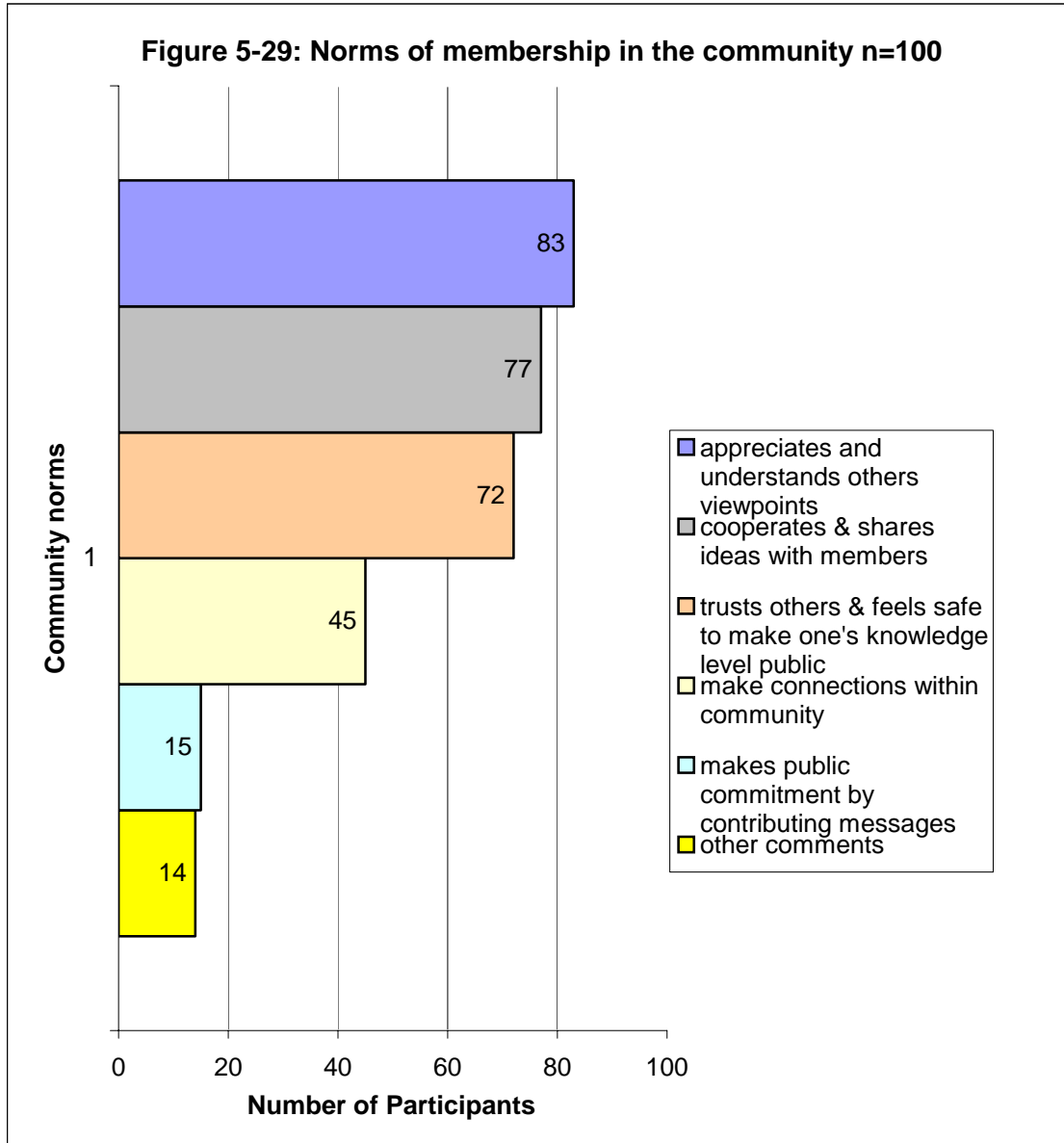
Participating by expressing one’s own views was reported by sixty-four percent (64%) of the respondents. Reading and following the discussion was reported by twenty-five percent (25%) of respondents and participating by expressing one’s own views and debating was reported by fifteen percent (15%) of respondents.



Seventy-five percent (75%) of respondents strongly agreed that they felt part of a larger community by interacting within the IBM based community and sixty-nine percent (69%) strongly agreed that make more contact with others in the community. Members also reported being able to express their own ideas (74%) and to interact informally (56%).

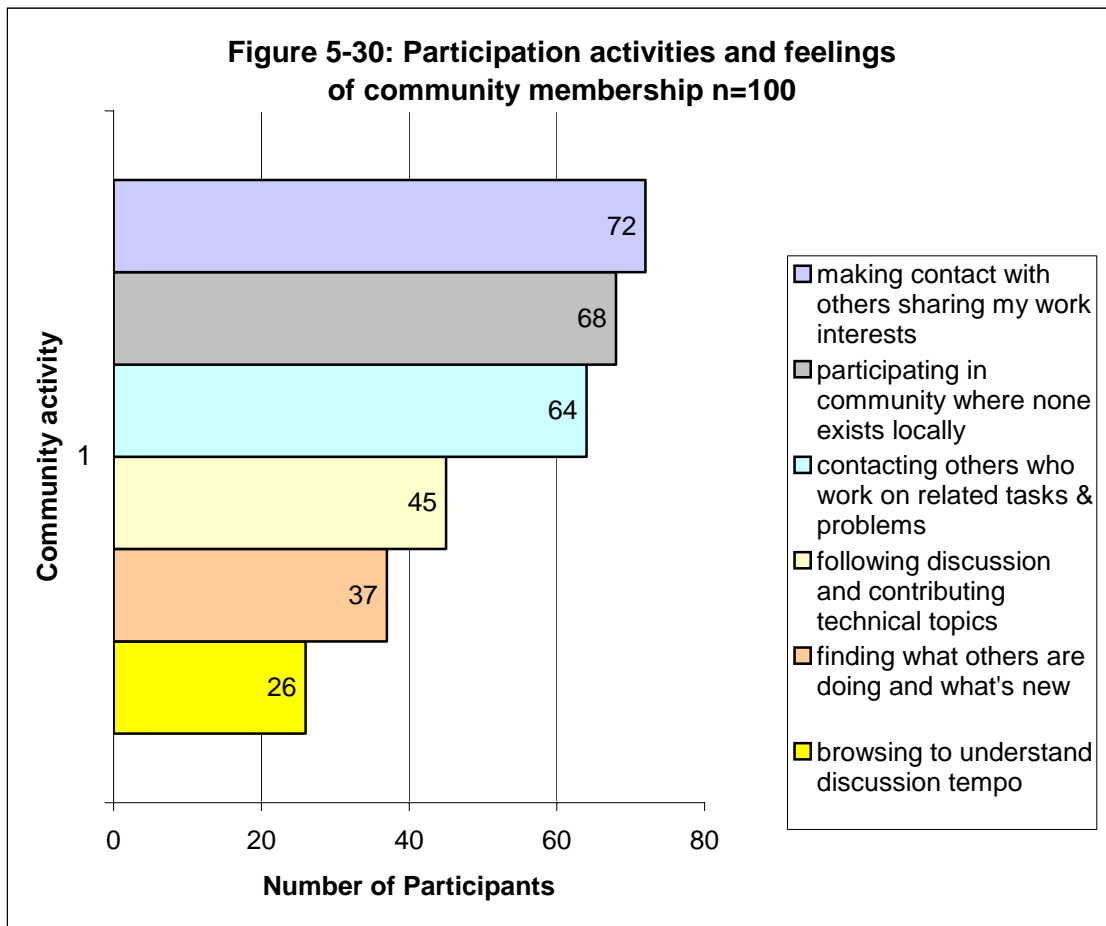


Respondents reported the existence of norms of participation for members. Eighty-three percent (83%) of the respondents indicated that one is expected to appreciate and understand other viewpoints expressed in the community. Members are expected to cooperate and share ideas (77%), to trust and feel safe to make one's knowledge public (72%) and to make connections within the community (45%). Only fifteen percent (15%) of respondents reported that making a public commitment by contributing messages was a norm of participation in the community.

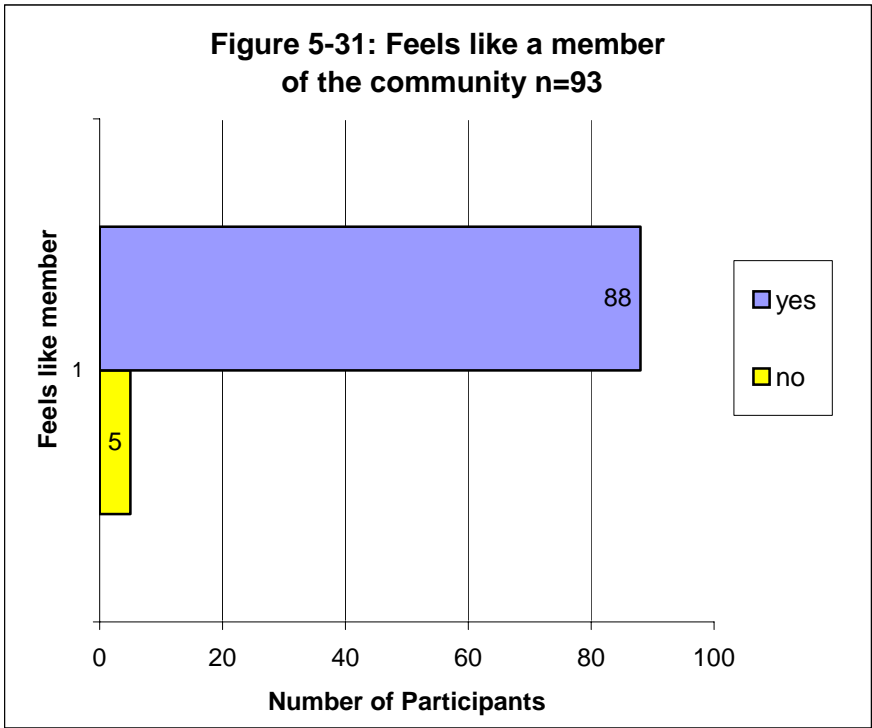


Respondents reported feeling part of the community through participating in a range of activities. These activities ranged from being passively involved to being actively involved in the message exchange. Being actively involved means contributing messages and interacting with members in the message exchange. A problem with the concept of “feeling part of the community” is that activities considered to be relevant and interesting to one person may be irrelevant or not interesting to another. There is not one criterion of “feeling part of the community” but potentially as many as the number of participants in the community. Finding and making contact with those members who share work interests was reported a criterion for feeling part of the community for seventy-two percent (72%) of respondents. Sixty-eight percent (68%) of the respondents reported that being able

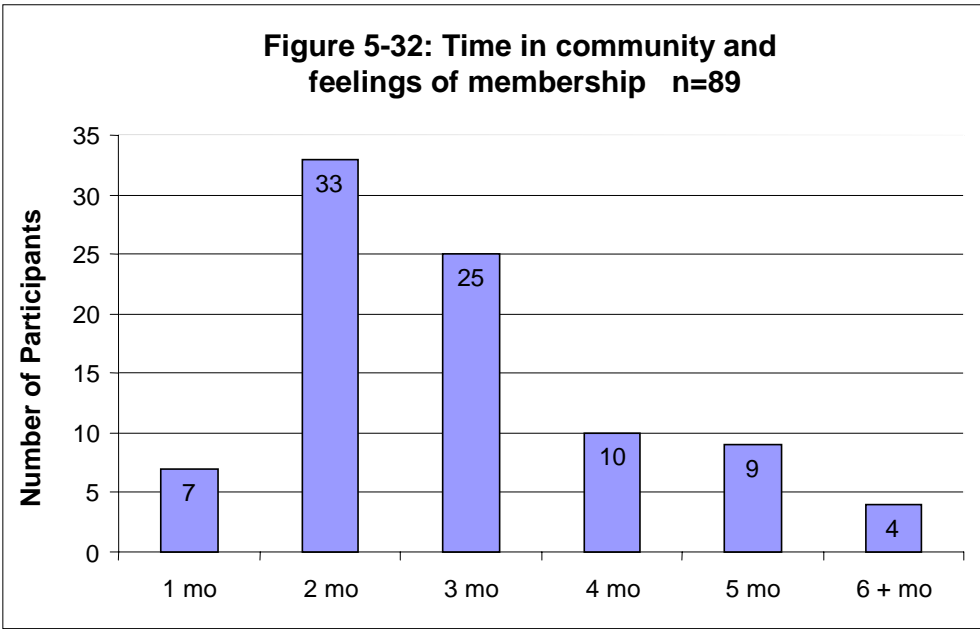
to access and participate in a community where none existed locally enabled them to feel like members. To a related question, sixty-four percent (64%) responded that they felt part of the community by “contacting others who work on related tasks and problems”. Other respondents (45%) felt part of the community by “following the discussion and contributing messages” and thirty-seven percent (37%) of respondents felt part of the community by “browsing to find out what others are doing and what was new.”



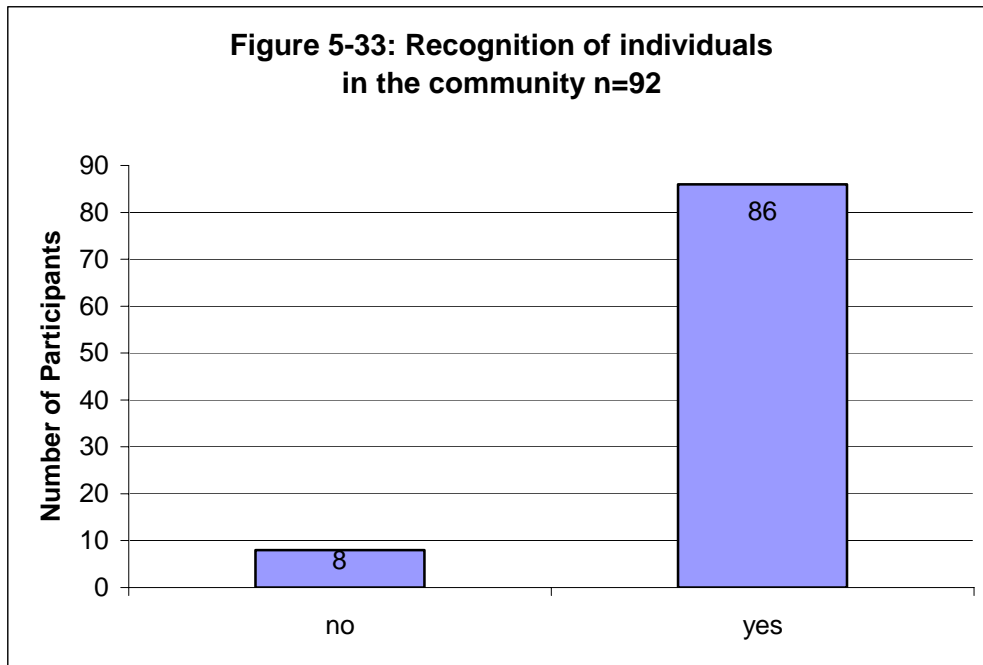
Most survey respondents reported feeling like a member in a community. About ninety-five percent (94.6%) of respondents indicated that they feel like a member in the community. This figure includes both active and non-active members in regard to message contributions.



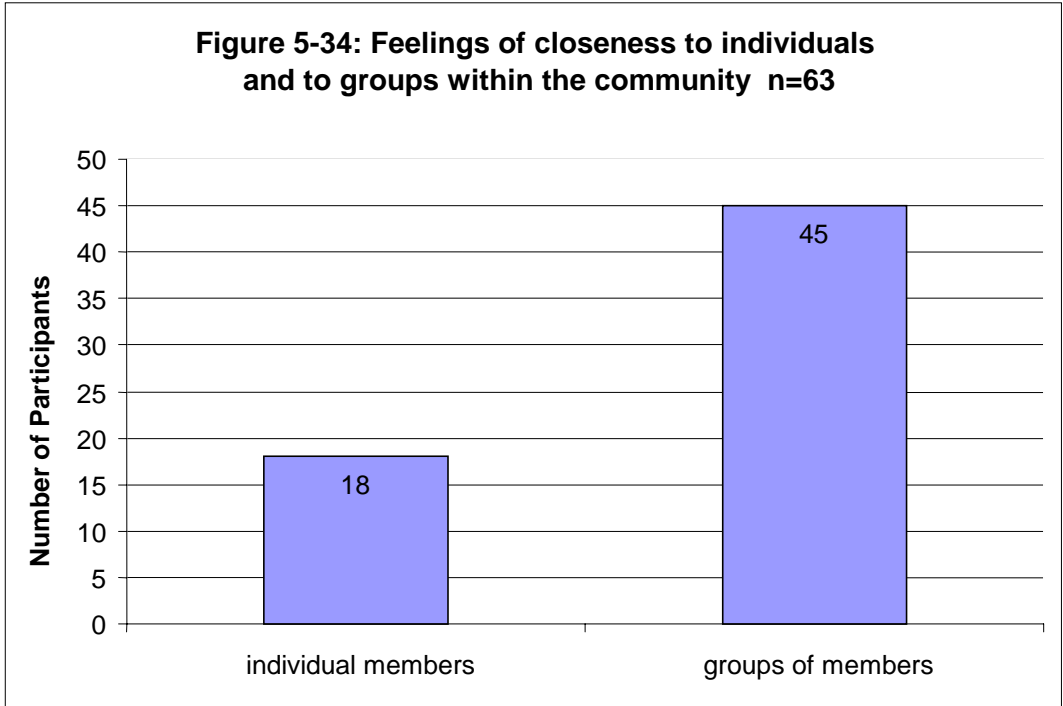
Most survey respondents also reported feeling like a member of the community in a relatively short time period. After two months membership, thirty-seven percent (37%) indicated feeling like a community member and another twenty-eight percent (28%) indicated that they felt like community members after three months membership.



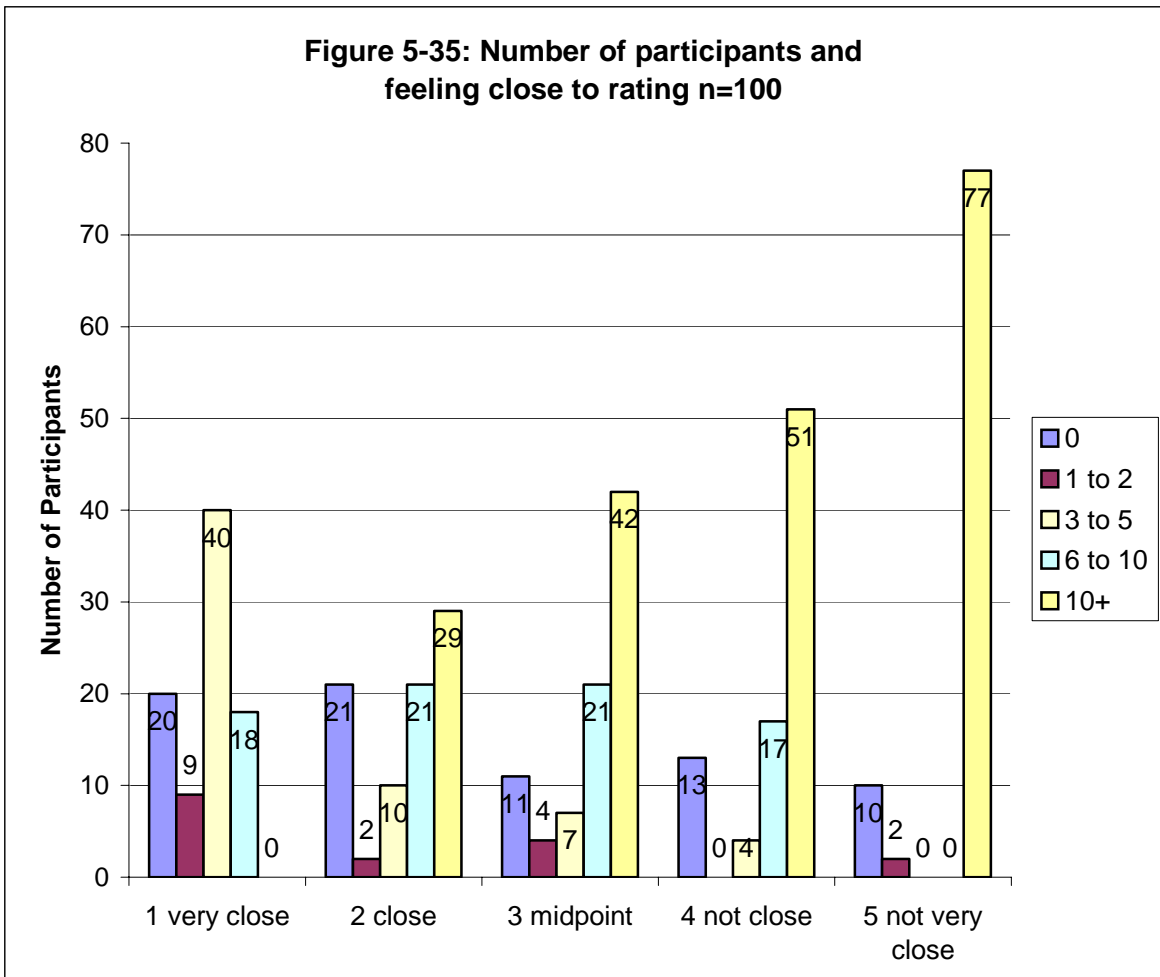
Participants were recognized as individuals by eighty-six percent (86%) of respondents. Eight-five percent (85%) of respondents indicated that they felt like community members after only four months of joining and about fifty-five percent (55%) stated feeling close to the whole community.



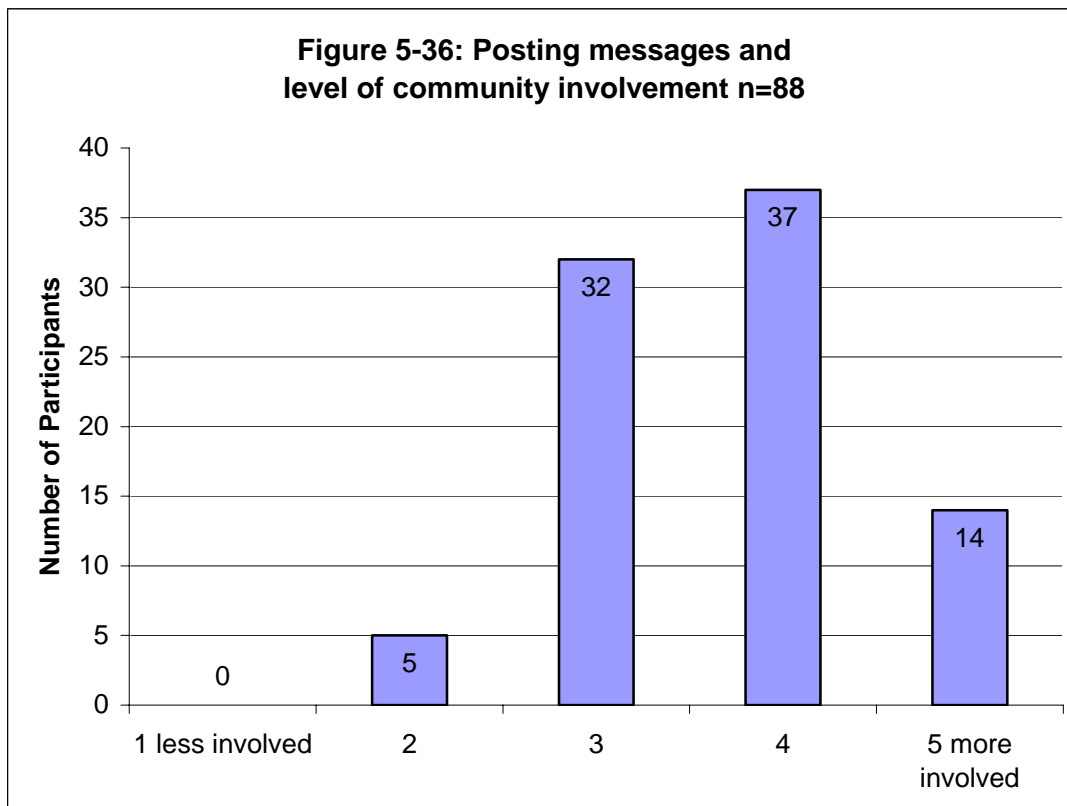
The possibility of developing close relationships with members was investigated with a survey question about the number of members the respondents felt “very close to” and “close to”. Respondents reported feeling close to individual members (28.5%) and to groups of members (71.4%).



The percentage of respondents reporting feeling *very close* to the number of members is as follows: 1-2 members (9%), 3-5 members (40%), 6-10 members (18%). The percentage of respondents reporting feeling *close* to the number of members is as follows: 1-2 members (2%), 3-5 members (10%), 6-10 members (21%). 10+ members (29%). There appears to be a core group of members (over 20% of respondents) that have formed close relationships 6-10 members within the community. Ninety-eight percent (98%) of respondents indicated that community membership is global.



Members were asked if they felt more involved in the community by posting messages. Forty-two percent (42%) of respondents reported that posting messages was connected to their sense of involvement with the community and sixteen percent (16%) indicated that they felt more involved in the community by posting messages.



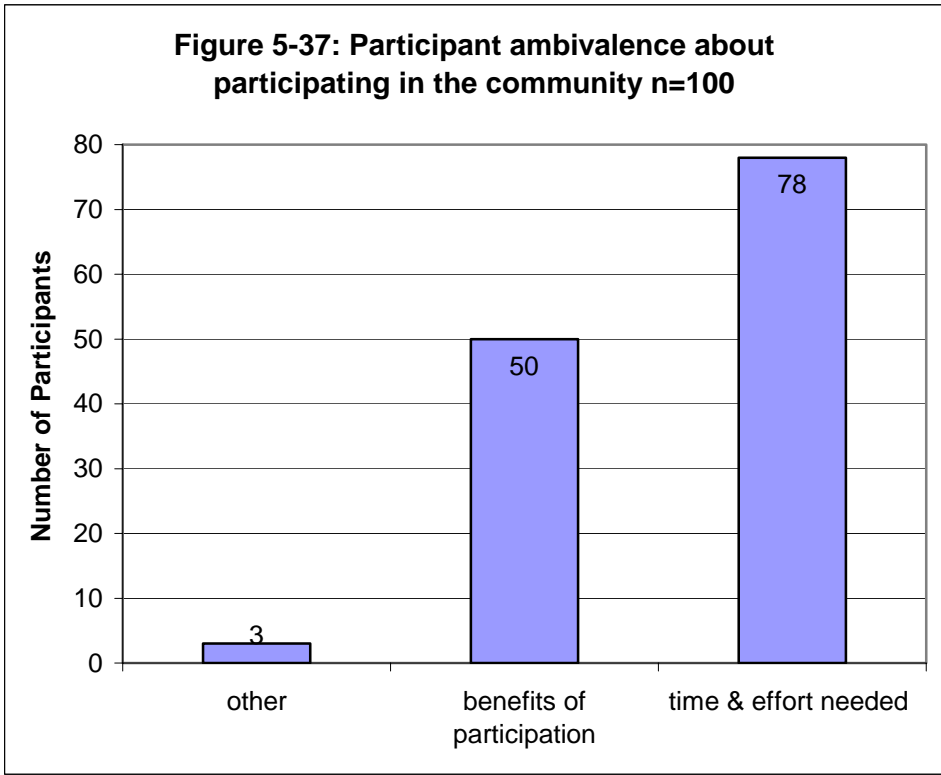
The relative rating of importance of some community activities offers an assessment of the interaction experience from a participant’s perspective. Being able to meet people and being able to discuss work problems were reported to be two most important activities undertaken in the community. Meeting people was reported to be a most important outcome for seven percent (7%) and an important outcome of the community interaction for seventy-six percent (76%) of respondents. The message interaction was reported to be most important for twenty-two percent (22%) of respondents and important for fifty-seven percent (57%) of respondents. In total, both activities were reported to be an important community activity for about eighty percent (80%) of the respondents.

Members were also asked whom they approach in the community for information and help with questions about work tasks. Approaching the whole community was indicated as likely for eighty-four percent (84%) and most likely for twelve percent (12%) of respondents. Members most likely to be approached with questions were frequent expert message posters according to ninety-two percent (92%) of respondents. Approaching friends for assistance was reported by seventy-seven percent (77%) of respondents. Work associates were the least likely to be approached by eighty-five

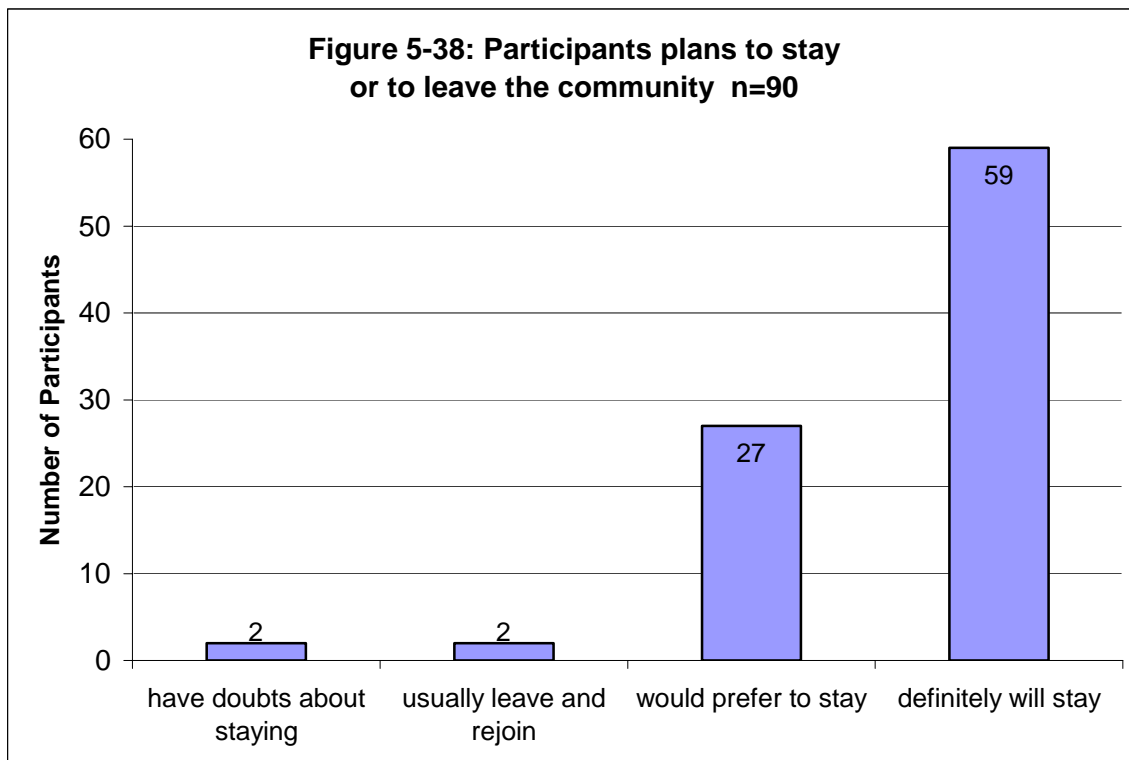
percent (85%) of respondents. This may not be too surprising given the earlier reports about members' concern for message posting and revealing of one's knowledge and expertise in public.

When asked about what people do with members they meet in the community, seventy-two percent (72%) indicated that they record the members name in a directory after which they (85% of respondents) reported sending email messages directly to members outside the community. One consequence of this message activity outside the community is that the message statistics captured on IT servers are likely only a partial record of the total communication and interaction in the community. Respondents (32%) also reported trying to develop relationships in person with people met in the community at business meetings and conferences.

Not all members are entirely satisfied with their participation and community experience. Before concluding the discussion on how members felt about participating, some brief comments may be in order about members' reports of feelings of ambivalence regarding their continuing participation in the community. Active participation requires a communication discipline and considerable time each day to read and to follow the community discussion. Participants indicate that the time and effort required for active participation by message contribution is a major source of ambivalence about the community.



Although there is a very high level of satisfaction with the community, a high percentage of respondents (78%) indicated a concern over *the time and effort required* to participate actively in the community by contributing messages. Also, fifty percent (50%) of respondents expressed ambivalence about the *overall benefits* of membership and participation. While acknowledging dissatisfaction in the community, largely over the time and effort required to participate, members would prefer to spend more time in the community.



Ninety-six percent (96%) of respondents indicated a preference and an intention to remain in the community. Of this number, sixty-six percent (66%) would definitely prefer to stay and thirty percent (30%) would prefer to stay. About two percent (2%) of respondents indicated that they come and go (leave/rejoin) among various communities.

The next section will report survey data from the Eureka community in three parts and it follows closely the topical sequence of the earlier data reported on the IBM-based community. The report begins with respondent’s accounts of sources of information used to find the community, what initially attracted them and their expectations and reasons for joining. This is followed in the second part with a report of member’s participation activities - how they participated in the message exchange and related activities undertaken in the community. The third part concludes with a report on the community membership experience - how members felt about participating in the community and their plans for continued membership in the Eureka community.

5.3 Data report from the Eureka community

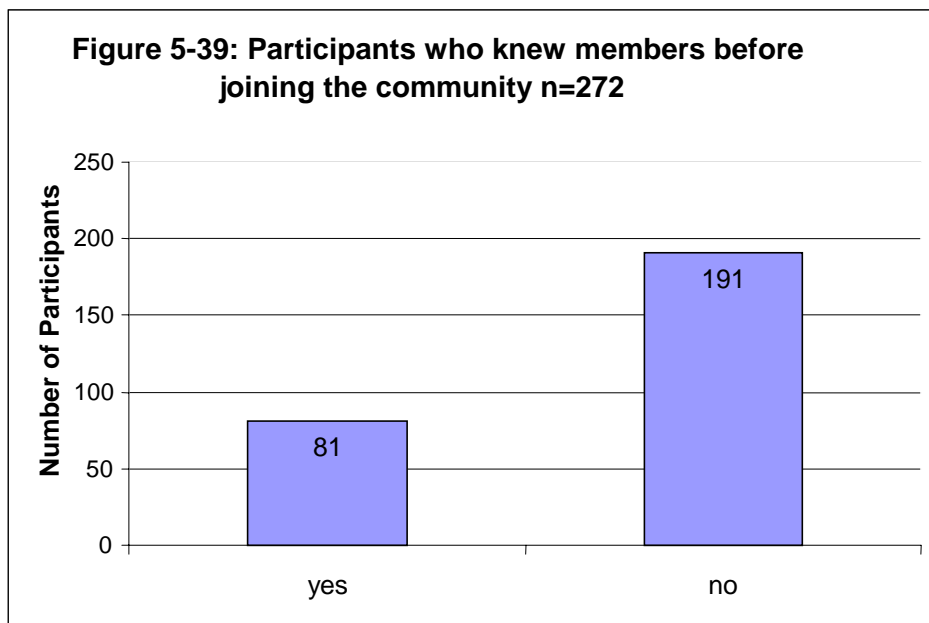
The data report covers the following topics reported by survey respondents: reasons for joining, ways of participating, specific purposes for participating, public involvement in the community message exchange, message reading behaviour, authoring messages (Tips), deterrents to authoring

messages (Tips), benefits of public participation and finally, a report on how members felt about their community experience within Eureka.

5.3.1 Joining the Eureka community

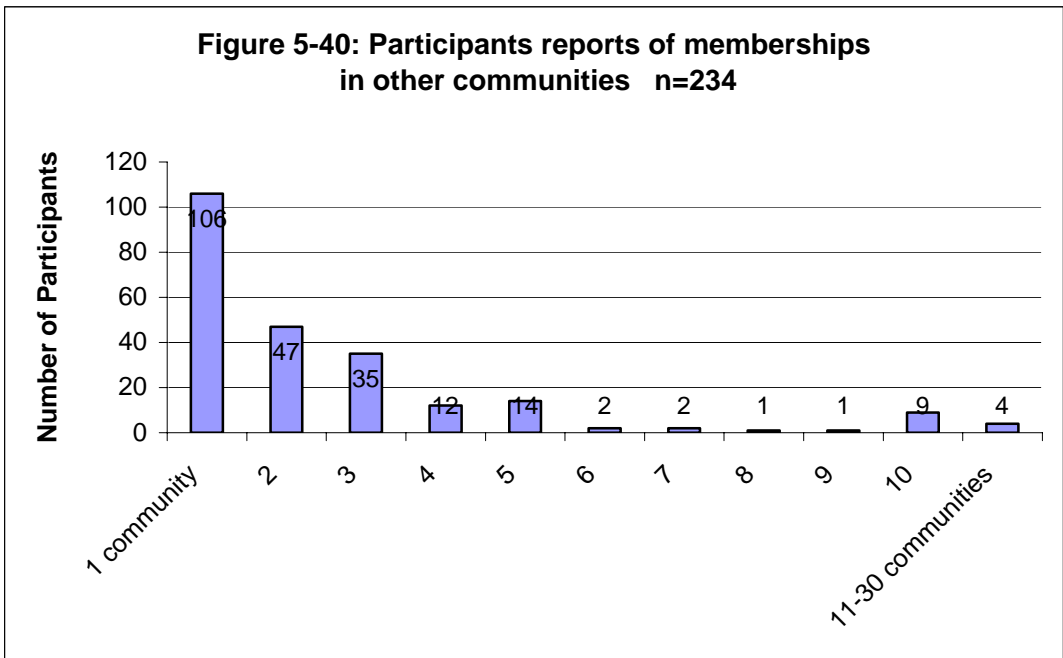
Only those field service engineers who are permanent Xerox employees have direct access to the Eureka community. In this regard, a decision to join is non-voluntary however a decision about how often and for what purposes one chooses participate is a voluntary matter. It should be noted that access to the Eureka community is fully integrated with regular workplace training programs and on-the-job fieldwork practices. Therefore, it would be most unusual for permanent, field service engineers to not want to participate and interact with others in the community.

The majority of respondents (70%) did not know members before joining. Only one third of respondents (30%) knew members before joining. The majority of members were introduced to the community during initial technical training and employment as field service engineers with Xerox Corporation.



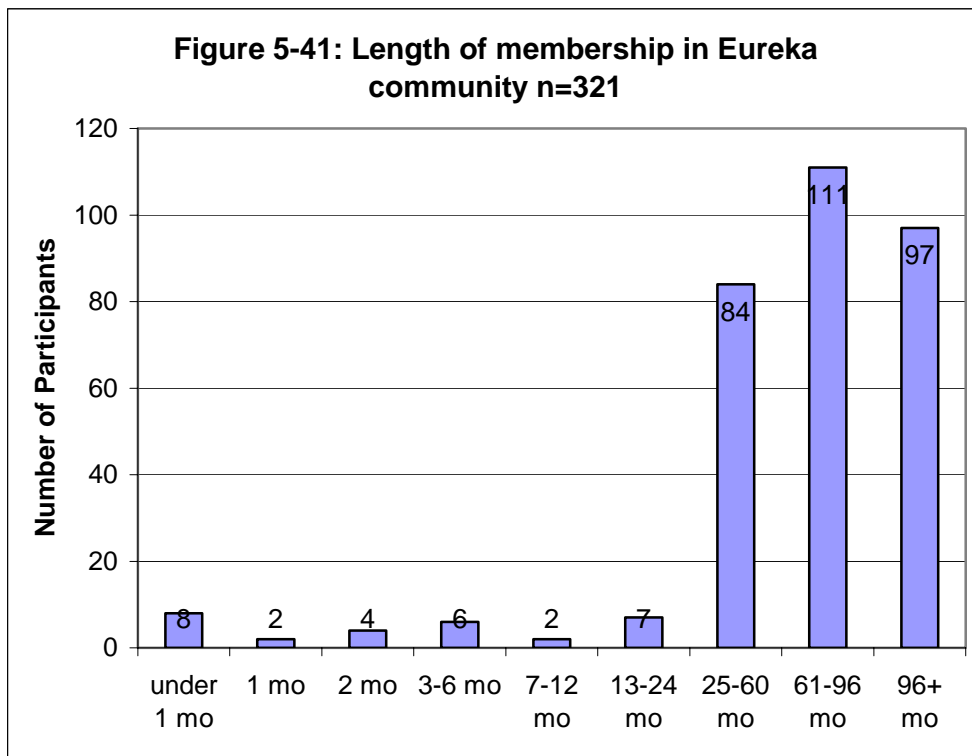
5.3.2 Multiple community memberships

Forty-five percent (45%) of respondents (106) belong only to the Eureka community. Twenty percent (20%) of respondents (47) belong to 2 communities and fifteen percent (15%) of respondents (35) belong to 3 communities.



5.3.3 Length of membership in Eureka community

Eureka is a mature and stable community with a majority of members reporting over five years of membership in the community. Categories of membership time in the community are as follows: 0-24 months for 29 respondents (9%), 25-60 months for 84 respondents (26%), 61-96 months for 111 respondents (35%), and over 8+ years for 97 respondents (30%). Only nine percent (9%) of respondents had less than 2 years of membership duration in the community.



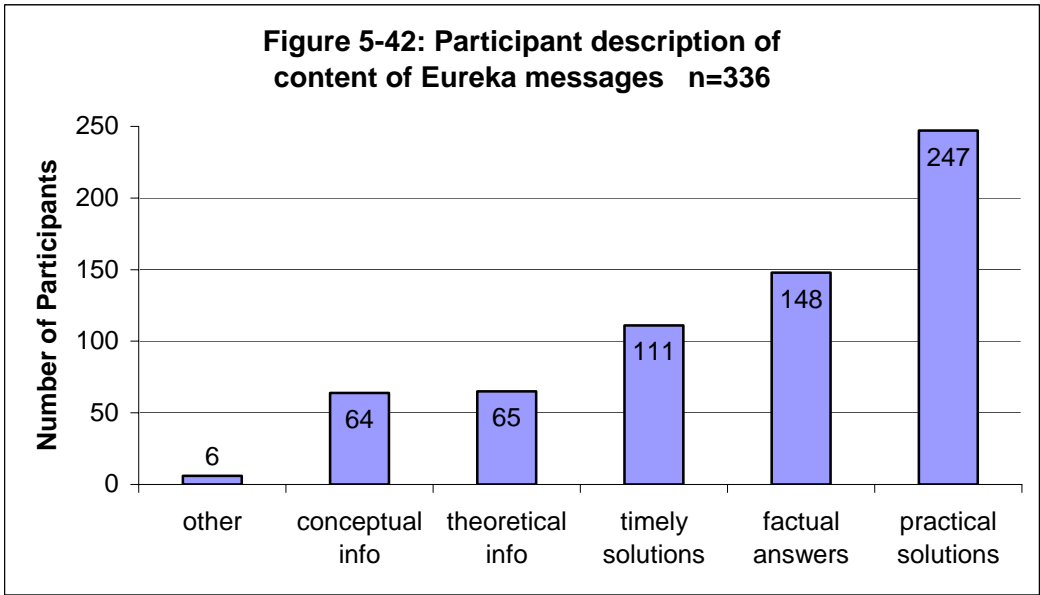
5.3.4 Content of messages posted to Eureka

The contents of messages contributed to Eureka are described as being practical and factual. Seventy-three percent (73.5%) of members described the contents of Eureka messages as offering practical solutions to equipment hardware and software problems. Members reported that messages provide factual answers (44%) to questions posed and are available on a timely basis (33%). A smaller number of respondents (19%) described the message contents as being conceptual and theoretical.

Participants described their posted messages as follows:

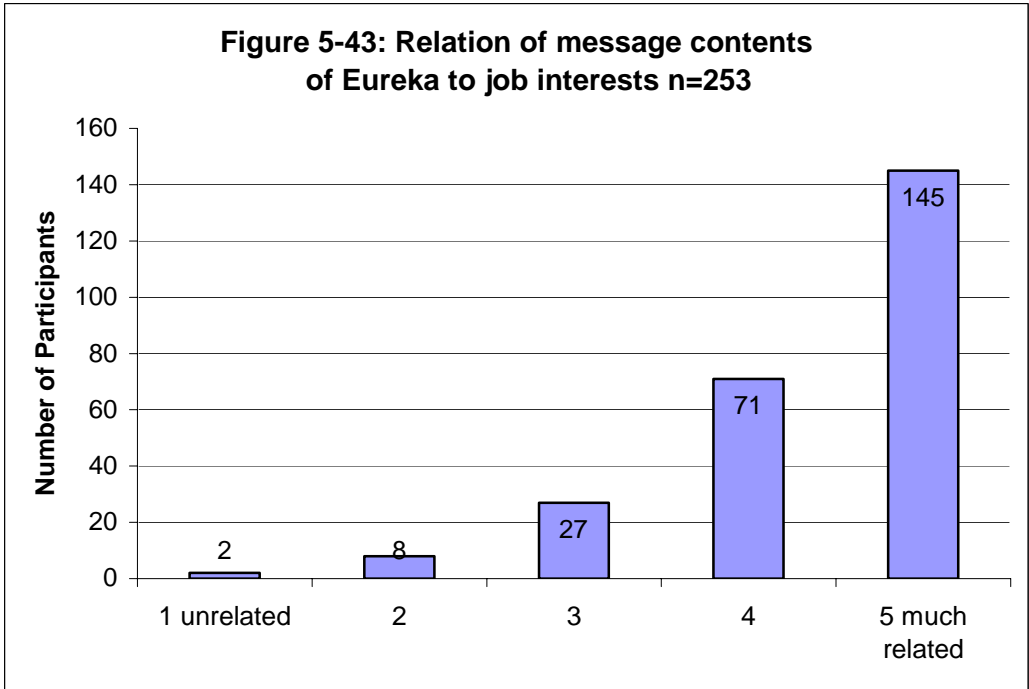
“Information sharing. Machine/problem information that has not been submitted by field engineering. Example: I will use monthly technical conference calls. I will verify that the information that we talked about has not already been submitted and if not, I will post it.”

“I try to view all tips to make sure I am not submitting a tip that already exists. Sometimes I have written the author of another tip and asked him to add something that I found. That way I do not author a similar tip.”



5.3.4.1 Relatedness of Eureka message contents to job interests

Eureka messages were also described as being much related to member’s job interests by fifty-seven percent of respondents (57.3%) and related to job interests by twenty-eight percent (28%) of respondents.



Participants describe the contents of posts to Eureka as follows:

“It has further developments in my systems being tested.”

“The extreme availability of technical information. I may not be the best technician, but I have access to others who are. When we (SSCEs) uncover a unique problem solution and can share it with others, it’s a great gift!”

“Information to repair machines quickly. Product information.”

“Opinions from around the world.” “Wide knowledge base.”

“Solutions not listed in EDOC.” “Quick solutions.” “It’s good stuff. It helps me to not reinvent the wheel.”

“Access to solutions without having to call hotline which can become very difficult to reach.”

“The information and know how of others expertise.” “I do not have access to E-doc material as I only do PM’s, but I run into more and more situations where I need more documentations than was supplied.”

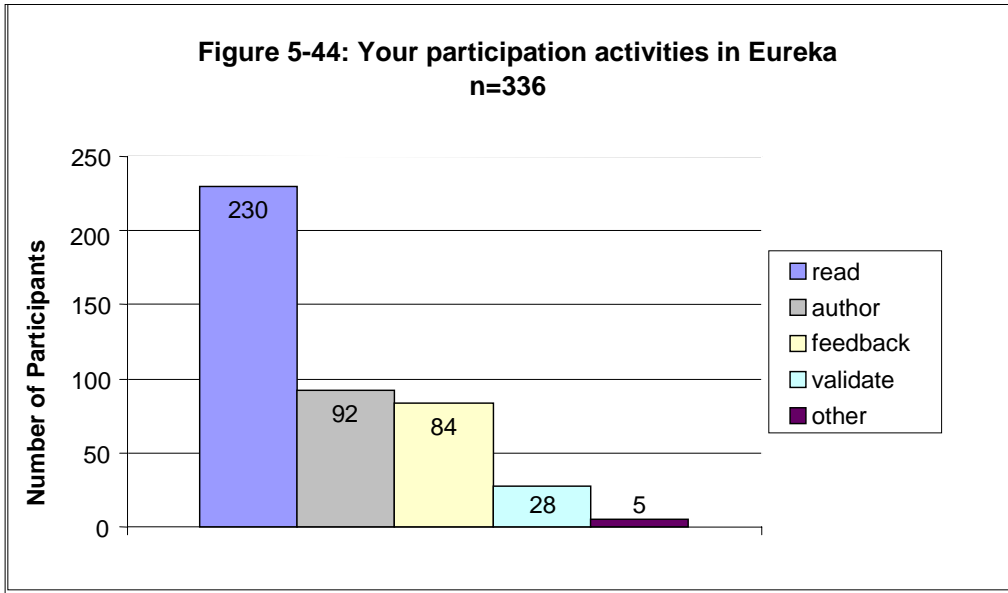
“Eureka solutions get you to the cause of the problem more directly than the EDOC troubleshooting procedures, which are written to eventually get you to a solution, but usually in a roundabout fashion.”

“When the edocs. don’t fix the printer, the EUREKA does or at least steers me in the right direction.”

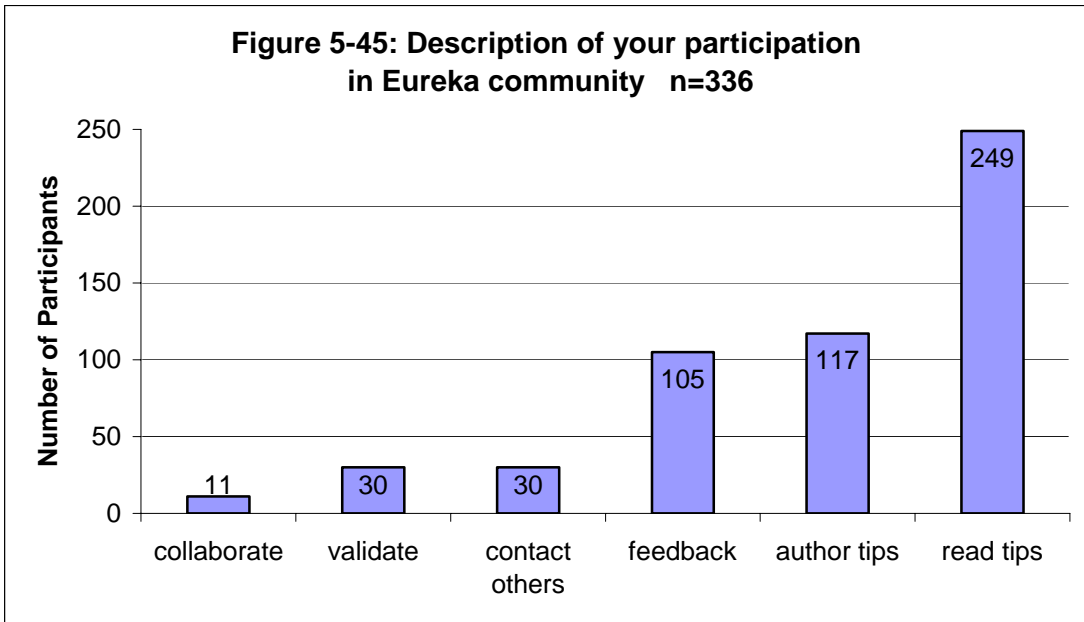
“The information base for additional solutions to weird, rare, symptom based, multiple code, trends and other real world problem solutions an or tips. Hard to find parts or broken links to parts, alternate parts (even tools) ways to avoid downtime, increase knowledge on how the products should function and what failure modes can occur with a list of symptoms.”

5.3.5 Categories of participation in Eureka

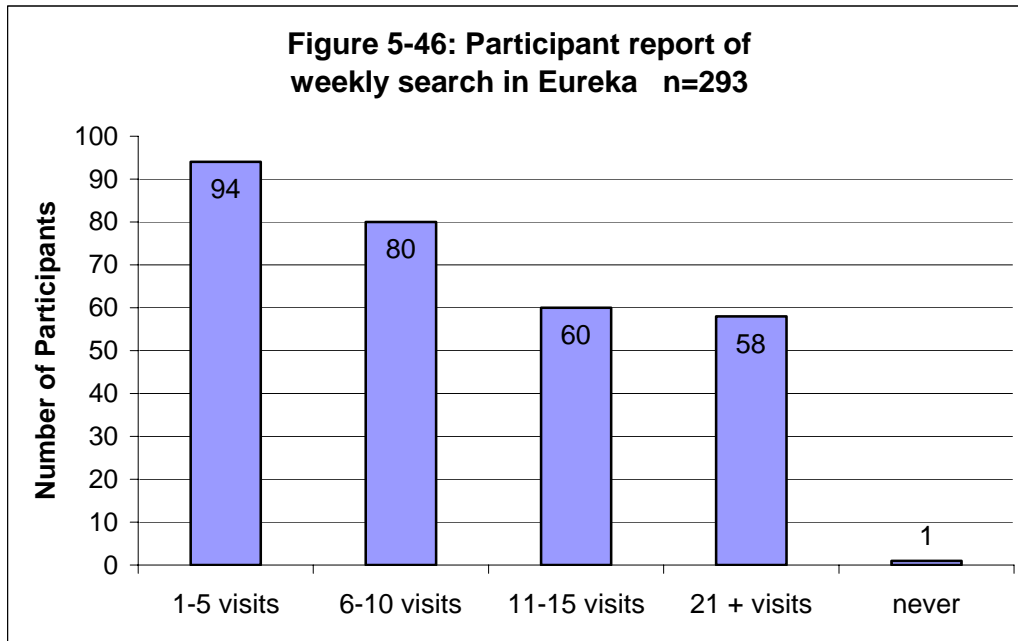
The majority of members describe their participation in Eureka largely as readers of Tips. Sixty-eight percent (68%) of respondents described their participation in this way. However, a large number of respondents (27%) described their participation as authors of Tips followed by twenty-five percent (25%) of respondents who described their participation as giving feedback and responding to questions. About eight percent (8.3%) of respondents described their participation as being Validators of Tips submitted.



A related question about participation activities was asked later in the survey and the response percentages were slightly higher. On the second question, seventy-four percent (74%) of respondents indicated their participation by reading Tips and about thirty-five percent (34.8%) of respondents described their participation as authors of Tips. Thirty-one percent (31%) of respondents described their participation as giving feedback and about nine percent (8.9%) participated by contacting others and validating Tips submitted.

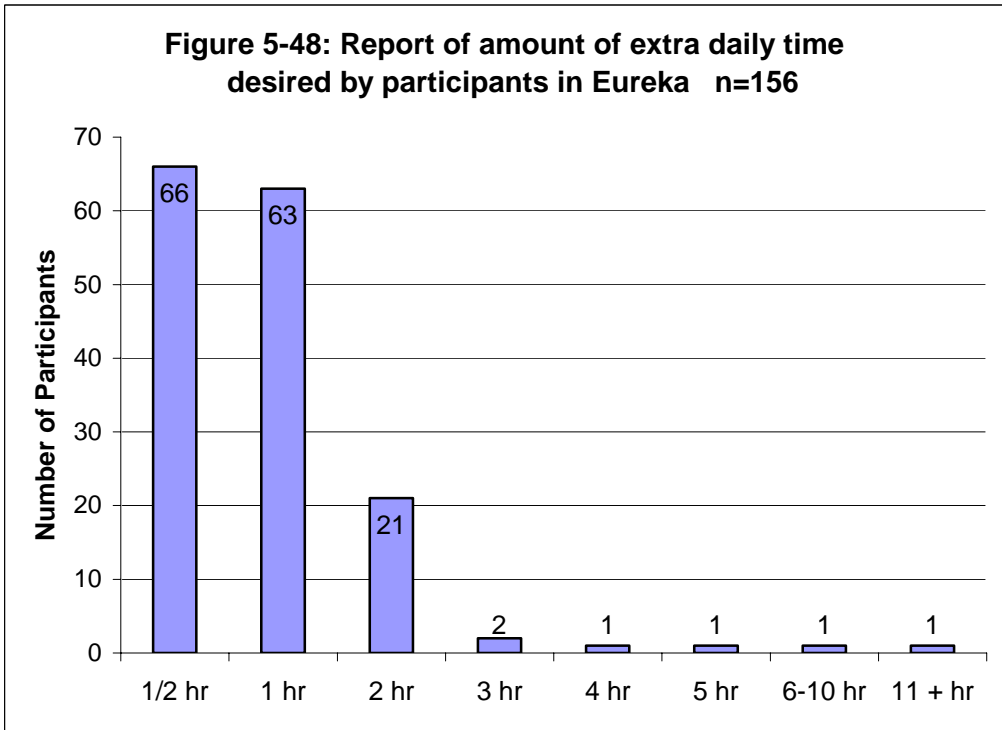
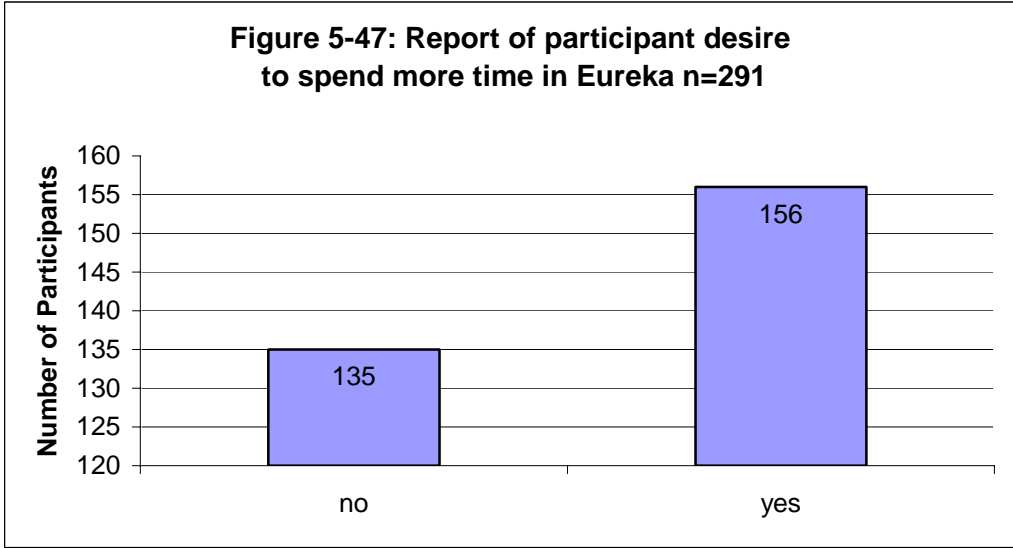


Weekly search activity in Eureka involves searching within the database of validated Tips contributed by the community to find information and solutions related to problems a hand. It is a daily activity for the majority of respondents (60%) who reported 1-10 visits per week. Thirty-two percent (32%) reported searching 1-5x each week and twenty-seven percent (27%) reported searching 6-10x. Twenty percent of respondents (20%) reported searching 11-15x each week and over 21x. Clearly, these members search the database an average of 2 x and 3x each working day.

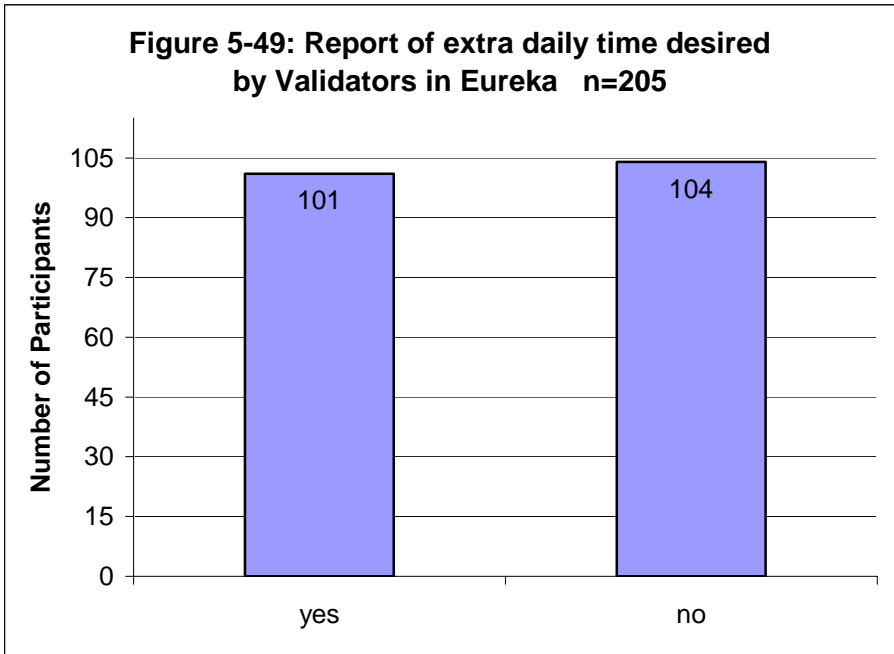


5.3.6 Time and effort to participate in Eureka

Most respondents indicated a preference to spend more time each day visiting Eureka. A majority of respondents (53.6%) would like to spend more time in Eureka, in particular, forty-two percent (42%) of respondents would like to spend an extra 30 minutes each day and forty percent (40%) of respondents would like to spend an extra hour each day.



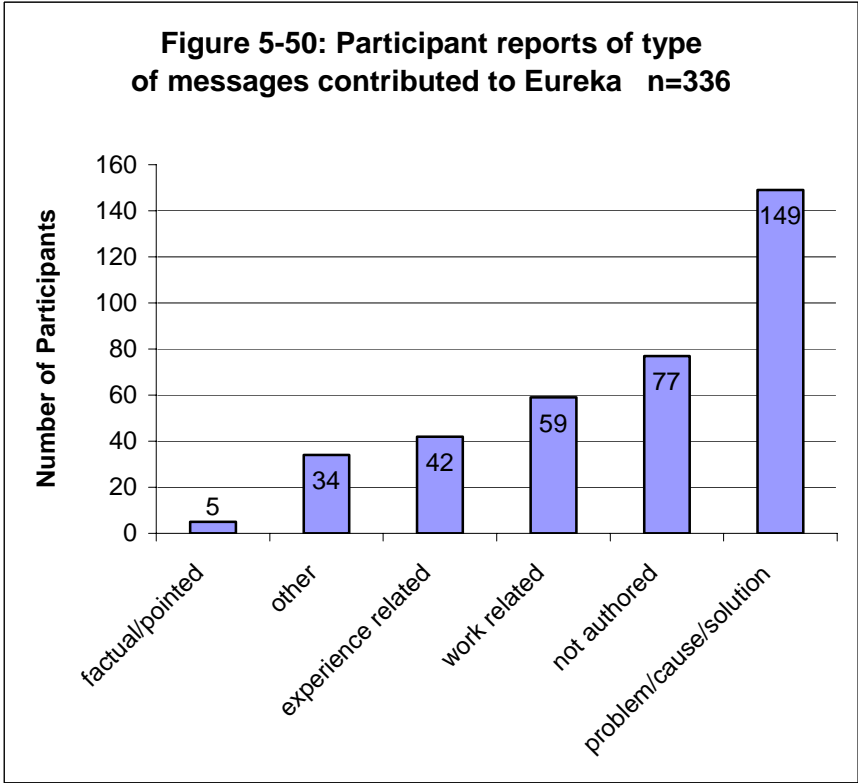
Validators are field experts on specific equipment to whom Tips are submitted for verification and practicality of purpose. About fifty-one percent (50.7%) of respondents would like to spend extra time each day in Eureka and in particular, forty-two percent (42%) of Validator respondents would like to spend an extra 30 minutes each day.



About thirty-four percent (33.6%) of respondents would like to spend an extra hour each day visiting in Eureka.

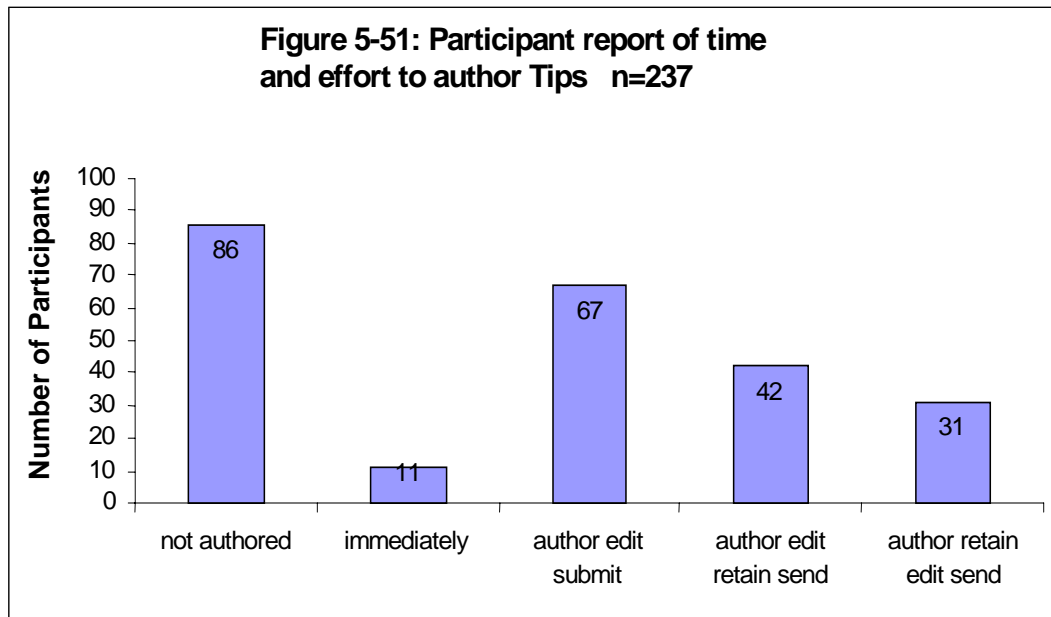
5.36.1 Time and effort to prepare and post messages to Eureka

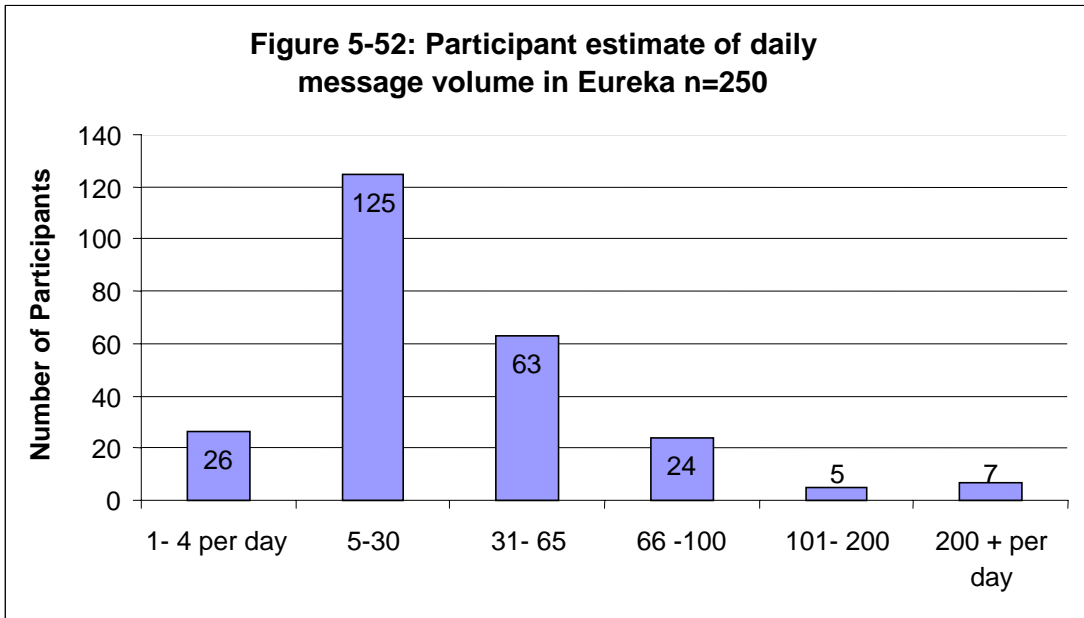
Regular, daily participation in the message exchange is reported to require discipline, time, and



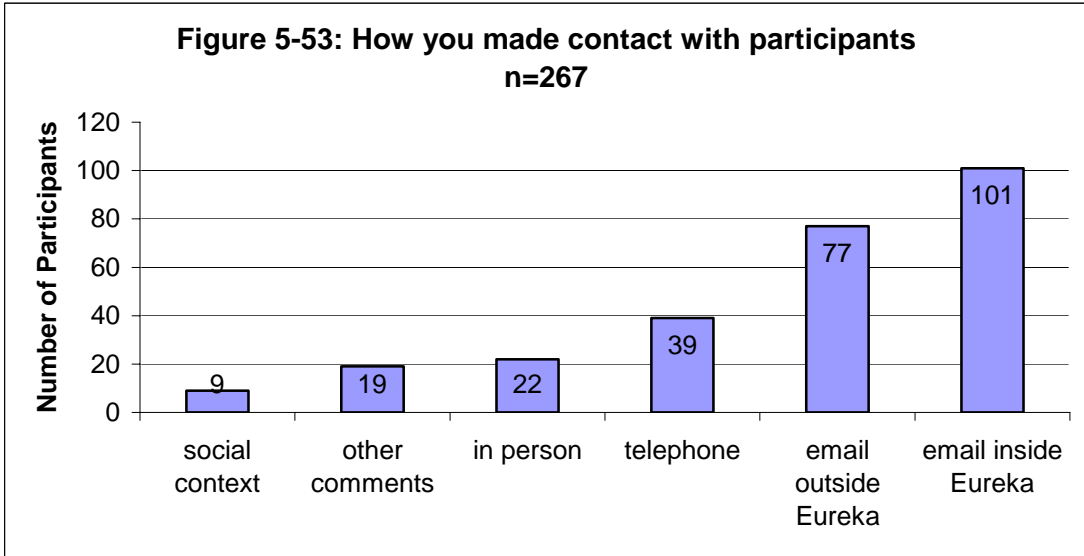
effort to communicate. Messages are written following a Eureka standard genre that is problem – cause – solution. Participants reported that most posted messages are work related and, in particular, based on one’s fieldwork experience. As well, respondents indicated a propensity to be careful and thoughtful while preparing messages (Tips) for posting.

Over twenty-eight percent (28.2%) of respondents reported editing messages before posting to the community. Almost eighteen percent (17.7%) of respondents edit and retain messages before posting. Further deliberation was reported by over thirteen percent (13.1%). Only thirty-six percent (36.3%) of respondents reported not authoring Tips.

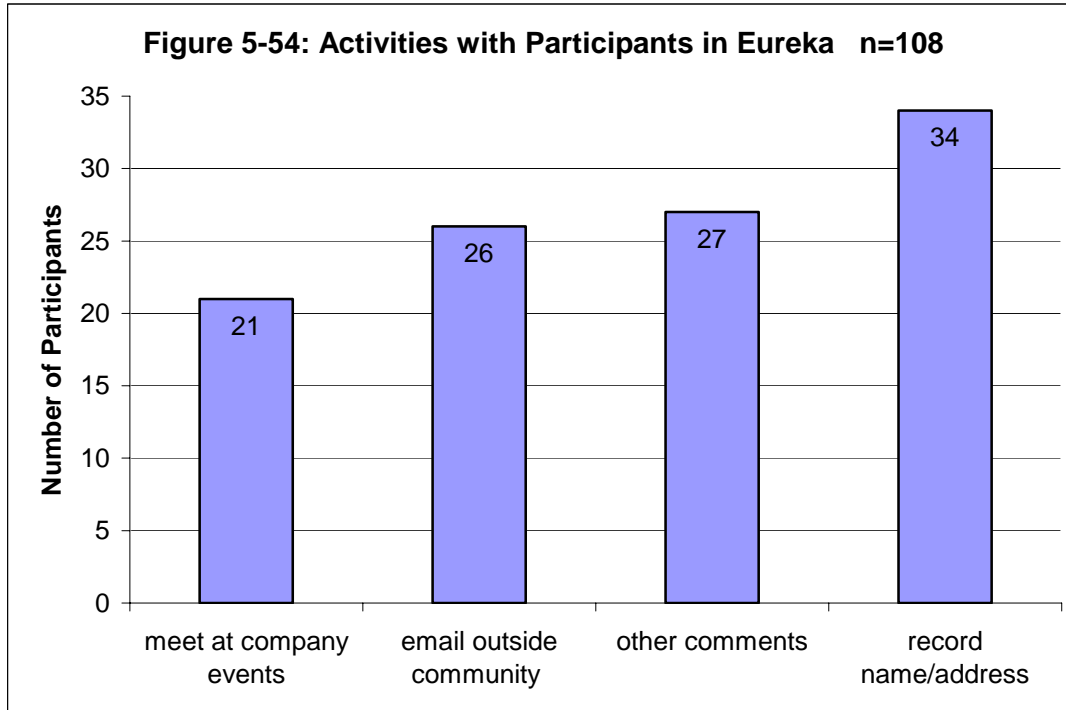




Email is the primary means used to contact members of the community. Almost thirty- eight percent (37.8%) of reported email contacts were made within the Eureka community compared to about twenty-nine percent (28.8%) of email contacts reported occurring outside the Eureka community. It appears from these reports that much email communication is not recorded on the Eureka message servers.



For new contacts with members of Eureka, respondents reported recording contact names in an address directory, meeting members contacted in the community later at in-person at company events and sending email outside the community directly to members.

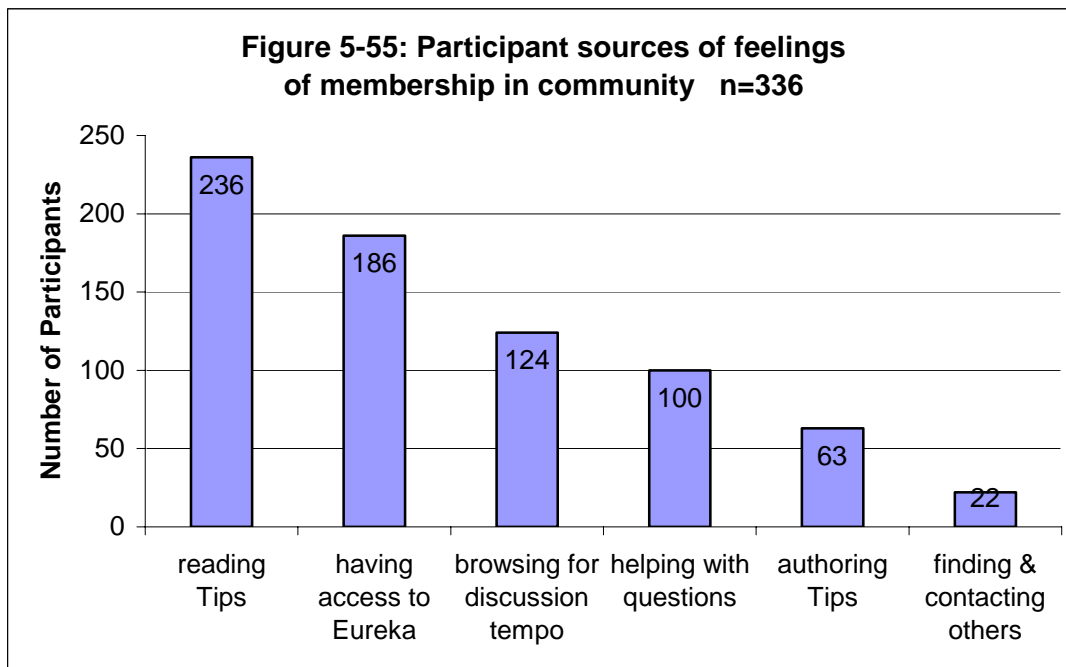


5.3.7 Participation activities and feelings of membership in Eureka

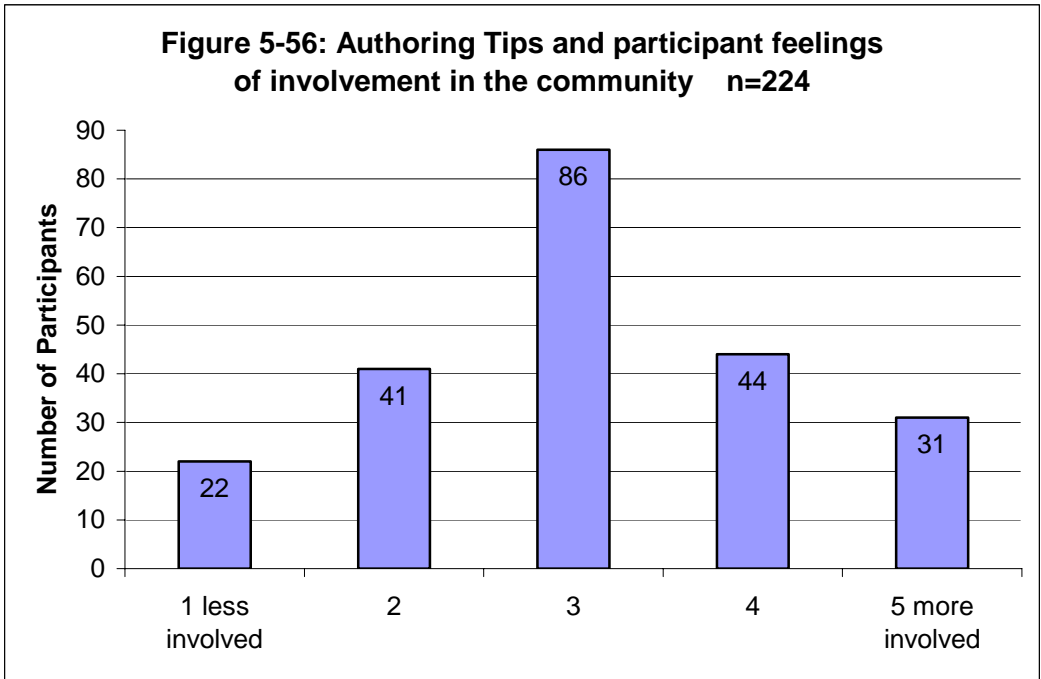
Members reported that different ways or modes of participating were linked with feelings of membership in the community. The most frequent reported way of participating was by reading Tips. Over seventy percent (70.2%) of respondents reported feeling like members by reading Tips. Another fifty-five percent (55.4%) of respondents indicated that simply having access to Eureka was connected with their feelings of community membership. Others, about thirty-seven percent (36.9%) of members reported that simply browsing to get the tempo of the discussion was associated with their feelings of membership in the community.

Participants offered additional comments about participation and feelings of membership in Eureka as follows:

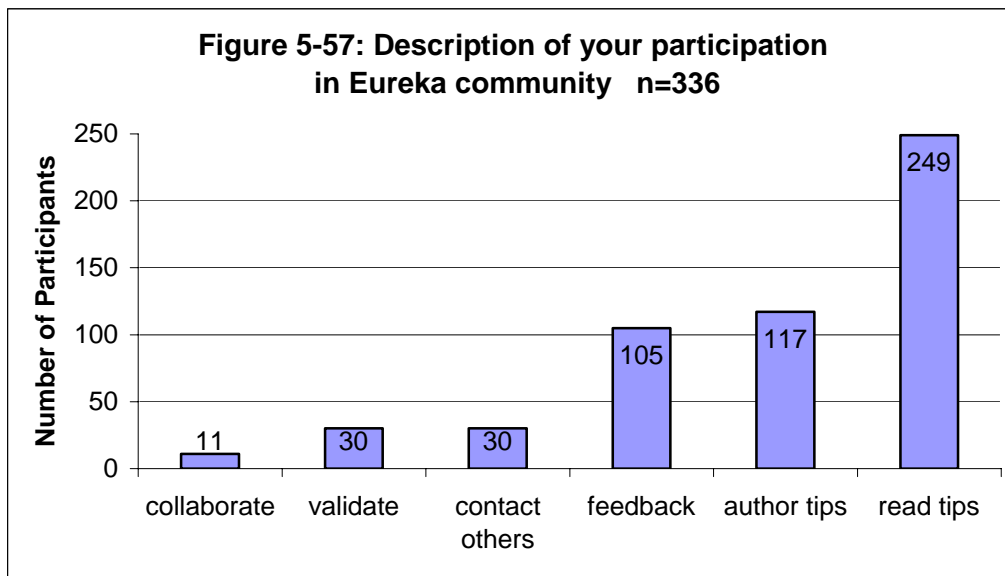
“I have fixed lots of machines that I wouldn’t have if not for Eureka.” I’ve never gotten in personal touch with someone solely thru Eureka.” “Repairing.” “Helping others technical problems.” “I don’t participate because I don’t have easy access to the Internet when I am in school.” “Encouraging others to submit tips.” “Little opportunity to reply as a contract manpower employee.”



About thirty percent (29.8%) of respondents indicated feeling like a community member by helping others with questions and close to nineteen percent (18.8%) reported feeling like members by authoring Tips and by following some topics in the community discussion. Only six percent (6.5%) of respondents reported feeling like a member by finding and contacting others. There are slightly more reports of feelings more involved in the community by authoring Tips. Most respondents (38%) reported at the midpoint of the scale and a few more reported feeling more involved by authoring messages (75 more involved vs 63 less involved).



Members described their participation in terms of categories of activities. In a related question about participation activities placed later in the survey questionnaire, over seventy-four percent (74.1%) of respondents reported participation by reading Tips, followed by about thirty-five percent (34.8%) who reported participating by authoring Tips and giving feedback (31.3%). Others reported participating by contacting members and by validating Tips (8.9%) and only a few members (3.3%) reported participating by collaborating to solve a work problem.



5.3.7.1 Norms of community membership

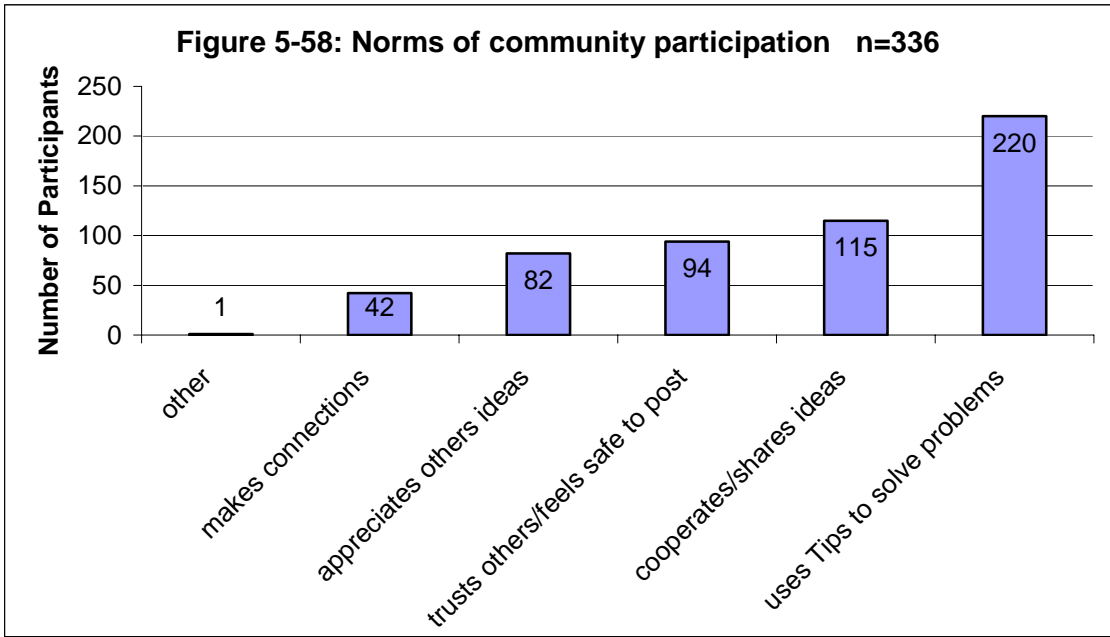
A majority of respondents (65.5%) indicated that participating in Eureka implies that community members use the message Tips to solve work problems. Thirty-four percent (34.2%) of respondents indicated that it's expected that members cooperate, share work ideas, trust others and feel safe (28%) to post messages to a receptive community wherein members appreciate others viewpoints (24.4%) in a discussion. A smaller percentage of respondents (12.5%) indicated that participation implied making contact with community members.

Participants offered further comments as follows:

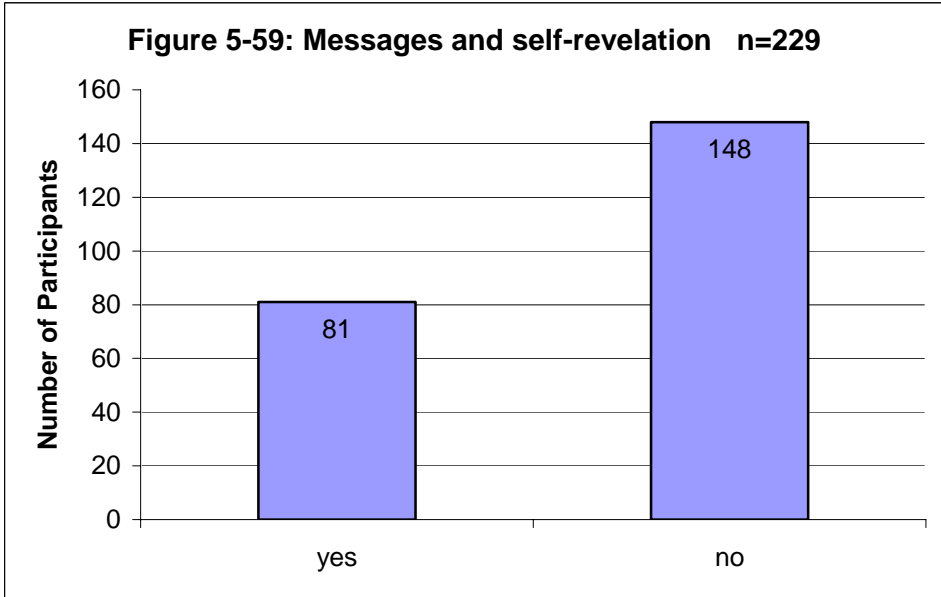
“Personally, thank a few who do author, for their time and solutions provided and have gone on to retirement.” “Sometimes, I contact them by their email link.”

“I don't understand the point of this question. Don't view eureka as a personal service; don't expect anyone to contact me.” “Indirect “thank you” from a colleague that solved a problem with my tip.”

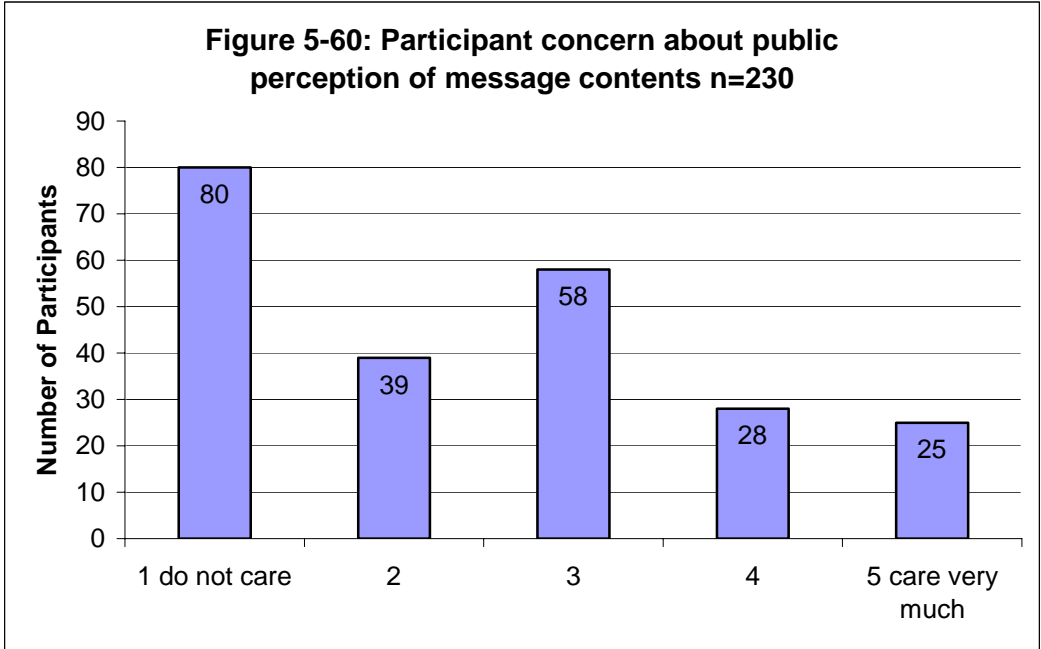
“Until this survey, I wasn't even aware that people were so conscious about social issues around a piece of technical information.” “I do it to share what I've learned just like others share what they learned so it saves me time.” “This is a tool to help resolve technical problems, not a social club.”



A majority of respondents (64%) reported that messages posted did not reveal of one’s knowledge level to the community. Only thirty-five percent (35%) of respondents indicated that messages posted to the community revealed one’s level of knowledge to members.

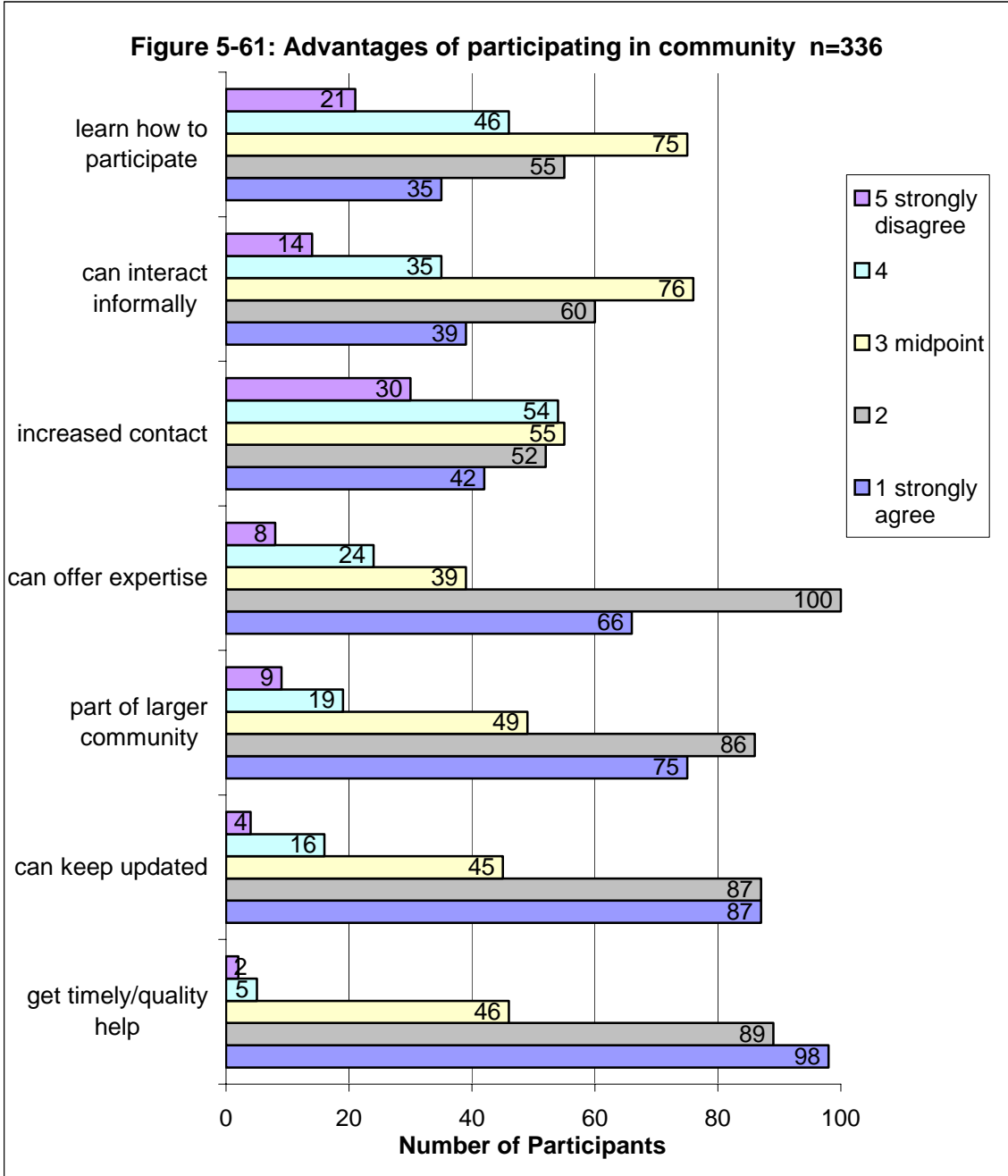


Eureka members reported little concern about the public perception others formed from the contents of their message posts to the community. Most respondents (35%) indicated not caring much about message contents and public perception compared to about sixteen percent (15.7%) who reported caring about message content and public perception.

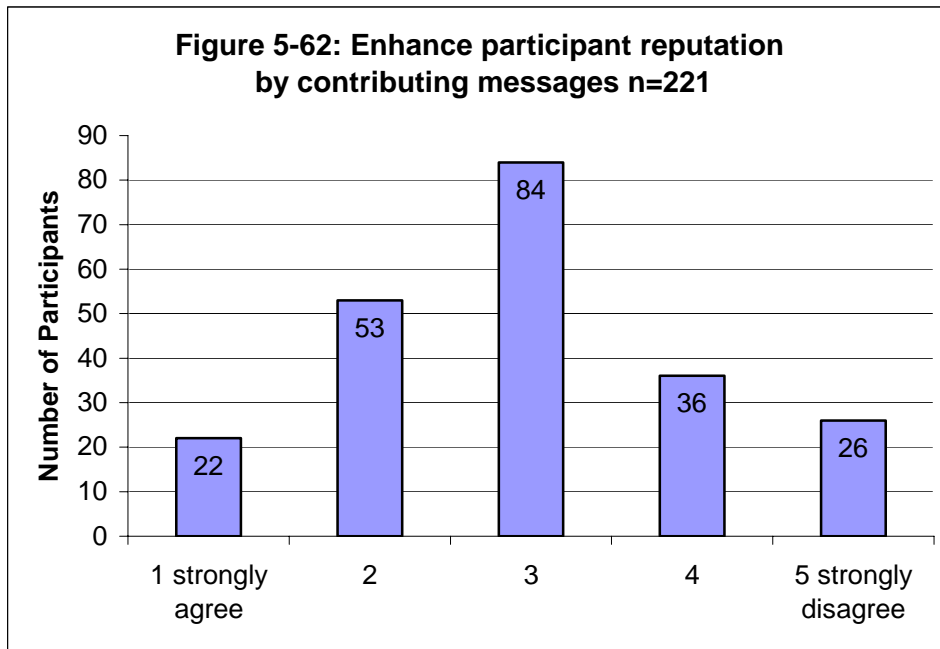


5.3.8 Advantages of participating in the community

Participants reported several advantages flowing from participation in the Eureka community. Members (77.9%) reported obtaining quality and timely help with work problems, keeping updated through participation (72.8%), offering expertise to others (70%), feeling part of a larger community (68%), interacting informally (44%), increasing contact with others (40%), learning how to participate (39%) and gaining a sense of belonging to the community. In many cases, very large numbers of respondents reported multiple advantages of participation in Eureka compared to not participating in the community.

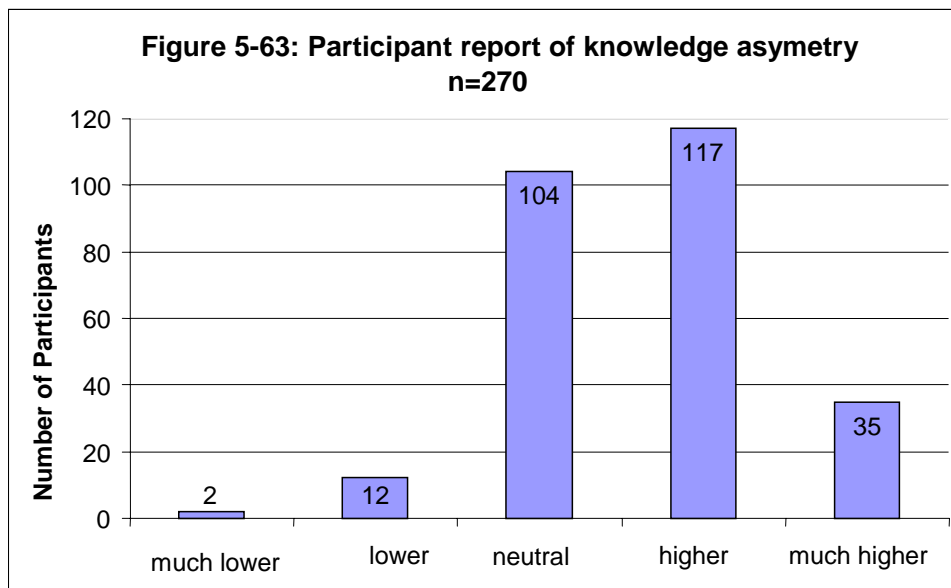


More members of Eureka (34%) agreed that contributing messages enhances one’s reputation in the community however a majority of respondents (38%) reported a midpoint rating. Twenty-eight percent (28%) of respondents reported no connection between contributing messages and enhancing one’s reputation.



5.3.8.1 Report of knowledge asymmetry

More members reported higher knowledge levels compared to the level of knowledge in the community. About thirty-five percent (34.8%) reported higher knowledge levels than the community and over ten percent (10.4%) reported much higher knowledge levels than the community. Thirty-one percent (31%) of respondents indicated having the same knowledge level as the community and about four percent (3.6%) reported having lower



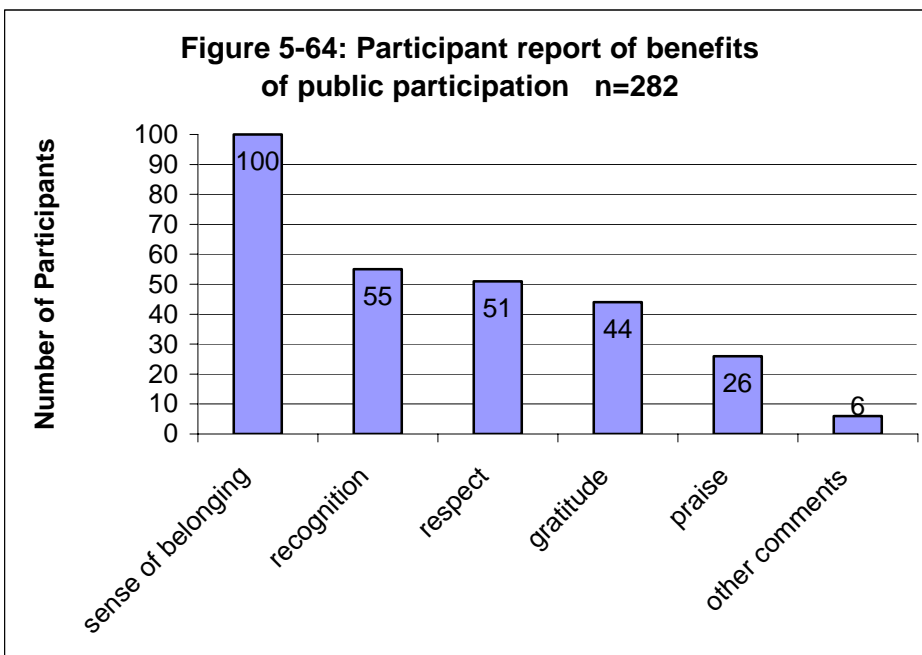
knowledge levels than the community at large.

5.3.8.2 Benefits reported from public participation

Public participation in the community was reported being beneficial in a number of ways for members. Thirty-five percent (35%) of respondents reported that the most frequent benefit is a sense of belonging to the community. Other benefits reported are recognition from the community (19.5%), respect from members (18%), gratitude (16%) and praise (9%).

Participants offered further comments about benefits of participation on the survey as follows:

“Ease of search of information, usually understandable format, sometimes even pictures (real colour) as opposed to usual black and white CAD drawings.” “Very handy and speed at which a solution to problem can be found.” “Eureka is sometimes the first thing to fix the problem.” “It is a very powerful trouble shooting tool. It can get to the source of a problem very quickly. It can save a technician huge amounts of time and parts dollars.” “When using some of the current manuals the only way to solve a problem is to use Eureka.” “Working in a rural territory, your knowledge base is too ‘thin’, so it’s great to have a source of up to date knowledge and know how.” “Just being able to offer a solution to a tough problem for someone.”



5.3.9 Ambivalence about Eureka and plans for future participation

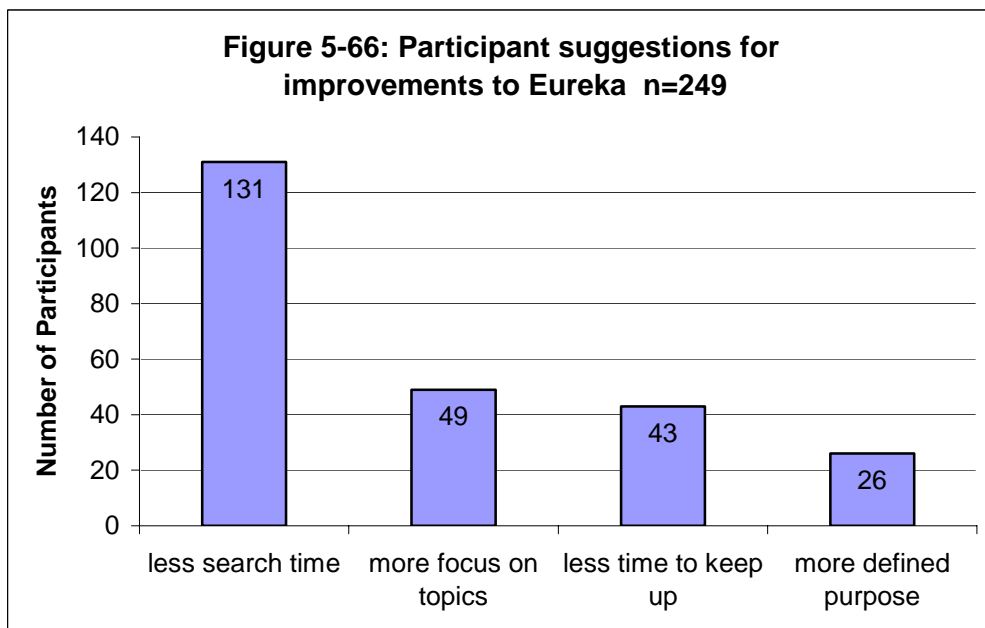
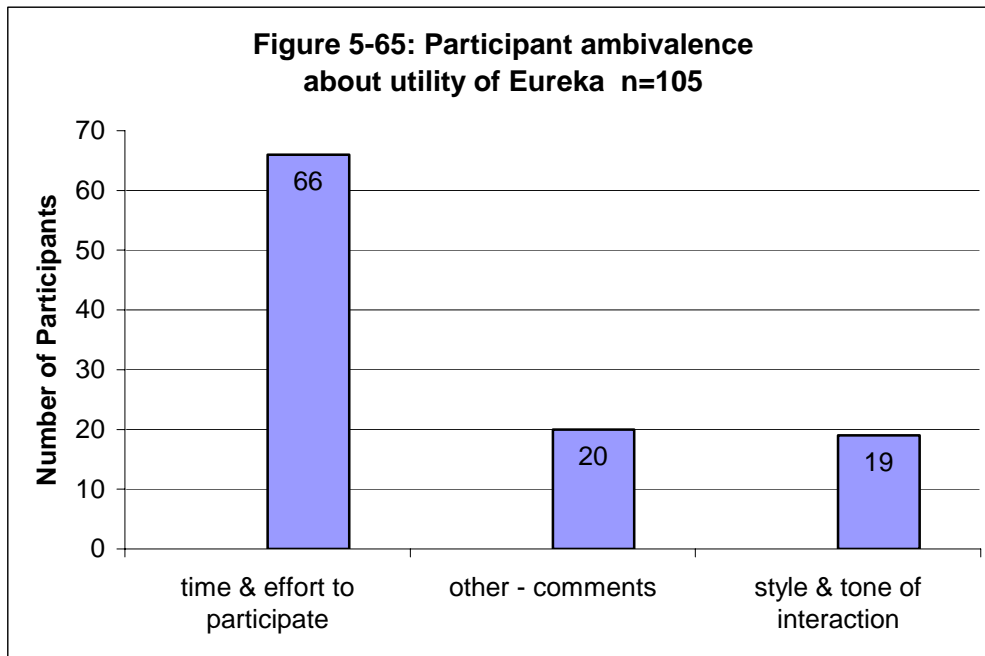
Eureka members expressed high levels of satisfaction their experience within Eureka. Almost eighty-six percent (85.8%) of respondents reported having no ambivalent feelings about the utility of the Eureka community. With regards to plans for more frequent participation in Eureka, almost twenty percent (19.6%) expressed doubts about more participation largely due to the time and effort

needed to participate. About six percent of respondents (5.7%) expressed doubts about more frequent participation due to the interaction style within the community.

Participants offered additional comments as follows:

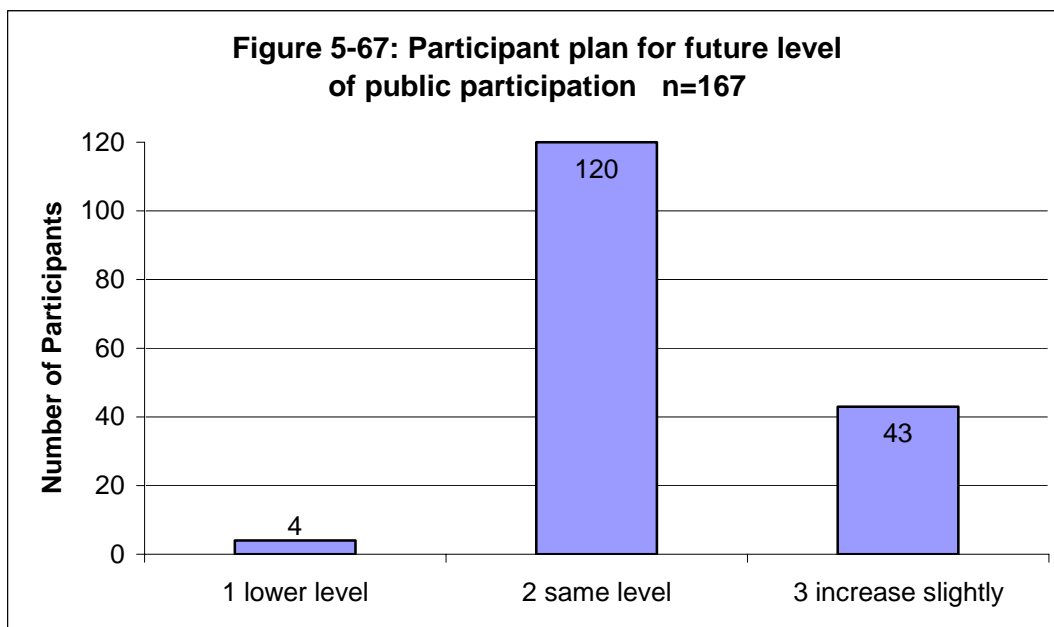
“Eureka lacks of a ”Google” quality search engine.” “Once a database on a product family tapers off, we lose tech support in Rochester too soon. Weird and unusual problems still take a machine down for days.” “Not all the products I service are in Eureka or even updated in Eureka.”

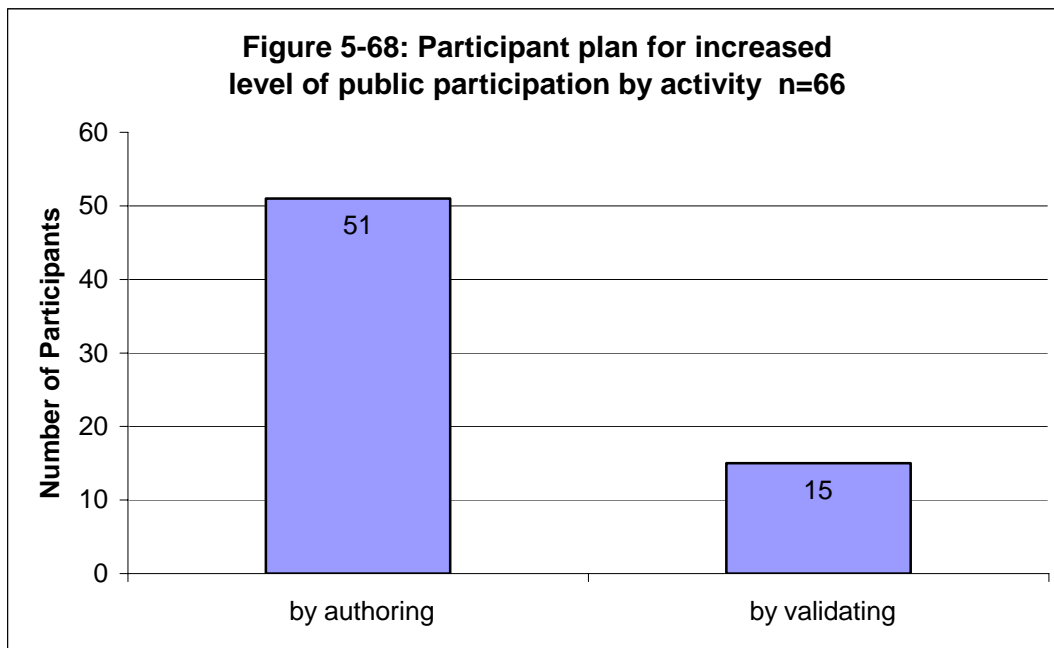
“I question the quality of the information.” “It would be nice if there was some way of bucketing all the tips that are similar...every author has a unique way of describing a fault, and it makes it difficult to find if it’s named differently.” “Tips are sometimes difficult to find.” “Stop validating tips that are in the manual.”



Forty percent (40%) of respondents indicated that requiring less time to search for information would be an improvement. About fifteen percent (14.6%) of respondents suggested that more focus on discussion topics by participants would be an improvement. Also, about thirteen percent (12.5%) of respondents reported that more satisfactory participation would require less time to keep up with Tips and with daily interaction during the community discussion. About ninety-four percent (93.6%) of respondents reported plans to continue participating in Eureka.

Planning to participate at the same level was reported by about fifty-two percent (51.5%) of respondents and about nineteen percent (18.5%) reported plans to slightly increase participation activities compared to about twenty-two percent (21.9%) of respondents that reported plans to increase participation by authoring Tips.





5.4 A comparison of the two communities - IBM and Eureka

- Membership in other communities

IBM respondents reported joining multiple communities (6-15) unlike Eureka respondents wherein a majority reported belonging to less than 5 communities.

1-5 communities: IBM (21%) vs Eureka (91%) and of this number 106/234 (45%) reported joining only Eureka.

6-10 communities: IBM (50.5%) vs Eureka (6%)

11-15 communities: IBM 22.5% vs Eureka (1.7%)

- Length of membership

Length of membership time in the IBM based community is considerable less than membership time in Eureka. Fifty percent (50%) of IBM respondents reported between 13 – 24 months of membership compared to ninety one percent (91%) with over 2 years length of membership in Eureka and a majority with over 5 years membership.

- Frequency of participation by activities

Reading: IBM respondents reported reading messages on weekly basis (93.3%) compared to Eureka respondents who reported reading messages on a daily basis (70.6%).

Browsing: IBM respondents reported browsing on a weekly basis (93%) compared to Eureka respondents who reported browsing on a monthly basis (56%).

Posting messages: IBM respondents reported posting questions on a daily basis (64%) compared to Eureka respondents who reported posting on a monthly basis (57%).

Replying to messages: IBM respondents reported replying to questions on a weekly basis (69%) compared to Eureka respondents who reported offering feedback on a monthly basis (35%).

- Time and effort to author messages

IBM respondents vs Eureka respondents

Post immediately	4.4 %	4.6 %
Author edit post	17.8 %	28.3 %
Author edit retain post	35.6 %	17.7 %
Author retain edit post	31.1 %	13.1 %

IBM members reported spending more time preparing, checking and posting messages.

- Desires more daily time in community

Yes: IBM (82%) vs Eureka (53.6%)

30 minutes IBM (90%) vs Eureka (42.3%)

60 minutes IBM (10%) vs Eureka (40.4%)

- Most important benefits of membership

IBM: Feelings of gratitude for message contributions (75%) and a sense of belonging to the community (69%).

Eureka: Receiving quality and timely help (77.9%) and keeping updated with current information (72.8%).

- Knowledge asymmetry

IBM: Higher level (29.2%), equal level (27%) and lower level (43.8%)

Eureka: Higher level (56%) equal level (38%) and lower level (5.1%)

- Expressed ambivalence about the community

IBM (68%) vs Eureka (6.7%)

- Feels like a member of the community

IBM (94.6%) vs Eureka (84.3%)

- Plans to definitely stay in the community

IBM (59%) vs Eureka (93.6%)

5.5 Other observations

Much happens outside the community space and is not recorded on the message servers. Both IBM members and Eureka members reported frequent messages directly to members outside the community. Eighty five percent (85%) of IBM respondents reported contacting members by personal email compared to about eight percent (7.7%) of Eureka members who reported doing so. Also, IBM members, in particular, reported communicating frequently outside the community by telephone (62%) and finding members met initially in the community at company and industry conferences.

Members reported that the Eureka community offers clear value to participants. As reported, most members would like more time in the community to diagnose hardware and software problems prior to field service calls and, in some cases, to requisition parts required for maintenance and repair work. Time spent on these pre-service call activities are not supported by supervisory management who consider response time from service despatch to customer premises to be a more important measure than total time to complete the on site service call.

Members of both communities are primarily readers with a small group of message posters.

Eureka field representatives typically install, repair and maintain a category of products over a longer time period (36 months to 66 months) thereby acquiring expertise in the technology and in management of the customer territory. In contrast, IBM community participants move through cycles of software product updates and new software introductions at a faster rate and report having little training and time to learn about new software technology.

Chapter 6

EXPLORING PARTICIPATION FACTORS FROM THEORETICAL PERSPECTIVES: PROPOSITIONS

The data gathering methods available in the case studies are not sufficiently rigorous to validate experimental hypotheses. This is a natural limitation of field work with ongoing communities of practice in the workplace: it is not possible to control the environment in ways that allow more rigorous data collections. For example, the survey responses, while highly informative, represented only a small fraction of users in at least one context (the IBM communities) due to a low participation rate. In addition, we were not able to control for the possibility of completion of multiple surveys by IBM community members who were members of multiple communities, nor were we able to associate the respondents with the particular communities of which they were members. Overall, it is likely that our sample of community members in both cases is biased toward more frequent users and is therefore not necessarily representative of the total membership of the communities.

In lieu of formal hypotheses, we have instead derived propositions from the theories and applied them to the partial data obtained from the case study methods. In section 6.1 below, we discuss the propositions to be considered later in the light of the case study data. These were derived from the theoretical literature that informed the research study, as discussed in Chapter 02. Following the discussion of the propositions, in section 6.2 we present the definitions of the variables in the study and measures of the data relationships. In Chapter 07 we present the results of analyzing the data from the case studies using these propositions. Our intent there is to use these results to suggest which theoretical perspectives may be applicable for providing insight into the factors affecting participation (and whether more rigorous experimental study of these theories is likely to be prove useful).

6.1 Propositions

Proposition One: Members Expectations of Purpose

Nonnecke and Preece (2001) describe member's participation in communities of practice as "a means of satisfying their wants or needs". One of the explanations passive participants or lurkers (those who persist in staying) give for their behaviour is it enables them to explore an appropriate role in the community and it meets their initial expectations and planned behaviour in joining the communities of practice. As Kim (2000) indicates, candidate members join communities of practice with certain expectations about its nature and purpose as indicated in the community name or defined in the community membership charter. The degree of correspondence between member's expectations on joining and topics discussed in the communities of practice may affect the message contribution behaviour of members. Propositions 1a and 1b are as follows.

Proposition 1a states that a correspondence between member's initial expectations of purpose for joining a community and the relevance of posted topics to job interests will positively affect public message contribution behaviour.

Proposition 1b states that a correspondence between member's initial reported expectations of purpose for joining a community will positively affect their public participation activities (reports of posting and reports of replying to questions).

Proposition Two: Relevance of community discussion to work interests and participation after joining the community.

The degree of correspondence between the discussion topics and member's work specialty or work interests may affect message contribution behaviour in communities of practice. Nonnecke and Preece (2001) classify this as a member's "relationship to group". Based on utility theory discussed above, one may expect that a high degree of correspondence in knowledge (symmetry of knowledge) will provide incentive and encouragement to join the discussion.

Proposition 2 states that members' rating of the relevance of the community discussion to work interests after joining the community will be positively associated with message contribution in the community.

Proposition Three: Information utility and message contribution

One's attitude with respect to relevance and utility of information posted to communities may have an impact on message contribution behaviour. At any point, the individual must decide not only what alternatives to choose from the available knowledge resources, but whether he/she should search for more useful knowledge. One's propensity to engage in information search and collection activities for utilitarian information may lead to more active contributing behaviour.

Proposition 3 states that the job utility of information contributed to the community is associated with participation (posting questions and replying to questions).

Proposition Four Costs and Benefits

Because participating in a community of practice requires time, effort, attention, and resources, it is a costly activity. As a result, individuals can be seen as making decisions regarding their participation based on expectations about the costs and benefits of joining and participating (Moreland & Levine, 1982; Markus, 1990; Connolly & Thorn, 1990; Kollock, 1999). The costs that affect individual message contribution are those costs borne by members. In the communities of practice, there are three types of costs born by the member: a) knowledge and skill requirements, b) communication discipline - attention and readiness to reciprocate message communication and c) time and effort commitment.

In a study by Nonnecke, Preece and Andrews (2004), 29.7% of survey respondents indicated that they are still learning about the group by passively participating in an effort to decide upon a future mode of participation. Common sense informs us that on average, the effort to create a message is affected by a number of message characteristics, the most obvious being message length. Messages with fewer words take less time to write and on average should be simpler. As Jones, Ravid and Rafaeli, (2002, p.6) point out, "none of these measures are ideal because the effort to write a message relates to many other factors including the concepts the author intends to convey, the content of the message in a discourse stream, the complexity of the language required, etc."

Proposition 4a states that lower perceived access contribution costs (time, effort, attention, discipline) of participation in the community, is associated with higher rates of message contribution behaviour.

Critical mass theory was conceptualized in relation to interactive media technology such as telephone, bulletin boards and email. In these cases users' contributions correspond to efforts in reciprocating communication. Interactive media like bulletin boards, computer conferences, communities of practice, depend on members' contribution of information to exist; there is no community of practice without members' contributions. Therefore, message contribution in these cases corresponds to efforts in reciprocating information exchange. The variety of resources (heterogeneity of resources) members may contribute will affect the quantity and mix of benefits available to all members. Members' heterogeneity of resources contributed increases the possibility of joining and message contribution because the differential ability to derive benefits or to contribute knowledge resources increases the likelihood that there will be some members willing to contribute (critical mass of participants) even if others do not and can get contributions started and flowing. Successive message contributions increase the possibility of more members obtaining benefits and more members joining, contributing and participating in the community of practice.

Proposition 4c states that the higher the reported perceived diversity of messages available to the community, the higher the reported number of message contributions.

Proposition 4d states that the higher perceived quality of the messages available to the community, the higher the reported number of message contributions.

Proposition Five: Size of the Community, Benefits and Message Contribution

Benefits of participation increase with the number of active members in community. Getting higher message contribution rates from new members is associated with larger communities of practice.

Proposition 5 states that message contribution rates are positively associated with size of community.

The larger the size of the community of practice, the greater number of benefits available to community members. Greater message contribution rates are positively associated with larger communities of practice.

Xerox Eureka Community

Proposition 1 states that a member's expectation of purpose for joining a community is associated with participation (authoring Tips).

Proposition 2 states that members' rating of relevance of community discussion topics to member's work interests is linked to participation (authoring Tips).

Proposition 3 states that member's rating of job utility of information found in the Eureka community is positively associated with participation (authoring Tips).

Proposition 4a states that lower the ease of authoring Tips (costs of time, effort, attention), the higher the reported frequency of authoring Tips.

Proposition 4b states that the larger the reported degree of benefits obtained from participation, the higher the reported level of message contribution (authoring Tips).

Proposition 4c states that the higher the perceived diversity of messages (Tips) contributed to the Eureka community, the higher the reported frequency of authoring Tips.

Proposition 4d states that the higher the reported perceived quality rating of Eureka message content posted to the community, the higher the reported number of message contributions (Tips).

Proposition 5 states that message contribution rates are positively associated with size of community.

6.2 Definitions of variables

6.2.1 Dependent variables and measures

Contribution rate: Group contribution. Operationalized as the number of messages contributed monthly by the group. The value was calculated by subtracting from the total number of messages on the server in July 2006, the total number of messages in August 2005 on the server and dividing this by twelve to get a monthly figure.

Joining Rate: Numerical growth of members of the community. Operationalized as the percentage increase of total number of participants from August 2005 to July 2006.

6.2.2 Independent variables and measures

Costs of contributing: Time, effort and attention required to compose and post messages.

Operationalized as the average level of time for members to prepare and post messages.

There are five ordinal levels: low- 0 (have not posted), 1 (write and post immediately), 2 (write, edit and post immediately), 3 (write, edit sit on it, and post later), high- 4 (write, edit, sit on it, and edit before posting).

Benefits: Recognition within the community, praise, sense of belonging to community, gratitude, respect within community. Benefits were operationalized as the average number of benefits received by members of the community.

Content diversity refers to the variation in knowledge resources contributed in terms of the depth and range of message content posted to the community of practice. For each of these variables there was a five-point category scale: 1) excellent to 5) poor.

Knowledge asymmetry is the percentage of members who compare their knowledge on a five-point scale as 1) much lower level, 2) lower level, 3) same level, 4) higher level, 5) much higher level.

Size refers to the total number of participants appearing in the roster of the community of practice.

Membership stability is defined as the degree of permanence in the community of practice and operationalized as three variables: length of community membership, plans to stay or plans to leave the community and message reading involvement. Length: 1) less than 1 month, 2) 1 month, 3) 2 months, 4) 3-6 months, 5) 7-12 months, 6) 13-24 months, 7) over 25 months. Plans: 1) will be leaving soon, 2) will not be leaving soon, 3) prefers to stay, 4) definitely will stay, 5) usually leaves and rejoins the community (transient members).

Level of involvement is defined as the degree of involvement in reading messages and the frequency of posting messages. Reading posted messages involvement has four levels: 1) low involvement- scan headings, 2) scan headings and sender's name, 3) scan headings, sender's name and number of responses, 4) high involvement - scan headings, sender's name and number of responses and message body. Posting is the frequency with that a member:

- posts questions
- posts replies to questions
- posts comments
- posts replies to comments
- posts announcements

For each of these variables there were five decreasing frequency levels of contribution: 1) hourly, 2) daily, 3) weekly, 4) monthly 5) never.

Message content diversity refers to the relationship of message content to job interests. This variable has five ordinal levels: 1 (unrelated) to 5 (much related).

Chapter 7

EXPLORING PARTICIPATION FACTORS FROM THEORETICAL PERSPECTIVES: RESULTS

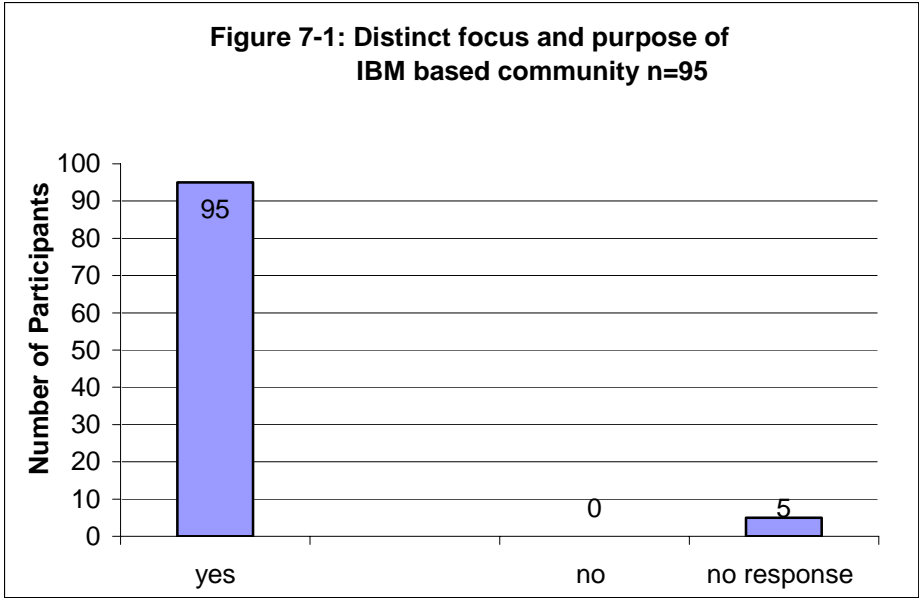
Our purpose in this chapter is to consider whether the theoretical perspectives in Chapter 02 provide value in understanding the user behaviour observed and reported in the case studies. As noted previously in Chapter 06, the data gathering methods available in the case studies are not sufficiently rigorous to validate experimental hypotheses. Instead, we have derived propositions from the theories and applied them to the partial data obtained from the case study methods. Our intent is to use these results to suggest which theoretical perspectives may be applicable for providing insight into the factors affecting participation (and whether more rigorous experimental study of these theories is likely to prove useful).

In this chapter, there is a description of

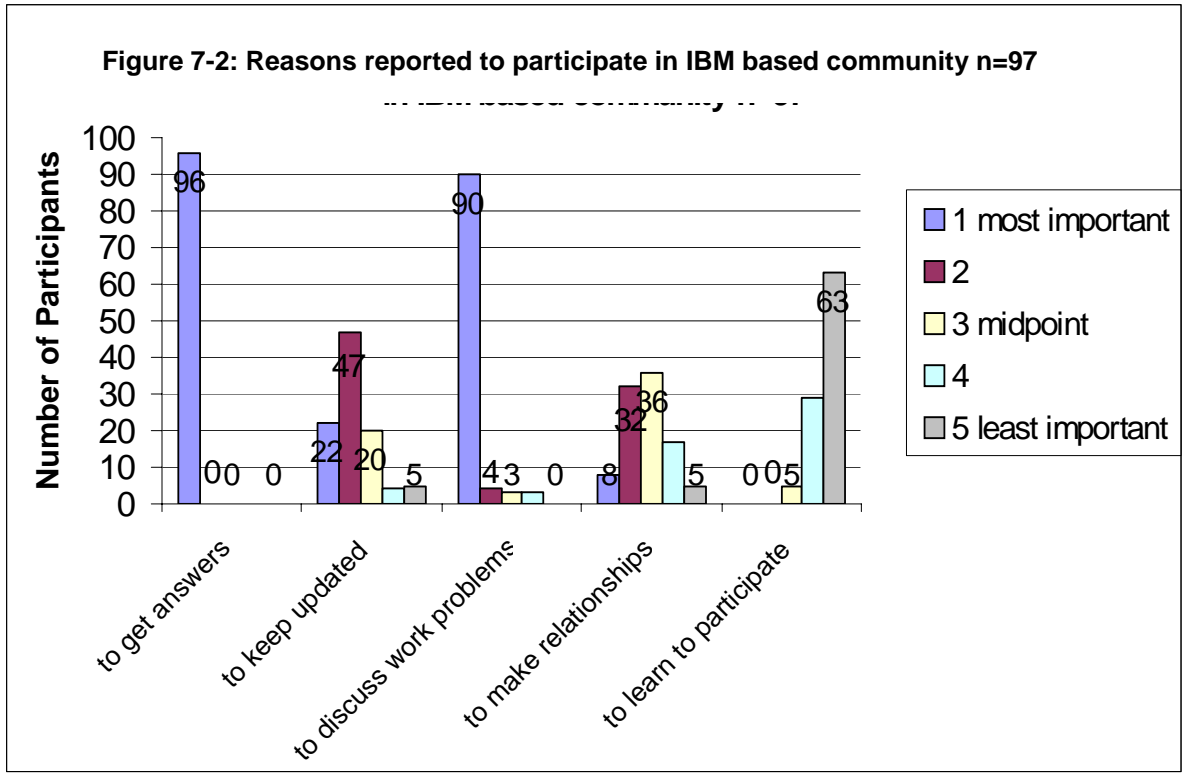
- participants' reports of their initial attraction to the community, participants' reports of the purpose and focus of the community and their reports of reasons to participate in the community
- applying propositions from theoretical perspectives to the IBM based community
- applying propositions from theoretical perspectives to the Eureka community

7.1 Members reports of attraction to community, community purpose and reasons to participate

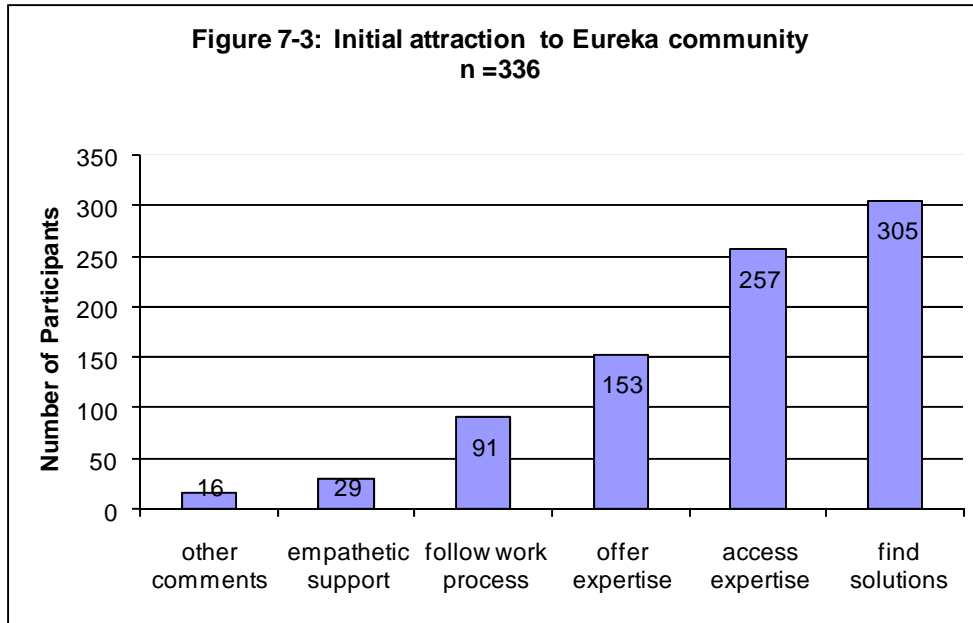
The initial attraction to the IBM based community as reported is largely to gain knowledge to assist oneself with work problems. These reports range from gaining general knowledge (84%), to accessing expertise (88%) and to getting answers (94%). Being attracted to the community to build professional relationships was reported by seventy-five (75%) of respondents and being attracted to the community to offer expertise was reported by seventeen percent (17%) of respondents. Overwhelmingly, members reported that the community had a distinct focus and purpose.



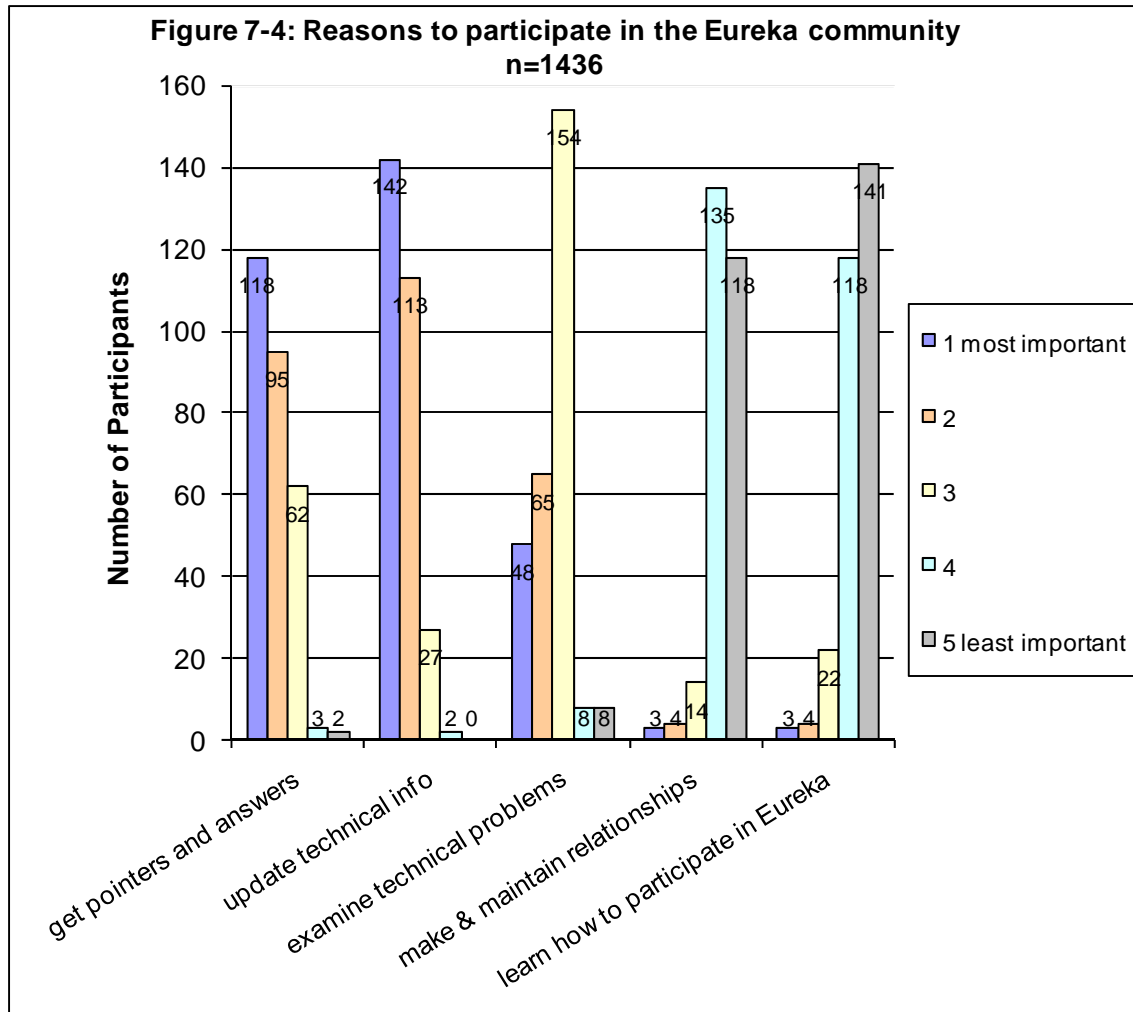
The most important reasons reported for participating in the community are to get answers (96/97), to discuss work problems (90/97) and to keep updated (47/97).



For members of the Eureka community, most respondents (91%) reported being attracted to the community to find solutions to work problems and seventy seven percent (77%) of respondents were initially attracted to access expertise in the community. Others, forty-six percent (46%) respondents, reported attracted to the community to offer their expertise and twenty-seven percent (27%) of respondents reported being attracted by the prospect of following standard work practices.



The most important reasons reported for participating in the community are to keep updated with technical information and to get pointers and answers about technical, work problems from the community



Reasons reported for participating are to find technical information and to keep updated (90%), to get pointers and answers (76%) and to examine technical problems (40%). Interestingly, the *least important* reasons reported to participate are to make and to maintain relationships (89%) and to learn how to use Eureka (90%).

7.2 Exploring the survey results with the Spearman rank correlation coefficient test for ranked data

In section 3.3 of chapter 3, reference was made to the ongoing academic debate about level of measurement of a variable and if there is an appropriate statistical procedure to match the level of measurement. Presently, it remains an unsettled question among research methodologists and statisticians in psychology and the management sciences.

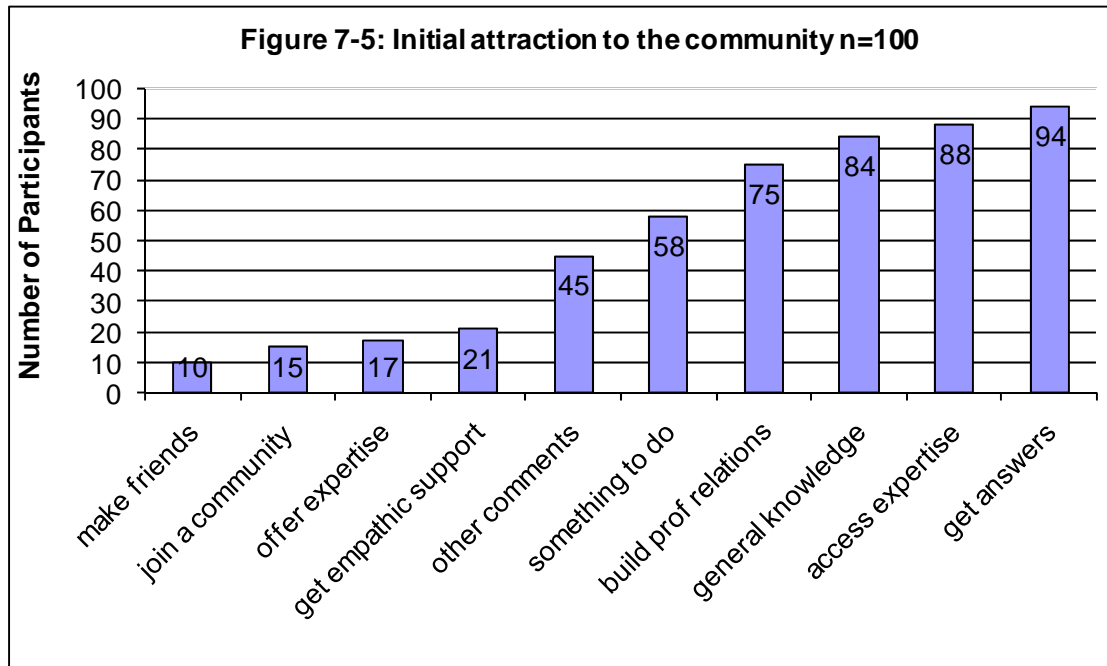
The Spearman rank correlation coefficient test is used to test the propositions for the IBM-based community and the Xerox Eureka community. The Spearman rank correlation coefficient test is a nonparametric analog of the linear correlation coefficient and it helps one decide what type of relationship, if any, exists between data from populations with unknown distributions. This correlation coefficient is simply the linear correlation coefficient between the ranks of the data on variables x and y . To make a test of propositions using the Spearman rank correlation coefficient test, we do not need to make any assumptions about the populations of x and y variables. Tests of propositions are computed using the Spearman rank correlation coefficient test and the participation variable is considered to be measured at an ordinal level.

As discussed above in Section 3.3.1, correlation and regression are interwoven models however statisticians commonly make a distinction between these two techniques. The distinction between the two models tends to break down in practice depending on the interests of the researcher. If the purpose of the research is to allow for prediction of Y on the basis of knowledge about X , we will speak of regression. If, on the other hand, the purpose is merely to obtain a statistic expressing the degree of relationship between two variables, we will speak of correlation. In practice, the two techniques are often treated as one and the same, since they are so closely related and frequently used together. The appropriate test statistic for both variables measured at least at an interval or at a higher ratio level, is the Pearson product-moment correlation coefficient test. For variables measured at an ordinal level, the data is rank-ordered and the appropriate test statistic is the Spearman correlation coefficient test for ranked data. (For tables of different kinds of correlation coefficients and levels of measurement required see Mitchell and Jolley, 2004, p.162 or various academic textbooks in research methods and statistics.)

7.2.1 IBM Community: Proposition testing results

Survey question 8-A3 asked respondents what attracted them to join the community. Response selections were check marked and respondents could choose all that applied and offer further comments in a text box within the survey. The response frequencies are given in Figure 7-5 below. The most frequent attraction to the community was to get

answers (94), to access expertise (88), for general knowledge (84), and to build professional relationships (75).



Survey question D3 asked respondents how often they participated in the following activities in the community.

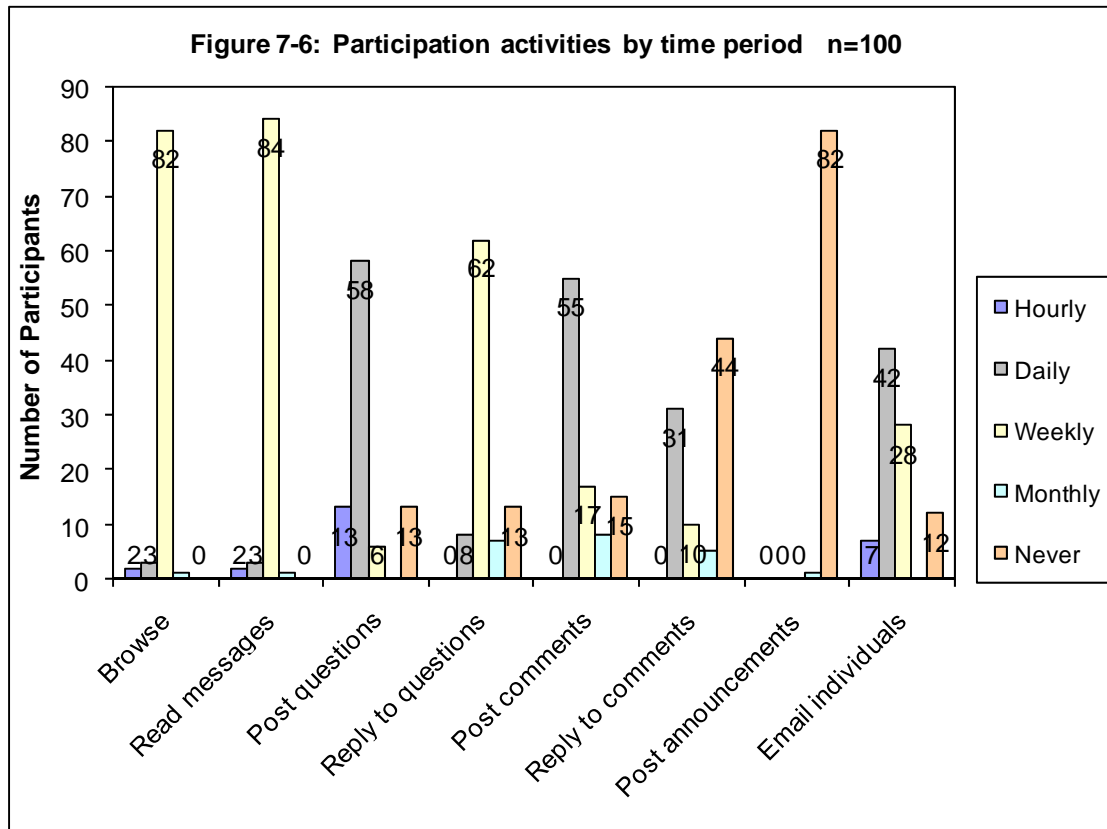
Table 7-1: Participation activities in the community

Question D3: How often do you do these activities in the community?

	Hourly	Daily	Weekly	Monthly	Never
Browse	2	3	82	1	0
Read messages	2	3	84	1	0
Post questions	0	6	58	13	13
Reply to questions	7	62	8	7	13
Post comments	0	55	17	8	15
Reply to comments	0	31	10	5	44
Post announcements	0	0	0	1	82
Email individuals	7	42	28	0	12

Members have more frequent patterns of participation for some activities and participate less frequently for other activities. Most of the communication activity occurs either on a daily or on a weekly basis. Members reported posting questions (58) weekly, posting

comments (55) daily, and sending email directly to individuals (42) on a daily basis. Reading and browsing messages and replying to questions are largely weekly activities.



There is as brief discussion of terms you used in the propositions followed by an explanation of the variables used. Public participation (public message contribution) is defined as messages posted to the community discussion as questions and replies to questions. Initial expectation of purpose refers to a member’s intention upon joining the community to contribute public messages or to be a passive member and not contribute public messages to the community discussion. Relevance of topics discussed to job interests refers to how relevant members rate the community discussion is to their job interests and work duties.

Proposition 1a - Expectations of membership purpose, relevance of discussion topics and message contribution

Proposition 1a states that a positive correspondence between member's expectation about expertise available (to offer and to access expertise) and the relevance of topics discussed to job interests will be positively associated with message contribution (posting and replying questions).

Only two variables, posting questions and replying to questions of the 10 participation activities were defined as participation in this study. These two variables were of interest to test propositions in both communities. The two variables, to offer expertise and to access expertise of the eight initial attractions to the community, were also defined as member's expectation about expertise available in the community and/or to be contributed to the community.

The nominal variables, attraction to the community to offer expertise/to access expertise, were coded on a binary scale (0=not attracted, 1=attracted). The nominal variables, posting questions/replying to questions, were measured on a five-point ordinal scale and recoded (1=never, 2=monthly, 3=weekly, 4=daily, 5=hourly). In order to test this proposition 1a (Table 7-2a); Spearman rank correlation analyses were performed because the two variables, member's initial expectation of purpose for joining a community (to offer and to access expertise) were measured on a binary scale (0 = not attracted vs. 1 = attracted) and the other two variables, message contributions (posting and replying questions) were measured on a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly).

In this study, variables measured on an ordinal scale (e.g., posting questions and replying to questions), the scales (1 to 5) were transformed into a rank scale by mean values using a method of rank assigned to ties. For example, the variable, posting questions was originally coded on a 5-point ordinal scale (1 to 5) and then transformed into new scales like 7.0, 20.0, 55.5, and 87.5.

Table 7-2a presents the association between individual member’s reported purposes for joining the community and their reported participation activities (posting questions and replying to questions). See Figure 7-5: Attraction to the community above.

Using the Spearman rank correlation coefficient test, the relationship is significant at a .05 level (.216 correlation) for reports of being attracted *to offer expertise* and posting questions. The relationship between reports of being attracted *to access expertise* and the reports of posting questions is significant at a .05 level (.249 correlation). The proposition is supported. .

Table 7-2a: Relationship between initial attraction to community and participation (posting/replying to questions)

IBM-based communities		To offer expertise	To access expertise	Posting questions	Replying to questions
To offer expertise ^a	Spearman Correlation	1.000	.003	.216(*)	.083
	Sig. (2-tailed)	.	.974	.041	.439
	N	100	100	90	90
To access expertise ^a	Spearman Correlation		1.000	.249(*)	-.010
	Sig. (2-tailed)		.	.018	.922
	N		100	90	90
Posting questions ^b	Spearman Correlation			1.000	.258(*)
	Sig. (2-tailed)			.	.014
	N			90	90
Replying to questions ^b	Spearman Correlation				1.000
	Sig. (2-tailed)				.
	N				90

Note: ^a indicates binary scales (0 = not attracted vs. 1 = attracted); ^b was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest; * Spearman rank correlation coefficient test is significant at the 0.05 level (2-tailed).

Table 7-2b presents the relationship between members rating of the relevance of discussion topics to job interests and participation (posting questions and replying to questions). The nominal variable, rating of relevance of discussion topics to job interests is measured on a five point quality scale (1=poor to 5 = excellent). The nominal variables, posting questions/replying to questions, were measured on a five-point ordinal scale and recoded (1=never, 2=monthly, 3=weekly, 4=daily, 5=hourly).

In order to test this proposition 1a (Table 7-2b); Spearman rank correlation analyses were performed because the variable, relevance of discussion topics to job interests was measured on a 5-point interval (1 = poor to 5 = excellent) and the variable, participation (posting questions) was re-coded and measured on a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly).

Using the Spearman rank correlation coefficient test, the relationship between the variables, relevance of discussion topics to job interests and participation (posting questions) is significant at a .05 level (.216 correlation). The relationship between the relevance of discussion topics to job interests and participation (replying to questions) is significant at a .05 level (-.232 correlation). The proposition is supported.

Table 7-2b: Relationship between relevance of discussion topics to job interests and participation (posting/replying to questions)

IBM-based communities		Relevance	Posting questions	Replying to questions
Relevance ^a	Pearson Correlation	1.000	0.216 *	-0.232 *
	Sig. (2-tailed)	.	0.042	0.029
	N	95	89	89
Posting questions ^b	Pearson Correlation		1.000	0.258 *
	Sig. (2-tailed)		.	0.014
	N		90	90
Replying to questions ^b	Pearson Correlation			1.000
	Sig. (2-tailed)			.
	N			90

Note: ^a indicates a 5-point quality measure scale (1 = poor to 5 = excellent); ^b was re-coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly); * Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed).

Proposition 1b – A member’s initial expectation of purpose for joining a community will positively affect member’s participation (reports of posting and reports of replying to questions)

A member may join a community with an initial expectation, intention or purpose in mind: to keep updated, to access expertise, to follow specific topics, to read messages and to post or to not post messages. Proposition 1b states that member's *initial expectation of purpose* for joining a community will positively affect member’s participation (reports of posting and replying to questions).

The dependent variable, posting questions, was originally coded 1- 5 on an ordinal scale and used ranked scores in the analysis presented in Table 7-3. The independent variables, 12 initial expectations of membership were measured on a binary scale (0 = not attracted vs. 1 = attracted). To test proposition 1b, a regression analysis was run. An initial attempt to test the proposition used ordinal regression analysis however the results were not properly performed. Some of the responses were skewed or had little to no variability. Therefore, in this analysis, the dependent variable was recalculated using its' rank scores.

Table 7-3: Influence of Initial expectations of membership on posting questions

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	13.129	14.867		0.883	0.380
Offer expertise	20.037	6.552	0.318	3.058	0.003
Access expertise	24.340	8.171	0.330	2.979	0.004
General knowledge	20.469	8.539	0.291	2.397	0.019
Something to do	-18.753	5.993	-0.411	-3.129	0.002
Enjoy myself	29.142	11.428	0.271	2.550	0.013
Build professional relationships	4.864	6.655	0.090	0.731	0.467
Read stories	1.030	6.500	0.022	0.158	0.875
Tell stories	0.939	5.846	0.020	0.161	0.873
Make friends	13.880	7.825	0.197	1.774	0.080
Empathic support	2.402	5.603	0.044	0.429	0.669
Get answers	-8.691	15.711	-0.058	-0.553	0.582
Join community	9.125	5.995	0.145	1.522	0.132
Model Summary	<i>F</i> -value = 3.240 (<i>p</i> < .001) R = .579; R ² = .335 Adjust R ² = .232				

Note: Dependent Variable = posting questions (originally coded 1- 5 on an ordinal scale) used ranked scores. Independent variables = 12 initial expectations of membership (0 = not attracted vs. 1 = attracted) To test proposition 1 b, regression analysis was run. An initial attempt to test the proposition used ordinal regression analysis however the results were not properly performed because some of the responses were skewed or had little to no variability. Therefore, in this analysis, the dependent variable was recalculated using its rank scores. The final results as shown in Table 7-3 is based on linear regression analysis, the dependent variable used ranked scores and the independent variables used a binary scale.

The final results as shown in Table 7-3 are based on a linear regression analysis, the dependent variable used ranked scores and the independent variables used a binary scale. The relationship between a member's *initial expectation of purpose* for joining a community and a member's participation (*reports of posting questions*) is significant at a .05 level for initial expectation of purpose *to offer expertise, to access expertise, general knowledge, enjoy myself, and something to do*. The proposition is partially supported.

Proposition 1b that member's initial expectation of purpose for joining a community will positively affect member's participation (reports of posting and reports of replying to questions) is partially supported at a .05 level of significance. An expectation to be a non-public participant by reading stories is associated with less *replying to questions* in the community (-15.305 beta coefficient). Note to the reader: only two variables are significant in the model and the Adjusted $R^2 = .024$ is very low to estimate the influence of initial expectation of membership on public participation.

Table 7-4: Influence of initial expectation of membership on replying to questions

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	41.090	16.089		2.554	0.013
Offer expertise	1.200	7.090	0.020	0.169	0.866
Access expertise	1.470	8.842	0.021	0.166	0.868
General knowledge	6.700	9.240	0.099	0.725	0.471
Something to do	-7.961	6.485	-0.182	-1.228	0.223
Enjoy myself	6.134	12.367	0.059	0.496	0.621
Build professional relationships	19.650	7.202	0.377	2.728	0.008
Read stories	-15.305	7.034	-0.337	-2.176	0.033
Tell stories	11.283	6.327	0.256	1.783	0.078
Make friends	-2.532	8.468	-0.037	-0.299	0.766
Empathic support	-7.395	6.064	-0.142	-1.220	0.226
Get answers	-6.127	17.002	-0.043	-0.360	0.720
Join community	1.437	6.487	0.024	0.221	0.825
Model Summary	F -value = 1.180 ($p = .312$) $R = .394$; $R^2 = .155$ Adjust $R^2 = .024$				

Note: Dependent Variable = replying to questions (originally coded 1 – 5 ordinal scale) changed to ranked scores. Independent variables = 12 initial expectations of membership (0 = not attracted vs. 1 = attracted)

The dependent variable, posting and replying to questions, was measured as the mean values of ranked scores of two variables (posting questions and replying to questions). The independent variables are the 12 initial expectations of membership and these were measured on a binary scale (0 = not attracted vs. 1 = attracted).

The proposition is partially supported at a .05 level of significance for initial expectations of purpose of membership (to offer expertise, to access expertise, general knowledge, something to do, enjoy myself, and to build professional relationships) and participation.

Table 7-5: Influence of initial expectations of membership on public posts

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	27.110	12.022		2.255	0.027
Offer expertise	10.619	5.298	0.217	2.004	0.049
Access expertise	12.905	6.607	0.225	1.953	0.050
General knowledge	13.585	6.905	0.248	1.967	0.050
Something to do	-13.357	4.846	-0.376	-2.756	0.007
Enjoy myself	17.638	9.241	0.211	1.909	0.060
Build professional relationships	12.257	5.381	0.291	2.278	0.026
Read stories	-7.138	5.256	-0.194	-1.358	0.178
Tell stories	6.111	4.727	0.171	1.293	0.200
Make friends	5.674	6.327	0.104	0.897	0.373
Empathic support	-2.496	4.531	-0.059	-0.551	0.583
Get answers	-7.409	12.704	-0.063	-0.583	0.561
Join community	5.281	4.848	0.108	1.089	0.279
Model Summary	<i>F</i> -value = 2.506 (<i>p</i> < .008) R = .530; R ² = .281; Adjust R ² = .169				

Note: Dependent Variable = mean values of ranked scores of two variables (posting questions and replying to questions); Independent variables = 12 initial expectations of membership (0 = not attracted vs. 1 = attracted).

Proposition 2 – Relevance of community discussion to work interests and participation after joining the community.

Proposition two states that member’s rating of the relevance of the community discussion to work interests after joining the community will be positively associated with message contribution in the community.

Survey question B9 asked respondents to rate the relevance of the community discussion to their work interests on a five-point ordinal scale (excellent – poor). Ninety percent of respondents (87/94) reported that the community discussion was “excellent” in terms of relevance to work interests.

The variable, rating of relevance, was reverse coded (1 = poor and 5 = excellent); the variables, posting and replying to questions, were coded originally on a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest.

For the data results that follow, the variables posting questions and replying to questions, were measured on a five-point ordinal scale and recoded (1=never, 2=monthly, 3=weekly, 4=daily, 5=hourly).

Survey question D3 asked respondents how often they participated in community activities. See Table 7-6 below for a description of responses.

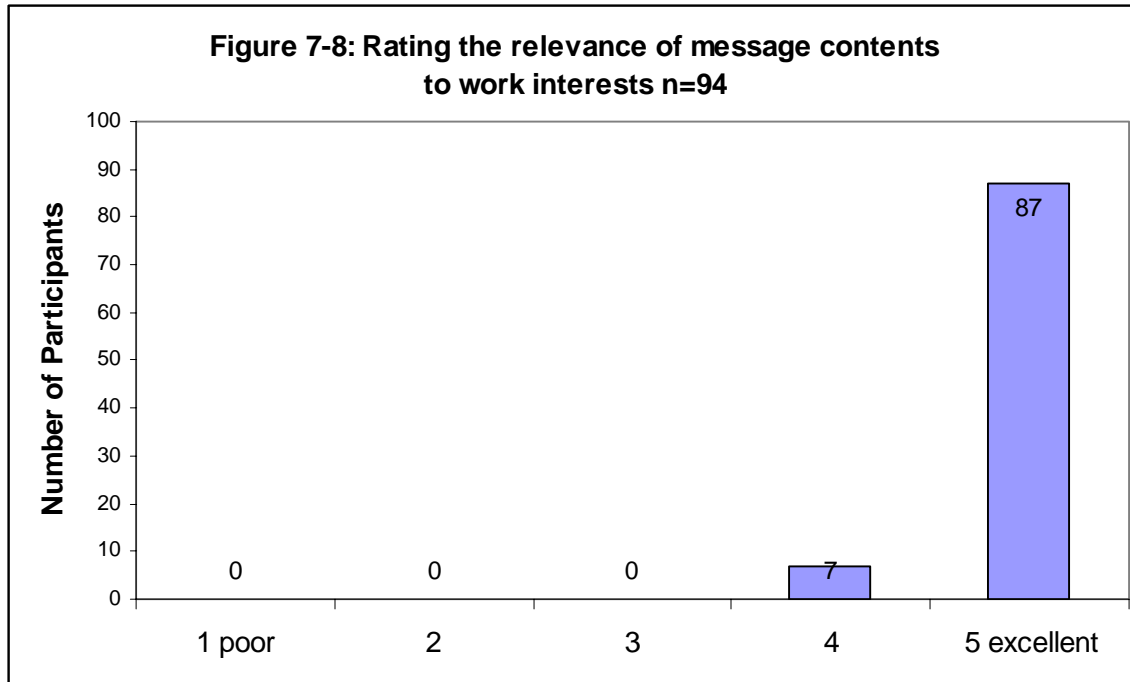


Table 7-6 Participation activities in the community

	Hourly	Daily	Weekly	Monthly	Never
Browse messages	2	3	82	1	0
Read messages	2	3	84	1	0
Post questions	13	58	6	0	13
Reply to questions	0	8	62	7	13
Post comments	0	55	17	8	15
Reply to comments	0	31	10	5	44
Post announcements	0	0	0	1	82
Email individuals	7	42	28	0	12

Member's rating of the relevance of the community discussion to work interests after joining the community is positively associated with participation (replying to questions) and significant at a .05 level (.233 correlation).

Table 7-7: Relationship between rating of relevance of discussion to work domain and participation (posting and replying to questions)

IBM-based communities		Rating of relevance	Message browsing	Message reading	Posting questions	Replying to questions
Rating of relevance ^a	Spearman Correlation	1.000	-.313(**)	-.315(**)	-.216(*)	.232(*)
	Sig. (2-tailed)	.	.003	.003	.042	.029
	N	95	87	89	89	89
Message browsing ^b	Spearman Correlation		1.000	1.000(**)	.270(*)	-.003
	Sig. (2-tailed)		.	.	.011	.978
	N		88	88	88	88
Message reading ^b	Spearman Correlation			1.000	.273(**)	-.003
	Sig. (2-tailed)			.	.009	.978
	N			90	90	90
Posting questions ^b	Spearman Correlation				1.000	.258(*)
	Sig. (2-tailed)				.	.014
	N				90	90
Replying to questions ^b	Spearman Correlation					1.000
	Sig. (2-tailed)					.
	N					90

Note: ^a was reverse coded (1 = poor and 5 = excellent); ^b was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly), To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest; * Spearman rank correlation coefficient test is significant at the 0.05 level (2-tailed); ** Spearman rank correlation is significant at the 0.01 level (2-tailed); *** Spearman rank correlation is significant at the 0.001 level (2-tailed).

The association between member's reports of the relevance of the community discussion to work interests after joining the community and participation (posting questions) is significant at a .05 level but in the opposite direction than proposed. There was a negative correlation between member's rating of the relevance of community discussion to work interests and posting questions. Stated alternatively, one possible explanation is that members who found more relevant, work related information in the community

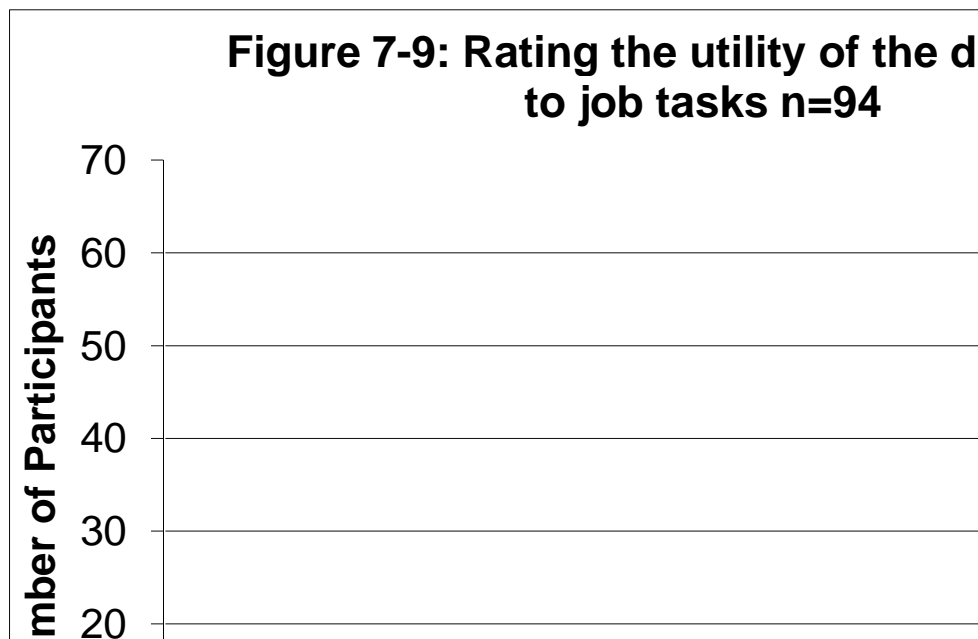
discussion may have been satisfied with the information obtained and may felt less need to post further inquiries on that particular topic.

The relationship between message browsing and posting questions is significant at a .05 level (correlation .270) and the relationship between message reading and posting questions is significant at a .01 level (correlation .273).

Proposition 3 - Information utility and message contribution

The utility of knowledge resources contributed to the community and participation is proposed in the third proposition. Specifically, proposition 3 states that the job utility of information contributed to the community is associated with participation (posting questions and replying to questions).

Survey question B10 asked how often respondents found the community discussion and topics useful for their job tasks on a five-point interval (never to always), 62/94 (64%) indicated “*always*” a useful discussion and 27/94 (28%) indicated “*very often*” a useful discussion.



The variable, message job utility, was reverse coded (1 = never and 5 = always). The variables, posting and replying to questions, were originally coded as a 5-point ordinal

scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest.

Table 7-8: Job utility of messages and message contribution

IBM-based communities		Message job utility	Posting questions	Replying to questions
Message job utility ^a	Spearman Correlation	1.000	0.59	-.191
	Sig. (2-tailed)	.	0.584	0.073
	N	94	89	89
Posting questions ^b	Spearman Correlation		1.000	0.258(*)
	Sig. (2-tailed)		.	0.014
	N	76	90	90
Replying to questions ^b	Spearman Correlation			1.000
	Sig. (2-tailed)			.
	N			90

Note: ^a was reverse coded (1 = Never and 5 = always); ^b was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly), To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest; * Spearman rank correlation is significant at the 0.05 level (2-tailed); ** Spearman rank correlation is significant at the 0.01 level (2-tailed).

The proposition that the job utility of information contributed to the community is associated with participation (posting and replying to questions) is not supported at a .05 level of significance (-.191 correlation).

Proposition 4a – Perceived effort of access to participate in the community discussion (participation costs: time, effort, attention) and public message contribution behaviour

Proposition 4a states that lower perceived access contribution costs (time, effort, attention, discipline) of participation in the community, is associated with higher rates of message contribution behaviour.

Survey question D4 asks respondents how much time, effort, attention and communication discipline was involved in preparing and posting messages.

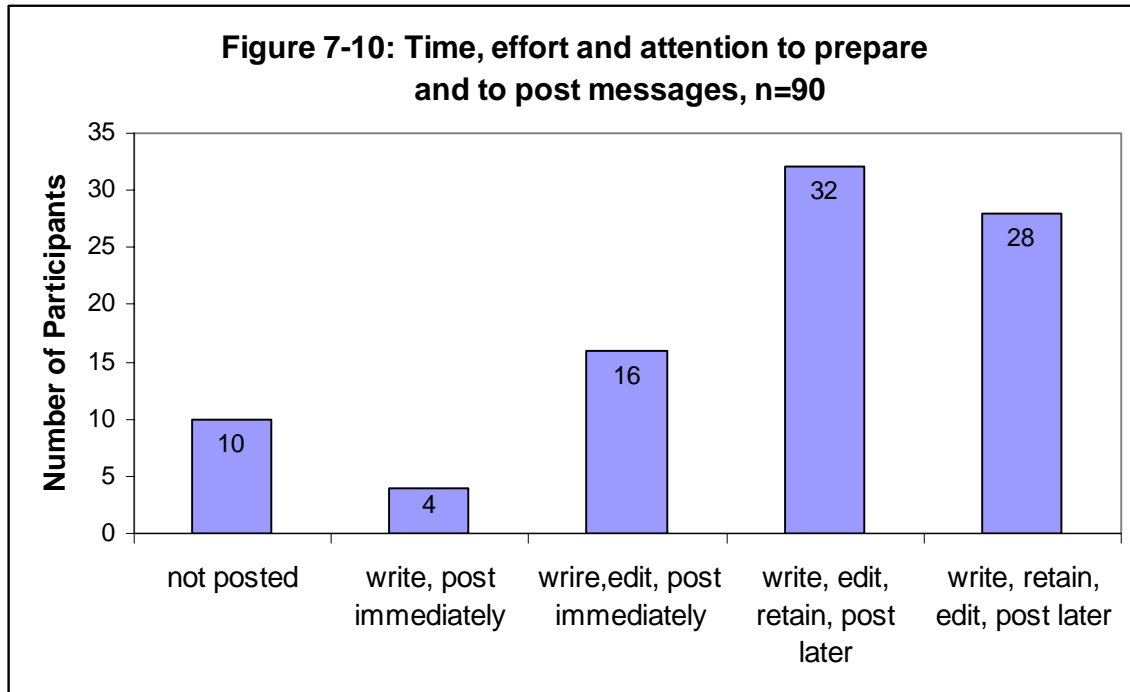


Table 7-9 presents the association between ease of access to participate in the community (time, effort, attention costs of participating) and public message contribution activities (posting and replying to questions).

Responses about the variable, time/effort to prepare and post messages, were originally measured on a 5-point ordinal scale (1=not posted, 2=write, post immediately, 3=write, edit, post immediately, 4= write, edit, retain, post later, and 5=write, retain, edit, post later) and the variables, posting and replying to questions were originally coded on a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest.

The relationship between lower perceived access contribution costs (time, effort, attention, discipline) of public participation and posting questions is significant at the .01 level (.467 correlation) and to questions at the .01 level of significance (.320 correlation). The proposition is supported.

Table 7-9: Access costs and participation

IBM-based communities		Time/effort to prepare and post messages	Posting questions	Replying to questions
Time/effort to prepare and post messages ^a	Spearman Correlation	1.000	.467(**)	.320(**)
	Sig. (2-tailed)	.	0.000	.002
	N	90	90	90
Posting questions ^b	Spearman Correlation		1.000	.258(*)
	Sig. (2-tailed)		.	.014
	N		90	90
Replying to questions ^b	Spearman Correlation			1.000
	Sig. (2-tailed)			.
	N			90

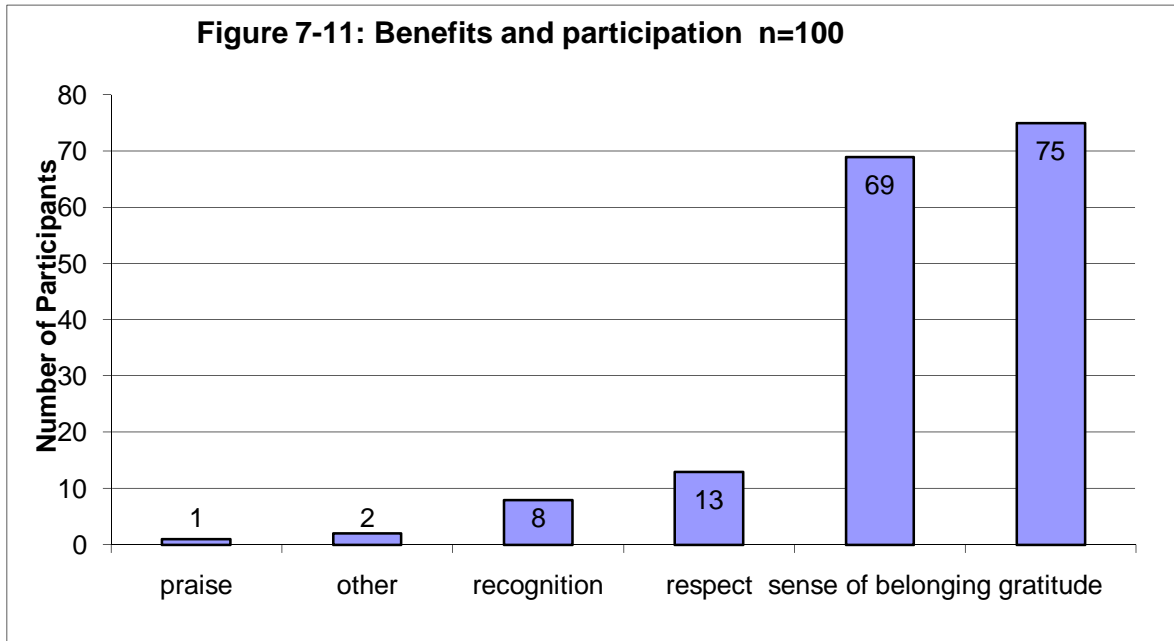
Note: ^a was originally coded as a 5-point ordinal scale (1=not posted, 2=write, post immediately, 3=write, edit, post immediately, 4= write, edit, retain, post later, and 5=write, retain, edit, post later) and ^b was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly), to apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest; ** Spearman rank correlation is significant at the 0.01 level (2-tailed) and * Spearman rank correlation is significant at the .05 level (2-tailed).

Proposition 4b - Benefits and message contribution

Proposition 4b states that larger the sum of benefits obtained from the community, the higher the number of message contributions.

The sum of benefits variable refers all benefits reported from contribution - recognition, praise, gratitude, respect and a sense of belonging to the community.

Survey question D20 asked respondents to indicate all benefits obtained from their participation in the community.



The variables, posting and replying to questions were originally coded on a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest. The sum of benefits variable is measured by the summed scores from the six benefits.

Table 7-10 presents the association between the sum of benefits received and participation (message contributions). The relationship between sum of benefits obtained and public participation (posting questions) is significant at a .01 level (correlation .387). The relationship between sum of benefits obtained and participation (replying to questions) is significant at a .05 level (correlation .258). The proposition is supported.

Table 7-10: Relationship between all benefits and participation

IBM-based communities		Posting questions	Replying to questions	Sum of benefits
Posting questions ^a	Spearman Correlation	1.000	.258(*)	.387(**)
	Sig. (2-tailed)	.	.014	.000
	N	90	90	90
Replying to questions ^a	Spearman Correlation		1.000	.268(*)
	Sig. (2-tailed)		.	.011
	N		90	90
Sum of benefits ^b	Spearman Correlation			1.000
	Sig. (2-tailed)			.
	N			100

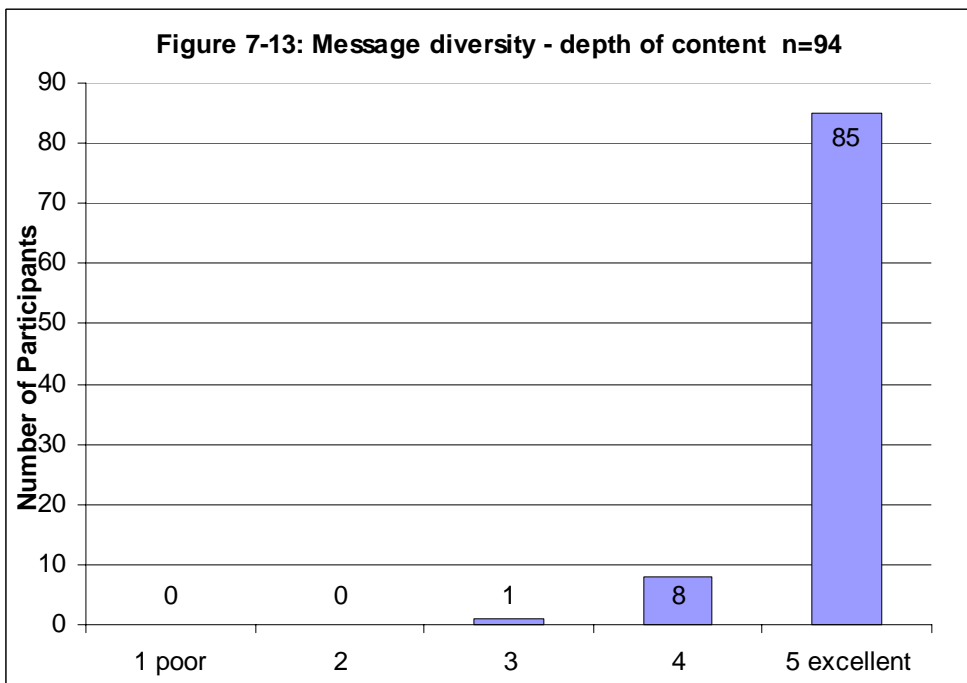
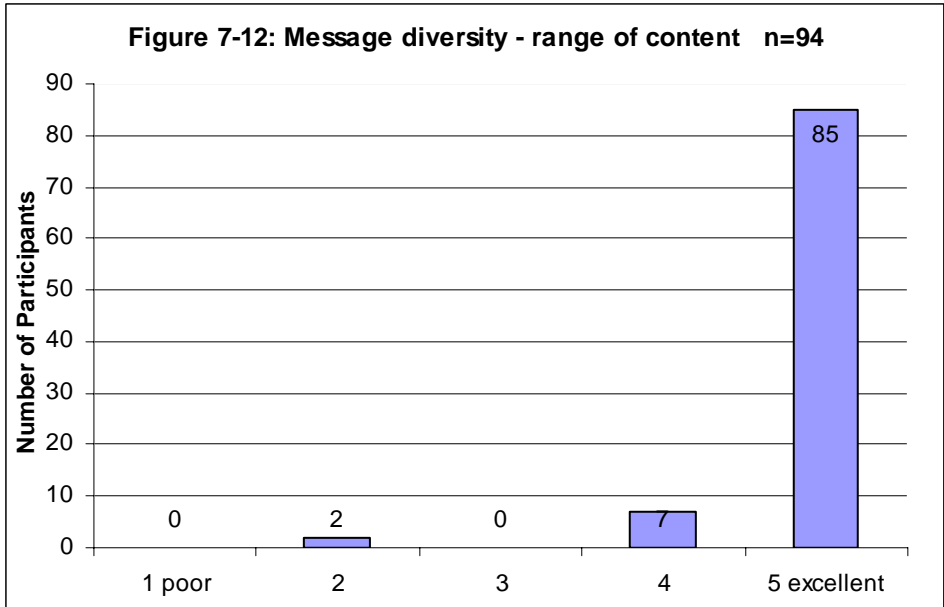
Note: ^a was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly), To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest; ^b indicates summed scores from the six benefits; * Spearman rank correlation is significant at the 0.05 level (2-tailed). ** Spearman rank correlation is significant at the 0.01 level (2-tailed).

Proposition 4c – Perceived message diversity and message contribution

Proposition 4c states that the higher the reported perceived diversity of messages available to the community, the higher the reported number of message contributions.

Survey question B9 asks respondents to rate overall the message diversity in terms of the range of topics contributed and the depth of topics available in the community on a five-item interval scale of (1=Poor to 5=Excellent).

Table 7-11 presents the association between perceived message diversity and posting of questions to the community. The variables, “posting questions and replying to questions” were originally coded on a 5-point ordinal scale and “range and dept of content” and was originally measured on a five-point ordinal scale in the survey instrument. The variables posting and replying to questions were originally coded on a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest. The variable, range and depth of message content, used the mean values of two variables (range of content and depth of content ranged from 1 = poor to 5 = excellent).



The relationship between perceived message content diversity (range and depth of content) available to the community and reported number of message contributions (replying to questions) is significant at a .01 level (.342 correlation). The proposition is supported.

Table 7-11: Relationship between perceived message content diversity and participation

IBM-based communities		Posting questions	Replying to questions	Range and depth of content
Posting questions ^a	Spearman Correlation	1.000	.258(*)	.342(**)
	Sig. (2-tailed)	.	.014	.001
	N	90	90	89
Replying to questions ^a	Spearman Correlation		1.000	-.131
	Sig. (2-tailed)		.	.22
	N		90	89
Range and depth of content ^b	Spearman Correlation			1.000
	Sig. (2-tailed)			.
	N			95

Note: ^a was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly), To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest; ^b used the mean values of two variables (range of content and depth of content ranged from 1 = poor to 5 = excellent); ** Spearman rank correlation is significant at the 0.01 level (2-tailed).

Proposition 4d: Perceived quality of discussion and participation

Proposition 4d states that the higher perceived quality of the messages available to the community, the higher the reported number of message contributions.

Survey questions B9 asked respondents to rate the quality of messages contributed to the community on a five-point interval scale (1=poor to 5=excellent).

The variable, quality rating of discussion was reverse coded (1 = never and 5 = always). The variables, posting and replying to questions, were originally coded on a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest.

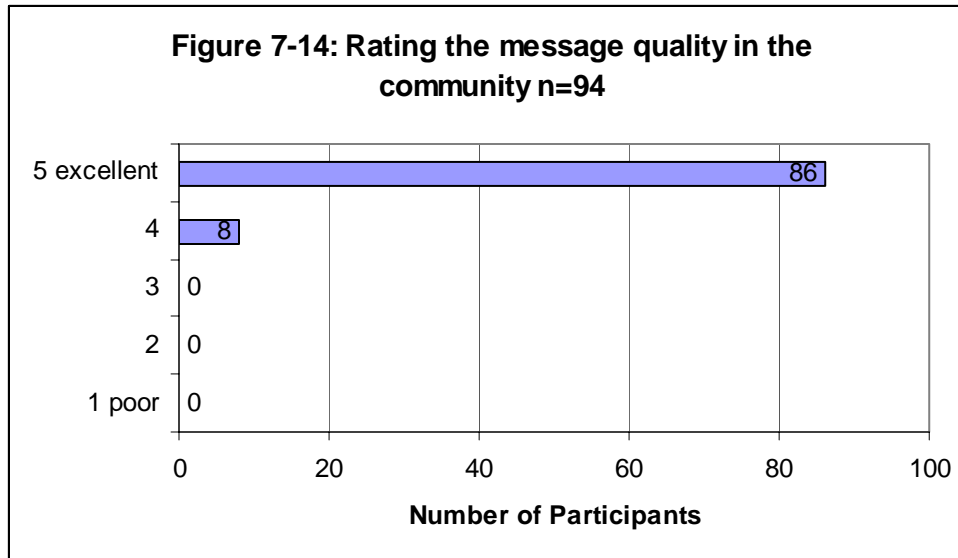


Table 7-12 presents the association between reported perceived quality of message discussion in the community and message contribution (posting questions and replying to questions). The relationship between higher perceived quality of messages available to the community and higher reported number of message contributions is significant at a .01 level (correlation .382). The proposition is supported.

Table 7-12: Relationship between quality rating of discussion and message contribution

IBM-based communities		Quality rating of discussion	Posting questions	Replying to questions
Quality rating of discussion ^a	Spearman Correlation	1.000	.382(**)	-.120
	Sig. (2-tailed)	.	.000	.262
	N	95	89	89
Posting questions ^b	Spearman Correlation		1.000	.258(*)
	Sig. (2-tailed)		.	.014
	N		90	90
Replying to questions ^b	Spearman Correlation			1.000
	Sig. (2-tailed)			.
	N			90

Note: ^a was reverse coded (1 = Never and 5 = always); ^b was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly), To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest; ** Spearman rank correlation is significant at the 0.01 level (2-tailed). *Spearman rank correlation is significant at the 0.05 level (2-tailed).

Proposition 5 - Community size, benefits and message contribution

Proposition 5 states that message contribution rates are positively associated with size of community.

The relationship is significant at a .10 marginal level (correlation -.420) for size of community and message contribution however not in the direction expected. There is a negative correlation between size of community (average number of members in each community) and average message contributions. As unexpected, this study found that as the community grows, the average number of contributions per member declined.

Table 7-13: Relationship between average message contributions and size of community

IBM-based communities		Average Number of Members in Each Community	Average Message Contributions
Average Number of Members in Each Community (Size of Community)	Pearson Correlation	1.000	-.420
	Sig. (2-tailed)	.	.099
	N	95	95
Average Message Contributions	Pearson Correlation		1.000
	Sig. (2-tailed)		.
	N		95

Note: In this result, Pearson correlation analysis applied because two variables were measured by mean values of each item.

In the following section, the tests of propositions for the Xerox Eureka community will be presented using the Spearman rank correlation coefficient test in a similar format as presented above for the IBM-based community.

7.2.2 Xerox Eureka Community

Proposition 1 states that a member's expectation of purpose for joining a community is associated with participation (authoring Tips).

The variable, sum of expectations, refers to expectation to offer expertise, to access expertise, to find solutions to problems, to follow standard work processes and to find emphatic support.

The variable, authoring Tips, was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, this variable was transformed into ranks, ranking all scores from lowest to highest. The variable, sum of expectations, is measured by the summed scores from the six expectations.

The relationship between members' expectation of purpose for joining a community and members' participation (authoring Tips) is significant at a .05 level of significance (correlation .142). The proposition is supported.

Table 7-15: Relationship between membership expectations and participation (authoring Tips)

EUREKA-based communities		Authoring Tips	Sum of expectations
Authoring Tips ^a	Spearman Correlation	1.000	.142(*)
	Sig. (2-tailed)	.	.042
	N	211	205
Sum of expectations ^b	Spearman Correlation		1.000
	Sig. (2-tailed)		.
	N		284

Note: ^a was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly); ^b indicates summed scores from six expectations; * Spearman rank correlation is significant at the 0.05 level (2-tailed).

Proposition 2 states that members’ rating of relevance of community discussion topics to member’s work interests is linked to participation (authoring Tips).

The variable, authoring Tips, was originally measured on a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest. The variable, relatedness of Eureka content to work interests, is measured on a scale of from 1 = unrelated to 5 = much related. The variable, rating of Eureka content by relevance, was reverse coded (1 = poor and 5 = excellent).

The relationship between members’ rating of the relevance of community discussion topics to work interests and participation in the community is significant at a .01 level, correlation .221. The proposition is supported.

Table 7-16: Relationship between message relatedness to work domain and authoring Tips

EUREKA-based communities		Authoring Tips	Relatedness of Eureka contents to work interests	Rating of Eureka contents by relevance
Authoring Tips ^a	Spearman Correlation Sig. (2-tailed) N	1.000 . 211	.175(*) .011 211	.221(**) .002 204
Relatedness of Eureka content to work interests ^b	Spearman Correlation Sig. (2-tailed) N		1.000 . 253	.321(**) .000 245
Rating of Eureka content by relevance ^c	Spearman Correlation Sig. (2-tailed) N			1.000 . 280

Note: ^a was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly), To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest; ^b scales ranged from 1 = unrelated to 5=much related; ^c was reversely coded (1 = poor and 5 = excellent); * Spearman rank correlation is significant at the 0.05 level (2-tailed); ** Spearman rank correlation is significant at the 0.01 level (2-tailed).

Proposition 3 states that member’s rating of job utility of information found in the Eureka community is positively associated with participation (authoring Tips).

The variable, authoring Tips, was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, this variable was transformed into ranks, ranking all scores from lowest to highest. The variable, utility of Eureka contents, was reverse coded (1 = never and 5 = always).

The relationship between members’ rating of job utility of information found in the Eureka community and participation (authoring Tips) is significant at a .05 level, (correlation -.142) but *in the opposite direction than proposed*. The greater the utility rating of Eureka contents to job interests, the fewer messages (authoring Tips) contributed. The proposition was not supported.

Table 7-17: Relationship between job utility of Eureka contents and authoring Tips

EUREKA-based communities		Authoring Tips	Utility of Eureka contents
Authoring Tips ^a	Spearman Correlation	1.000	-.142(*)
	Sig. (2-tailed)	.	.042
	N	211	205
Utility of Eureka contents ^b	Spearman Correlation		1.000
	Sig. (2-tailed)		.
	N		284

Note: ^a was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly); ^b was reversely coded (1 = never and 5 = always). * Spearman rank correlation is significant at the 0.05 level (2-tailed) .

Proposition 4a states that lower the ease of authoring Tips (costs of time, effort, attention), the higher the reported frequency of authoring Tips.

The relationship between ease of authoring messages (Tips) and reports of higher frequency of message contributions is significant at a .01 level (.629 correlation). The proposition is supported.

The variable, authoring Tips, was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, this variable was transformed into ranks, ranking all scores from lowest to highest.

Table 7-18: Relationship between perceived ease of contributing and participation

EUREKA-based communities		Authoring Tips	Perceived ease of contributing Tips
Authoring Tips ^a	Spearman Correlation	1.000	.629(**)
	Sig. (2-tailed)	.	.000
	N	211	203
Perceived ease of contributing Tips	Spearman Correlation		1.000
	Sig. (2-tailed)		.
	N		237

Note: ^a was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly); ** Spearman rank correlation is significant at the 0.01 level (2-tailed).

Proposition 4b states that the larger the reported degree of benefits obtained from participation, the higher the reported level of message contribution (authoring Tips).

The variable, authoring Tips, was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, this variable was transformed into ranks, ranking all scores from lowest to highest. The variable, frequency of benefits reported, is measured by the summed scores from the six benefits.

The relationship between the larger reported degree of benefits obtained from participation and higher the reported level of authoring Tips contribution is significant at a .01 level, (.409 correlation). The proposition is supported.

Table 7-19: Relationship between benefits and authoring Tips

EUREKA-based communities		Authoring Tips	Frequency of benefit reported
Authoring Tips ^a	Spearman Correlation	1.000	.409(**)
	Sig. (2-tailed)	.	.000
	N	211	211
Frequency of benefit reported ^b	Spearman Correlation		1.000
	Sig. (2-tailed)		.
	N		336

Note: ^a was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly); ^b indicates summed scores from six benefits; ** Spearman rank correlation is significant at the 0.01 level (2-tailed).

Proposition 4c states that the higher the perceived diversity of messages (Tips) contributed to the Eureka community, the higher the reported frequency of authoring Tips.

The variable, authoring Tips, was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, this variable was transformed into ranks, ranking all scores from lowest to highest. The variable, perceived diversity of messages, is measured by the mean values of two variables (range of content and depth of content ranged from 1 = poor to 5 = excellent).

The relationship between members’ perceived diversity of messages (Tips) contributed to the Eureka community and higher reported frequency of authoring (Tips) is significant at a .05 level (correlation .218). The proposition is supported.

Table 7-20: Relationship between perceived message diversity and authoring Tips

EUREKA-based communities		Authoring Tips	Perceived diversity of messages
Authoring Tips ^a	Spearman Correlation	1.000	.218(*)
	Sig. (2-tailed)	.	.002
	N	211	201
Perceived diversity of messages ^b	Spearman Correlation		1.000
	Sig. (2-tailed)		.
	N		276

Note: ^a was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly); ^b indicates mean values of two variables (range of content and depth of content ranged from 1 = poor to 5 = excellent); * Spearman rank correlation is significant at the 0.05 level (2-tailed).

Proposition 4d states that the higher the reported perceived quality rating of Eureka message content posted to the community, the higher the reported number of message contributions (Tips).

The variable, rating of Eureka content quality was reverse coded (1 = poor and 5 = excellent). The variable, authoring Tips, was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly). To apply a rank-order test, these two variables were transformed into ranks, ranking all scores from lowest to highest.

The relationship between members' rating of higher perceived quality of Eureka contents and higher reported number of Tip (message) contributions is marginally significant at a .055 level (correlation .135). The proposition is supported.

Table 7-21: Relationship between rating of Eureka content quality and participation

EUREKA-based communities		Rating of Eureka content quality	Authoring Tips	Giving author feedback	Validator feedback
Rating of Eureka content quality ^a	Spearman Correlation	1.000	.135	0.016	.006
	Sig. (2-tailed)	.	.055	.820	.935
	N	280	204	200	184
Authoring Tips ^b	Spearman Correlation		1.000	.418(**)	.252(**)
	Sig. (2-tailed)		.	.000	.000
	N		211	198	188
Giving author feedback ^b	Spearman Correlation			1.000	.466(**)
	Sig. (2-tailed)			.	.000
	N			207	191
Validator feedback ^b	Spearman Correlation				1.000
	Sig. (2-tailed)				.
	N				191

Note: ^a was reverse coded (1 = poor and 5 = excellent); ^b was originally coded as a 5-point ordinal scale (1=never, 2=monthly, 3=weekly, 4=daily, and 5=hourly); ** Spearman rank correlation is significant at the 0.01 level (2-tailed).

Proposition 5 - Community size and contribution

This proposition could not be tested on the single Eureka community

Chapter 8

CONCLUSION AND IMPLICATIONS

This research study has revealed several aspects of the two case studies of communities of practice which have implications for management practice in supporting these means for knowledge management, such as membership stability and patterns of participation. This final chapter begins with a brief review of community demographics from Chapter 04 and a brief review of the utility theory and the critical mass theory of public goods in the context of participation in online communities. This review is followed by a two-part discussion of the implications of the survey results and subsequent analysis: a) the testing of the public goods theories, b) membership stability and patterns of participation.

This discussion section is followed by an examination of the results of both case studies from an applied perspective - the achievement of successful communities of practice in a corporate context and a discussion of some policy issues related to community access, work design and to member's education and training. Finally, limitations of the research and future directions of research are discussed and some conclusions are drawn from the research study.

8.1 Community Demographics

Information presented in this section on community demographics is repeated from Chapter 4 of the thesis and included here for convenience of the reader in comparing the two case study contexts. IBM-based survey respondents were employed in the IT industry on a global basis. These public communities were *open not only to employees of IBM but for public membership* from any interested software professionals working with IBM software technology worldwide.

Respondents were not asked to identify their place of employment however many IBM employees could be identified from email headers and comments submitted to the community discussion. An exact number of employees of IBM Corporation would be speculative as not all IBM employees self-identified when posting messages. About

seventy-two percent (71.9%) of the IBM-based survey respondents were male and twenty-eight percent (28.1%) were female. The majority of respondents were middle aged: sixty-two percent (62.5%) reported ages between 50-64 years, about nineteen percent (18.8%) were over age 65 and close to seventeen percent (16.7%) were between 30-49 years of age. Members of the IBM-based community are college educated with almost seventy-eight percent (77.9%) reporting a college degree or higher level of education. Community membership is international with fifty percent (50%) reported from Europe, thirty-four percent (34%) from North America, eleven percent (11%) from Asia and five percent (5%) from other locations. Further details by country are included in Table 3d (Appendix A). IBM-based community members have reported joining many communities. Almost half of the IBM respondents (47%) reported joining between 6-10 communities and about twenty percent (20%) of respondents have joined 1-5 communities and 11-15 communities. The number of community memberships reported is as follows: 1-5 communities (20%), 6-10 communities (47%), 11-15 communities (21%) and 16-20+ communities (5%).

Eureka survey respondents were members of a private network and *employed as field service engineers on a global basis by Xerox*. Community membership was private and restricted to service engineers who had access to the Xerox global service network (GSN). Over ninety-five percent (95.4%) of the Eureka survey respondents were male (see Table 3a). The high percentage of males in the Eureka survey is representative of the occupational category within the firm. Field service engineers are primarily males although this is changing albeit primarily in some urban centres.

The age distribution for Eureka members is skewed to over 30 years of age with fifty-nine percent (59%) of survey respondents between 30-49 years of age and thirty-five percent (35%) over fifty years of age. Company pension and retirement policies at Xerox may explain why so few respondents were in the over 65 year old age category in full-time employment during the survey period.

Educational data from the Eureka community was not collected on the survey in

compliance with a Xerox privacy policy about collecting employee information. Xerox has hiring guidelines for field technical representatives and typically requires a high school diploma followed by a two or three year technical college diploma. Initial Xerox technical product training for customer service engineers (CSEs) can extend to over one year period depending on product categories and regular update training is undertaken on a continuous basis. In this sense, field service engineers would perhaps have the equivalent of a three-year or four-year college diploma. Survey responses were received from Eureka participants in 24 countries. Thirty-eight percent (38%) responded from the USA (122 respondents), eighteen percent (18%) from Canada (58 respondents), fourteen percent (14%) from the Netherlands (44 respondents) and six percent (6%) from Germany (19 respondents).

8.2 Review of utility theory and public goods-based theory

Utility theory emphasizes that participation in a community of practice is driven by the relative and objective benefits that members derive from their participation, or experience within a community. The number of members participating by contributing messages affects the utility value for the entire community. People will adopt a new technology when the ratio of benefits to personal cost or benefits to personal effort to communicate is favourable.

Public goods benefit all members of a community regardless of the costs born by certain individuals or groups to obtain or produce them. The nature of public goods hinges on two critical properties: (1) a public good is *nonrivalrous* in consumption, and (2) a public good is also *nonexcludable*. These two properties have significant implications for participation in communities of practice because the knowledge exchanged in an online discussion benefits all members of the community not only the intended receiver of the message. Its' value is not diminished by the number of community members who will read and benefit from the knowledge it contains. Member participation is critically important to success of communities of practice because it is message contribution behaviour that forms the foundation on which thriving and flourishing communities of

practice are built. A critical mass theory of public goods was chosen because it models this reciprocal interdependence among members of communities of practice for community message content.

8.3 Research limitations

The case study research design methodology has inherent limitations that are also evident in this study. To begin, this case study is an empirical inquiry that investigated two contemporary communities of practice within live, field conditions and the boundary between the phenomenon and context are not always clearly evident. The case study method was used to uncover contextual conditions in the belief that these might be highly pertinent to the phenomenon of public participation in communities of practice. As a design method, the case study relies on multiple sources of evidence with data converging in a triangulated fashion.

Theoretical propositions were developed from two sources. Both case studies benefited from the prior development of theoretical propositions from public goods/critical mass and utility theory to guide the survey data collection and the data analysis. As Yin (2003) points out, “for case studies, theory development as part of the design phase is essential, whether the ensuing case study’s purpose is to develop or test a theory” (Yin, 2003, p.28). The initial goal was to have a sufficient blueprint for the study of participation in communities of practice and this required theoretical propositions, as noted by Eisenhardt (1989) that frame a “hypothetical story about why acts, events, structure and thoughts occur”. From this viewpoint, case study research design also offers strong guidance in determining what data to collect and the strategies for analyzing the data.

The IBM-based communities and the Xerox Eureka community are regarded highly in industry circles as longstanding and successful communities of practice. However, the two cases studied in this research were selected not necessarily as “representative sampling units” such as one would do if the purpose were to make an inference about a population or universe on the basis of empirical data collected about a sample. My

primary purpose was not to make a “statistical generalization” of results but to make an “analytic generalization” of the results of the data analysis. An analytic generalization uses a previously developed theory as a template with which to compare the empirical results of the case study and if the two cases, IBM and Xerox Eureka communities, are shown to support the same theory, replication may be claimed.

Four tests have been commonly used to establish the quality of empirical social research. These tests are relevant to a case research method and the four tests are: construct validity, internal validity, external validity and reliability. Each test will be discussed separately.

Construct validity is especially problematic in case study research. While acknowledging this as a limitation of the design method, multiple sources of evidence and documentation of the chain of evidence in data collection procedures were presented as a means to strengthen the design limitation. *Internal validity* is a concern for causal or explanatory case studies in which a researcher is trying to determine if the event x lead to event y . The same logic is inapplicable to descriptive and exploratory studies that are not concerned with making causal claims. The broader problem involves making correct inferences and ruling out rival explanations and other possibilities. Basically, an inference is made every time an event cannot be directly observed unlike in a laboratory where conditions are controlled for in the experimental design. As questioned by Zin (2003), is the evidence convergent? Does it appear to be airtight? The specific tactics for achieving this result are difficult to identify in doing case studies and remains a limitation of the study. A test of *external validity* deals with knowing whether a study’s findings can be generalized beyond the immediate case study and the external validity problem remains a major barrier to doing case studies.

Typically, critics state that single case studies offer a poor basis from which to generalize to larger populations and in doing so implicitly contrast the situation to survey research in which a sample, if selected correctly, readily generalized to a larger universe. As emphasized by Zin, “*this analogy to samples and universes is incorrect when dealing*

with case studies. Survey research relies on *statistical generalization*, whereas case studies as with experiments rely on *analytical generalization*. (Zin, 2003, p.39). My objective in making analytical generalizations from this study is to generalize a particular set of results to indicate a useful application of public goods and utility theory. The goal of *reliability* in a research design is to minimize errors and biases and to be sure that if a later investigator followed the same procedures as employed in this case study by doing the same case study, s/he should arrive at the same findings and conclusions. The procedures of this study were well documented and would enable a subsequent researcher to repeat the same study if need be.

The limitations of a judgment selection sample of communities only allows for generalization to sponsored communities with similar characteristics: private corporate communities with proprietary message content in technical, field service operations and public communities supported by corporate organizations with public message content about software technology. These communities would have been in existence for at least 18 months, have message archives and between 11 and 1297 active contributors as in the sample communities.

The data analyzed in the two case studies employed here is based largely on recollections and assessments by community members and reported on the survey. Therefore, a common method bias cannot be ruled out. Interviews of participants would have added another source of data for comparison purposes however gaining access over private networks and reaching a representative sample of the global community precluded this undertaking. However, it can be reasonably assumed that community participants as members of their overall primary work organizations are sufficiently able to provide an assessment of the benefits of their community participation on the performance of respective work tasks at their primary work organization with a limited bias.

The conclusions of the study are limited to the members who responded to the survey questionnaire; presumably more active and committed ones would have made the effort of completing the survey. We have no direct way of generalizing data to other possibly

less motivated community participants. In a research study into lurking on email-based discussion lists, Nonnecke (2000) notes a bias that more posters than lurkers do respond to questionnaires. We also note here the limitations with respect to survey response rates at IBM-based community of 6.2% and at the Xerox Eureka community of 26% as discussed above in Sections 4.22 and 4.23.

8.4 Testing the accuracy of predictive relationships of public goods-based theories and utility theories

This section will discuss the accuracy of predictive relationships amongst responses relative to actual data to indicate how valid or useful the theory of public goods and utility theory may be as a framework for understanding behaviour in these online communities.

8.4.1 IBM-based community – results aligned with the predictions of the theory

Results support utility theory and aspects of public goods-based theory/critical mass theory. The supporting results for critical mass theory are the following: a) there was a significant positive relation between the sum of benefits reported by participants and posting questions; b) there was a significant positive relation between the reported diversity of messages contributed and posting questions; c) there was a significant positive relation between the perceived quality of public message contributions and posting questions, (d) there was a significant positive relationship between the relevance of discussion topics to job interests and posting questions.

Supporting results for utility theory are as follows: a) there was a significant positive relation between member reports of *initial expectation of purpose* for joining the community and public participation. Specifically, there was a significant positive relation between reports of being attracted to the community to offer expertise and posting questions; there was a significant positive relation between reports of being attracted to the community to access expertise, for general knowledge, for something to do, to enjoy myself and posting questions. There was also a significant positive relation between

member's reports of posting questions and member's reports of replying to questions; b) there was a significant positive relation between member's reports of relevance of the community discussion to work interests *after joining* the community and public participation. Specifically, there was a significant positive relation between member's reports of relevance of the community discussion to work interests and replying to questions, c) there was a significant relationship between member's ease of access to participate (time, effort, and attention) in the community and posting questions. There was a significant relationship between reports of lower ease of access costs of participation (time effort attention) and reports of higher rates of public message contribution (replying to questions).

8.4.2 IBM-based community -results not aligned with the predictions of the theory

There was a significant relation between member's reports about the relevance of discussion topics to job interests and member's reports of replying to questions but not in the expected direction of the data. There was a negative correlation between reports of highly relevant discussion topics to job interests the frequency of posting replies to questions. Stated alternatively, members who found more relevant work related information in the community discussion may have less need to post further questions to obtain solutions to work place questions

Discussion: This may be due, perhaps, to heterogeneity in the level of knowledge available to the community. A participant may have contributed an adequate answer to the question posted. It answered a participant's specific need therefore there is no further reason or requirement to reply (other than to be courteous). There may also have been a high response rate from members with expert knowledge on the question thereby obviating the need of other participants to post response messages. It may become a situation whereby an adequate or satisfactory answer to a question was contributed and members need no further support from the community so participants move on to the next task and or question. It is also possible that some members do not reply to messages due to lack of appropriate knowledge of the specific topic.

There was no significant relationship between reports of the job utility of information posted to the community and reports of posting and replying to questions.

Discussion: If knowledge resources contributed to a community have high applicability and utility to solve member's work questions and immediate problems, it is reasonable to postulate that members are readily finding answers to their questions in the community. If so, there may be no further need for members to post more questions on the topic. In a community where there are a high number of knowledge experts that contribute quality answers to questions, it only requires one reply message from a knowledge expert to produce an adequate solution to the question. Many members will read an adequate solution to the question from the expert contributor thereby obviating any further need to post further questions or replies on the topic. As described earlier, community members are task oriented and have an urgent need to diagnose and repair a problem in a timely manner. It seems reasonable that message readers will assess an answer as being either adequate or inadequate to solve the question at hand and give it a try out. If the answer to the question is adequate, members can solve their immediate task and move on to other pressing work tasks in a timely manner.

There may also be categories of questions that are more complex and more difficult to answer in a single question and response. There may be several iterations of questions and responses on a topic until an acceptable answer or solution is posted. If an acceptable answer is provided from the discussion, it also seems reasonable that members will attempt to solve their work task with the solution provided from the sequence of questions and answers.

There was a marginally significant relationship between the size of the community and public message contribution but a negative correlation between size of the community and number of messages contributed.

Discussion: As the membership in the community grows, the average number of messages contributed per member declined. Larger communities have the potential for more members to contribute messages and the message contributions per member decline

in larger communities. Unlike the limited potential to contribute in smaller communities, there are more members to potentially share the time and effort of contributing messages to the community discussion and there is only so much information members can deal with before information overload occurs. Also, within larger communities there may be more opportunity to “socially loaf” as a member.

Table 8-1: Theoretical perspectives and application to IBM-based community Table

<u>Theory of public goods</u>	<u>Results for IBM-based community</u>
<p>Public messages contributed benefit all participants. Participants who make an effort and respond to requests for information from the community may not have their efforts reciprocated by enough people to make their continued efforts and public participation worthwhile. Without an adequate supply of beneficial, public, message contributions, community membership will likely drop off and end. Message production and consumption is critical to the usefulness and sustainability of the community for those participants who ask and/or respond to requests for help and information.</p>	<p>There is a significant relationship between members’ initial expectation of purpose of community membership (to offer expertise) and posting questions.</p> <p>There is a significant relationship between members’ initial expectation of purpose of community membership (to access expertise) and posting questions.</p> <p>There is a significant relationship between members’ initial expectation of purpose of community membership (to access expertise, to access expertise, general knowledge, something to do and to enjoy oneself) and posting questions.</p> <p>There is a significant relationship between members’ initial expectation/purpose (to read stories/messages) and replying to questions.</p> <p>There is a significant relationship between members’ initial expectation of purpose of community membership (to offer expertise, to access expertise, to build professional relationships and general knowledge) and public posts (posting and replying to questions).</p>

<p style="text-align: center;"><u>Critical mass</u></p> <p>Critical mass becomes an important factor in joining and remaining in a community of practice because interactive communities require active participants to achieve scale of message production and sufficient range and depth of message content to appeal to community members. That is, the more members who participate, the more potential to produce beneficial communication content that will be of interest to new and sustaining members.</p>	<p style="text-align: center;"><u>Results for IBM-based community</u></p> <p>The content diversity of messages contributed to the community is positively associated with replying to questions.</p> <p>Size of community is marginally significant but not in direction proposed.</p>
<p><u>Utility theory</u></p> <p>Utility theory is based on a rational-economic perspective of behaviour. It describes decision outcomes (information search, decisions to join or stay, and economic behavioural decisions) in terms of utility or value placed on them by individuals. Decisions can be understood in terms of rationally ordered levels of utility attached to different outcomes. Utility theory emphasizes that participation in a community of practice is driven by the relative and objective benefits that members derive from their participation, or experience within a community.</p>	<p style="text-align: center;"><u>Results for IBM-based community</u></p> <p>There is a significant relationship between the rating of relevance of community discussion to work interests <i>after joining the community</i> and replying to questions.</p> <p>There is a significant relationship between ease of access costs to participate and posting questions.</p> <p>There is a significant relationship between the sum of all benefits obtained from membership and posting questions.</p> <p>There is a significant relationship between the perceived quality of messages contributed and posting questions.</p> <p>There was a significant relationship between reports of lower ease of access costs of participation (time effort attention) and reports of higher rates of public message contribution (replying to questions).</p>

8.4.3 Eureka community – results aligned with the theory

Results were aligned with utility theory and with some aspects of public goods-based theory/critical mass theory. The results aligned with utility theory are presented first and followed by results aligned with public goods-based theory.

Results aligned with utility theory are as follows: a) there is a significant positive relation between member's reported level of expectation of purpose for joining Eureka and participation (authoring messages -Tips); b) there was a significant positive relation between members reports of the *relevance* of Eureka discussion topics to work interests and frequency of participation (authoring messages -Tips); c) there was a significant positive relation between members reports of the *relatedness of Eureka contents* to work interests and frequency of authoring messages (Tips); d) there was a significant positive relation between the perceived ease of contributing messages (costs of time, effort and attention to author Tips) and the frequency of authoring messages (Tips).

8.4.4 Eureka community – results not aligned with predictions of the theory

Results not aligned with utility theory are as follows: a) there was a significant negative relation between member's reports about the job utility of information in Eureka and reports of authoring messages (Tips).

Supporting results for some aspects of public goods-based theory are as follows: a) there was a significant positive relation between reports of benefits obtained from participation and reports of contributing messages (Tips); there was a significant positive relation between the perceived diversity of messages and the frequency of authoring messages (Tips).

There was a marginally significant (.055) relationship between the perceived quality of Eureka message contents and the frequency of contributing messages (Tips).

Discussion: The unique role of the Validator in the Eureka community may explain this marginally significant result. Messages (Tips) are assigned to field product service

specialists for validation before being posted to the Eureka community as validated messages (Tips). In other words, the quality assurance function occurs during the validation process prior to messages (Tips) being released in public to the Eureka community thereby assuring that the quality of messages (Tips) would be homogeneous.

Table 8-2: Theoretical perspectives and application to Xerox Eureka community

<p style="text-align: center;"><u>Theory of public goods</u></p> <p>Public messages contributed benefit all participants. Participants who make an effort and respond to requests for information from the community may not have their efforts reciprocated by enough people to make their continued efforts and public participation worthwhile. Without an adequate supply of beneficial, public, message contributions, community membership will likely drop off and end. Message production and consumption is critical to the usefulness and sustainability of the community for those participants who ask and/or respond to requests for help and information.</p>	<p style="text-align: center;"><u>Results for Eureka</u></p> <p>Initial expectation of purpose of community membership is positively related to authoring Tips.</p>
<p style="text-align: center;"><u>Critical mass</u></p> <p>Critical mass becomes an important factor in joining and remaining in a community of practice because interactive communities require active participants to achieve scale of message production and sufficient range and depth of message content to appeal to community members. That is, the more members who participate, the more potential to produce beneficial communication content that will be of interest to new and sustaining members.</p>	<p style="text-align: center;"><u>Results for Eureka</u></p> <p>The content diversity of messages contributed to the community is positively associated with authoring Tips.</p> <p>The relatedness of all Eureka contents to work interests is positively associated with authoring Tips.</p> <p>The quality of Eureka contents and authoring Tips is marginally significant.</p>

<u>Utility theory</u>	<u>Results for Eureka</u>
<p>Utility theory is based on a rational-economic perspective of behaviour. It describes decision outcomes (information search, decisions to join or stay, and economic behavioural decisions) in terms of utility or value placed on them by individuals. Decisions can be understood in terms of rationally ordered levels of utility attached to different outcomes. Utility theory emphasizes that participation in a community of practice is driven by the relative and objective benefits that members derive from their participation, or experience within a community.</p>	<p>Relevance of community discussion to work interests after joining the community is positively associated with authoring Tips.</p> <p>The job utility of information found in the Eureka community is negatively associated with public message contribution (posting and replying to questions). It is significant at a .05 level but <i>in the opposite direction than proposed</i>. The greater the utility of Eureka contents to job interests, the fewer messages contributed.</p> <p>Lower ease of access (costs of time, effort and attention) of message contribution is positively associated with authoring Tips.</p> <p>The larger the reported degree of benefits obtained from participation, the higher the reported level of Tips contribution.</p> <p>The higher the reported perceived quality of messages posted is positively associated with message contributions (Authoring Tips).</p> <p>The content diversity of messages contributed to the community is positively associated with authoring Tips.</p>

8.5 Modes of participation in the communities

We turn now to an examination of other aspects of these online communities as suggested by the survey data, such as patterns of public and non-public participation.

8.5.1 Participation in the IBM-based community

The data reports suggest that three ‘modes of use’, browsing and reading mode, posting questions mode and social networking mode coexisted or alternated in member’s responses to survey questions. But the most frequently reported way of participating, for

those survey respondents, was the browsing and reading mode whereby members reported searching for information about a topic or to solve a problem at hand.

- **Browsing and reading**

Weekly participation, largely by browsing and reading, was reported by ninety-three percent (93%) of the survey respondents. The report suggests that browsing and reading is the principal mode of participation for the majority of members who participated in the survey.

- **Posting questions**

Responding daily to questions was reported by sixty-nine percent (69%) of survey respondents and posting questions daily was reported by sixty-four percent (64%) of survey respondents. Both reports suggest that posting and replying to questions is the principle mode of public participation.

- **Non-public participation mode**

Participants reported very high levels of communication activity *outside* the community. Eighty-five percent (85%) of respondents reported follow-up contact with participant's offline by email (see Figure 5-10). Forty-two percent (42%) of participants reported daily contact by email and twenty-eight percent (28%) reported weekly contact by email *outside* the community (see Figure 5-57). These reports suggest that server statistics capture only a portion of the participation activity within the community.

- **Social networking**

IBM survey respondents reported using access to the community to network (93%), to meet new people (92%) and to keep up personal contact (78%).

8.5.2 Participation in the Eureka community

There were at least three modes of public and non-public participation in the Eureka community: searching for information, following standard work processes and reading the message flow. In general, this suggests that most members do not participate in public by authoring Tips.

- **Searching for information**

The data reports suggest that most Eureka members participate in the community with three objectives in mind: to access technical information, to update and refresh their high level of technical knowledge, and to keep updated in company sanctioned field work practices. Some respondents explicitly describe Eureka as a database and see themselves as “accessing and extracting information”. As one member related, “You’re always up to date with the latest issues, if you back up BUS on a regular basis.” These members function within the community largely as recipients of messages and seldom author Tips. If they contribute Tips, the message content is work related and written in standard protocol: problem, cause and solution. (Note: the term BUS refers to a daily or frequent download of posted information to the community onto one’s laptop PC in a folder called BUS that refers to technical Business updates.)

- **Following standard work processes**

Most Eureka member’s reports suggest that their involvement and participation in the community is seamlessly integrated into prescribed work practices. Many access the community as the first source of information and working knowledge about current work practice in order to diagnose a machine problem remotely and to determine if parts may be required on a field service call.

- **Reading the message flow**

Reports suggest that people access the message discussion to “listen into” the persistent message exchange expecting to find some practical ideas for use in their work. Most of the survey respondents also “listen” to the evolving message exchange by reading (75%). In comparison, some survey respondents describe their participation as “authoring Tips” (31%) and “validating Tips” (10%). Reports also suggest that a large number of survey respondents (28%) approach the community as an interactive medium in which they can express their views and give feedback to other participants.

- **Non-public participation mode**

Eureka participants reported how they made contact with community members, from inside the community and from outside the community. Twenty-nine percent (29%) of participants reported making contact *outside* the community and thirty-eight percent (38%) of participants reported making contact *inside* the community (see Figure 5-10).

This is one measure of non-public and public participation in the community. Another measure of non-public participation is the activity undertaken with community members after contact is made. Twenty-four percent (24%) of participants reported contacting members directly by email *outside* the community (see Figure 5-57). These reports suggest that much participation among community members is not measured on server message statistics.

There is an anomaly in participant's reports of message contributions for both communities. Participants reported much higher rates of public participation than indicated on the server logs of both communities. The Eureka community has about 20,000 members. Thirty-six percent (36%) of Eureka survey respondents reported authoring Tips on a monthly basis and thirty-five percent (35%) reported giving feedback to authors on a monthly basis. Eureka server logs recorded an average of 4 Tips per active member during the preceding 12-month period ending on November 2006. Within the IBM-based community, sixty-nine percent (69%) of survey respondents reported replying to questions on a weekly basis and sixty-four percent (64.4%) of survey respondents reported posting questions on a daily basis. An active member is one who contributed at least one message during a 12-month period (August 2005 – July 2006).

The reported type of reported participation is therefore not consistent with the data on the server message statistics. Of course, survey respondents may have been more committed members and not representative of the entire membership in the community. In fact, most members of both communities have never or seldom contributed messages. However, it does suggest that our survey respondents may be over-stating their participation rates. It may be that these members conceive the community as an interactive medium (effects of computer-mediated communication rhetoric) so they report what they potentially could use the community for or would like to use it for not actual use.

8.6 Applying the results toward more successful corporate communities of practice

What is meant by the phrase “successful corporate communities of practice”? At one level, we have the criteria derived from the view of communities as cooperative and

mutually supportive places wherein people feel safe to engage and interact with others. At another level, communities will have sustainable rates of joining/leaving, message reading and public message contribution.

Upon examination of the average length of membership and participant's plans to leave or to stay, we can see permanence and stability in both communities. The median length of membership in the IBM-based community is between 13-24 months of a five-year community lifespan. The median length of membership in the Eureka community is 61-96 months of a community lifespan of ten years. Members reported having a strong attachment to the community. Ninety-six percent (96%) of respondents are planning to remain in the IBM-based community and ninety-four percent (94%) of respondents are planning to remain in the Eureka community.

Yet at another level, criteria for successful communities can be derived from the participant's expectations about communities and manager's expectations from the sponsoring organization. Communities are increasingly seen as an instrument to foster and to enhance knowledge sharing and learning in organizations, both processes that are crucial to company success (Brown & Duguid, 1991; Leonard-Barton, 1995; Stahl, 2003, Ellis, et al, 2004, Rourke & Anderson (2004). Much of the research about online learning focuses on interactions occurring in asynchronous communities and many studies tend to be exploratory cases with counting and coding of participant messages serving as a primary method of analysis. However, as pointed out by Rourke and Anderson (2004), there is no clear epistemological stance taken as to what constitutes learning and knowledge construction, and how we might examine these processes in communities of practice.

An ongoing lack of attention to a coherent theoretical foundation; examining transcripts without attending to their situated contexts, and relying primarily on reductionist methods of content analysis currently limits our understanding of the potentiality and actuality of any learning and knowledge exchange in corporate communities of practice. Research studies have tended to focus on participation-related product measures (number of

message posts, type of messages) without clearly delineating or measuring indicators of learning and knowledge exchange that may be process-oriented as well as product-oriented. While public participation is critically important, it does not inherently result in learning. Quantity of participation is not the same as quality. Even quality may be broadly defined, since a good question may be just as important as an answer to the question posted. Stahl's (2003) social theory of computer supported collaborative learning (CSCL) outlines how individual knowing is in essence an interpretation of a meaning that was first made in discussion online with others. It is only through capturing all elements of the communication that we can fully understand the context in which individual utterances function in the context of an online community discussion. It is through analyzing the discussion in context that we can understand how knowledge is created in the community.

8.6.1 Conditions associated with high public message contribution

According to the findings of this study, the following conditions are associated with public participation in the sample of the members of the community that responded to the survey. Assuming these participants are the most committed, the most active (Nonnecke, 2003) and those who receive the most benefit, what can we learn about them that might guide us in helping more community participants to achieve this level of benefit and participation?

For participants perceiving themselves to be receiving a high number of benefits from the community, benefits were associated with participant's plans to stay or leave and with participant's involvement in the public message exchange.

- Respondents seem to conceive the community as a useful place to keep themselves updated; to help themselves by getting information and answers to work related questions; as a place to obtain a feeling of belonging to a wider, global community; as a place where they can express themselves and where they make wider contacts within the company and the industry. Benefits seem to function as incentives that

keep participants in the community and predispose them to participate in the public message exchange.

- The community has core group of regular public message contributors.

Successful communities have a core number of regular public message contributors. Perhaps regular communicators have a higher need or desire to communicate with others? Regular, public message contributors contribute to an increase in the sense of community among participants by reintroducing social dynamics in a medium that does not facilitate it: active public participants promote interactivity and encourage reciprocity in the public message exchange. Numerous public message contributions give the participant a “presence” in the community and other people can start perceiving some regularity in the style or content of the regular contributor’s messages. The particular perspective or form of his/her messages, together with other regular contributors’ “presences” can break a sense of uniformity and anonymity in the public message exchange. It can bring individuality and communality into the community and can stimulate discussion.

- Participants have strong feelings of attachment towards the community and value their membership in it.

Participants in both communities reported strong feelings of community membership and Eureka participants, in particular, expressed little ambivalence about the community. While IBM participants expressed much ambivalence about the community, it is largely about the time and effort needed for active public participation not ambivalence about the utility and benefits of participation.

- Participants derive more benefit from belonging to work-related communities than to social or recreational communities.

Many participants pointed to the content application of beneficial messages for work tasks in their decision to stay or leave the community. Benefits seem to be the force that

binds participants to the community and predisposes them to contribute to the public message exchange. Intentions to stay or leave are also influenced by benefits such as the relationship of the community message content to one's work domain and the relevance of public messages contributed to specific work tasks.

- There is an interaction quality within the community that plays a fundamental role in public sharing of knowledge.

Participant and organizational benefits are supported by an interaction characterized by interpersonal trust, cohesion between members and a good communication climate. Thus, the importance of human factors in knowledge sharing is strengthened in this study. In terms of level of interactive participation in the community, respondents reported participation that implies interaction (getting and providing information, exchanging ideas and work experience and a mix of these purposes). However, their purported participation is not consistent with the findings that most participants have never or seldom contribute messages (Tips).

- Most participants have a weak involvement in the public message contribution.

There is a dominance of searching for information mode together with coexistence of two other general purposes for being in the community: following the discussion mode and social networking mode (IBM-based communities only) and following standard work processes mode (Eureka community only).

8.7 Some policy issues

An assessment of non-public participation as a mode of participation is essential to evaluate its impact and value in communities of practice. In both case studies examined here, participants reported frequent contact and message flow to and from outside the community and unrecorded on company message servers. One of the implications of this study is the usefulness of understanding the relationships between non-public participation as an informal practice around the community and the formal organizational

structure for managers and community participants. The off-line relationships reported in both case studies were not planned for by managers however it may be possible for managers to examine what kind of information gets exchanged outside the community. As Wenger et al. (2002) points out; managers cannot treat knowledge effectively as if it were a physical asset; they can measure and manage the 'knowledge system' through which it flows and creates value. To examine the relationships between non-public participation as an informal practice and the formal organizational structure is tantamount to designing, maintaining, evaluating and managing the 'knowledge system'. In that sense, it could be possible for managers to conceptualize a knowledge community as a 'knowledge system' by taking the following actions:

- Find types and sources of information that is created more readily by informal practices than by formal practices;
- Conceptualize the community as a 'knowledge system' that includes this information exchange;
- Encourage and persuade current or future participants to expect and to know how to utilize the system;
- Be open to and get continuous feedback from the participants' message behaviour in order to be aware of any change in their information needs.

Members in both communities overwhelmingly reported a desire to make more frequent visits to the community and to spend more time during each visit during the workday. They also reported gaining much business value from participation on a frequent and regular basis.

Participation is reported to be instrumental to performing troublesome and non-routine job tasks. The IBM-based communities are open to public membership from various organizations around the world. In the Eureka community, participation is formally part of the job design and performance expectations of field service engineers. Participation in Eureka is an integral part of problem solving routines and standard work processes of the field service force of the corporation. The design, use and integration of the Eureka

community into standard work processes of other IT organizations like Xerox Corporation may become the standard in the future.

Eureka members reported a preference to spend more time in the community to search for information useful to diagnose equipment problems and to be prepared for field service calls (with the necessary software and or machine parts) before arrival on customer's premises. Presently, one measure of effectiveness of service operations management is service response time – the time period from a customer telephone call for service to arrival of a service engineer on customer's premises. A number of Eureka respondents indicated a preference to spend more time on problem diagnosis within the community before service dispatch to customers however the priority management measure is response time to customer's premises not total time required to complete the service call*¹.

The development of corporate communities of practice continues to grow as does the access to online communities by employees from within corporate organizations. Corporate managements within different industry sectors will need guidance in the planning and 'management' of communities of practice. This could include establishing training and support programs for community sponsors and moderators.

8.7.1 Member's education and training issues

Based on the respondent's survey reports, a need exists for the development of a business policy about training of community participants. Most members had been introduced to and learned about the community from colleagues and friends. Corporate information systems had played a limited role in member's finding and joining the communities. So the first issue for consideration is: should a peer training system be more formally developed? Or should corporate information systems take a more active role in the

¹ Personal communication to G. Mahar from Mr. M. Boucher at Xerox Corporation

promotion and diffusion of communities within various functional departments of the organization and in the design of the training of potential members of the community? What could be the advantages and disadvantages of peer training?

A second issue comes from the fact that most members actually participate in the community in the role of readers and browsers and therefore as recipients of broadcasted messages; they underutilize the interactive capabilities of the medium. Is it sufficient to only include in the training curriculum “how to knowledge” – information that Rogers (1983) describes as only necessary to use an innovation properly? What constitutes the “principles knowledge” – information dealing with the functioning principles underlying how the innovation works (Rogers, 1983) for communities of practice and what parts of it should be included in the training for the medium? These are at least two questions for education and training management to consider in a curriculum design for training new members.

Online communities are a highly dynamic innovation and one with high requirements in terms of knowledge and skills. The “how-to-knowledge” is based on complex competencies acquired previously: a) a functional level of computer literacy and b) skills in written communication. It seems likely that the “principles knowledge” involves an understanding of computer networks, or of email protocol but also an understanding of online group communication, and in the case of communities of practice, an understanding of the conventions and the discursive practices of the particular corporate functional areas involved in the community of practice. New members take months before feeling like members of the community and to “authorize” their voices, to make their voice valid in the community. On the other hand, members who are knowledgeable but are also aware of the communication discipline required and effort needed to be a good communicator in online communities may limit their participation as some respondents indicated.

Members of the IBM-based communities and the Eureka community enjoy dual memberships in their formal work organizations and in the semi-formal online

community of practice. In order to analyze the performance benefits of public community participation, one has to focus on the benefits realized on task performance within member's primary work organization. Through public participation, community members share knowledge and learn from others work experience. This new knowledge leads to several individual benefits as well as to an improved network position with regards to associates in their primary work organization. Membership in the community enables participants to process information from the online community into their primary work organization. Members act as technical gatekeepers. By passing information on to non-community members and by applying it when performing their primary work tasks, community members may positively influence organizational performance. From an information processing perspective, community related activities can be understood as a two stage process including information gathering in the online community as the first stage and information processing towards the primary work organization as the second stage.

Besides the benefits of participation for individual members of the community, a member's formal position in the primary work organization can be regarded as an enabler of possible community performance effects on the primary organizational level. Besides the prescribed roles of the workplace, there appears to be an emergent role arising from participation in the community. A number of comments, offered in text boxes by respondents on the survey of the Eureka community in particular, referred to the benefits derived from community participation that were discussed during team meetings with their colleagues and applied on the job within their work teams.

8.8 Future research

There are many directions for future work and the discussion begins with suggestions from the statistical explorations of the tests of hypotheses for each community. The discussion begins with the IBM-based community followed by the Eureka community.

Member's *initial* attraction and expectation of membership within the IBM- based community was to offer expertise and to post questions and to access expertise and to post questions. While posting questions is one form of public participation, the long-term viability a community depends on the membership both asking questions and replying to questions. Further research into the IBM-based community would seek to understand why the *initial attraction* of IBM- based community members was to participate only asking questions and not to participate by replying to questions. A tentative exploration would be to investigate the relationship between reported knowledge levels, length of work experience and time in the community until new members begin to ask questions and reply to questions.

The significant relationship between the relevance of the community discussion to work interests *after joining the community* and replying to questions may have implications for community developers who are interested in supporting message contributions from new members. Developing measures of relevance of the community discussion for each community would be one step along the way to understanding members' interests and their propensity to reply to questions.

The relationship between job utility of information and replying to questions is significant for community participation. Further investigation into how members evaluate the utility of information contributed to the community would be useful knowledge to community developers. An initial investigation would be to learn the criteria members use to evaluate the utility of information contributed.

Both the diversity of messages and the quality of messages were significant to replying to questions for the IBM-based members. Further investigation into ways of measuring message diversity and measuring message quality from a member's perspective would be a first step in recognizing and understanding the importance of these concepts to message contribution in the community.

The size of community was a significant to public message contribution but not in the direction proposed. The contribution per member decreased with size of community. Further research into the size of community and individual message contribution per member would investigate the trade off between size of community membership and participation rates per member. This might have implications for community developers as to the optimal size of a community and participation rates of members.

Further research following the *statistical explorations of the Xerox Eureka propositions* would begin with an investigation of expectation of purpose of joining and authoring Tips. Eureka is a purposeful community resourced by the corporation but ultimately supported and dependent on the community membership. The question of expectation of membership and authoring Tips is significant within Eureka. How this expectation comes to be understood by new members seems to be a critical part of initiation to the Eureka community and to contributing Tips. Further investigation would explore aspects of the relationship between the initiation process to the Eureka community and the development of an expectation of public participation among new members.

Benefit of membership and participation is also significant within Eureka. An understanding the types of knowledge contributed and its' practical application in field conditions would be useful to community developers in terms of establishing a benchmark expectation of knowledge content for new member message contributions.

Message diversity and authoring Tips is significant for Eureka participants. As in the earlier case of the IBM-based community, development of specific measures of message diversity would enable community sponsors and developers to better evaluate messages contributed by a range of participants (i.e., apprentices, journeymen and masters) in the community. A further research direction applicable to both Eureka and the IBM-based community follows.

Further directions of research would involve a mixed method research design that uses both online survey research and personal interviews to collect data would have improved

this study. Interviews were conducted with two members of the community who were conveniently located in Toronto. Budget and time constraints precluded this activity given the global nature of community participants in both communities. In hindsight, a random selection of participants to interview would have been more representative and helpful to gain an understanding of participants' experience of community life and as a background source of knowledge about participant's communication behaviour. Such background knowledge would also have been helpful in the design survey questions and follow-up questions in particular. Data collected from the personal interviews and the survey could be compared and both data sources used to gain a better understanding of factors affecting reports of participation in online communities of practice.

For multiple survey questions with multiple responses such as Question A3: Initial attraction to the community, respondents offered multiple answers (in check boxes) to the question. Although the particular focus of this research study was on the relationship between each initial attraction variable and its correlation with participation, a future research activity would be to explore the differences in public participation between groups of respondents such as access + emphatic support and those respondents who gave only one answer. Many "respondent groups" could be investigated in a cross tabulation run (e.g., 15 responses x 100 IBM surveys) to see what combinations of respondent groups will affect participation beyond chance.

Future research into the ways and means of matching self-reports of public message contributions to actual message contributions archived on community message servers would be important from a theoretical and practical perspective. The critical mass construct in a public goods approach to online community building posits that a sufficient number of participants and type of public message contributions are essential for a community form and to be sustained. By validating self-reports and type of message contributions with archival server statistics, one would be able to examine the number and content of public message contributions per member that, at an optimum level, leads to successful and sustainable communities of practice. The practical significance of this knowledge to online community developers would be a reappraisal of the quantitative

and qualitative criteria used to assess successful communities. Community developers may be able to identify and direct their attentions to core group of public participants to ensure these participants are recognized and that their contributions are acknowledged on a regular basis. This may lead to a measure of the actual number of members that are essential to the well being and sustainability of the community at large.

It also seems important to take a detailed look at regular contributors' participation and its effect on the community interaction and outcomes. In particular, further study is needed on the specific ways in which regular contributors influence participation dynamics in the community interaction from within the community as well as from offline or outside the community.

Another area of research would investigate member's conceptualizations of their role in corporate communities of practice, factors influencing role conceptualization and resulting impact on community participation. A number of participants stated that they do not contribute messages because there was no need, obligation or public expectation to do so for membership in the community.

Most respondents report participating in the community by reading messages and they value this activity and practice. It seems important for managers to learn more about the value of this mode of participation from a participant's perspective. If managers could estimate its extent and its qualitative and quantitative value to passive participants, they would be in a position to let all members know about its size and potential value as an integral part of the community.

An additional issue arising from this study concerns what type of knowledge is actually transferred from the online community to the corporate workplace community. In analyzing the frequency and quality of interactions within online communities, we do not account for the type of workplace knowledge that is transferred between members and between workplace communities. Currently, online community research can only find evidence of tacit and experiential knowledge indirectly, that is, via stories and

collaboration. Research into ways of identifying and measuring tacit knowledge transfer could be useful. Future research could enhance our understanding of knowledge cultivation and learning in the workplace by considering the type of knowledge transferred. What is the ratio of tacit to explicit knowledge exchanged in these communities of practice? What the ratio is of documented versus informal knowledge transfer?

As this analysis is based on community member's perceptions, recollections and self reports, further studies could include assessments from leaders in the formal work organization and comparisons made between assessments of knowledge transferred from the online community to the formal workplace community.

Another way to address the research questions of this study would be through a longitudinal study. If adequate time were available to the researcher, a longitudinal research design could take the evolutionary aspect of communities into account and enable a study of the lifecycle of a community as proposed by other authors (Wenger et al., 2002).

8.9 Conclusions and Implications

1. The data provided support for participation in communities of practice as predicted by utility theory. Participant reports of their initial expectations of purpose to participate and reports of their subsequent experience of finding timely, relevant and quality knowledge that was beneficial in the performance of their work tasks were associated with reports of their present level of public participation, their level of satisfaction with the community, their plans for future public participation and plans for sustained membership in the community.
2. The critical mass construct within public goods-based theory seems crucial to understanding the dynamics of public participation in corporate communities of

practice. There is a core group of public participants willing to contribute messages even if other participants do not contribute publicly. Benefits derived from online communities of practice seem to go beyond merely obtaining information for work purposes to include feelings of belonging to a larger community, to the possibility of expressing one's self and of enhancing contacts within the firm and industry.

3. Communities of practice are dynamic complex entities that present not only a theoretical challenge but also a practical challenge. This study's results point to the complexity of managing communities of practice: benefits dynamics and flow and permanence dynamics of membership can only be managed to an extent. The participants' role needs to be conceptualized in ways that recognize and support different types of public and non-public participation while at the same time highlighting the inherent cooperative nature of communities of practice.
4. An outcome of this study is the demonstration that it is possible to get a rich set of data from (a subset of) community members about some of the reported factors that affect their joining and public and non-public participation in online communities. The methodology employed in this study (case study research with web-based surveys and archival server statistics) opens further possibilities for doing research in management sciences/information systems involving different work domains in public and private online communities.
5. Many forms of communities of practice exist, are possible and desirable. Perhaps we can reconcile the desire for more participatory and productive corporate communities of practice with the desire to let new online communities of practice reach maturity without excessive constraints, by developing tailored solutions from particular applied research into corporate communities of practice.

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Participation in Online Knowledge Communities

You are being invited to participate in a survey that asks participants about their activities in, `ibm.software.websphere` portal server, why they participate and what they feel they are gaining from their participation in `ibm.software.websphere` portal server overall. This study's objective is to help expand the body of knowledge about why and how individual and group participation can lead to a viable and sustainable knowledge community.

To study the dynamics of participation, of course, means going to `ibm.software.db2` and `ibm.software.websphere` participants such as yourself to help us answer these questions. The survey is being conducted within `ibm.software.db2` and `ibm.websphere.software` forums worldwide and all participants are invited to participate. To respond to our survey questions will take about 25 minutes and your participation will make a real contribution to the accuracy and success of the study. You should know that:

- This study is supported by IBM Center for Advanced Study (CAS)
- Your participation is completely voluntary and there are no known or anticipated risks to participating in the study. You can decline to answer particular questions, if you wish and reminder notices will not be sent to those of you who have responded.
- Data will be kept indefinitely in a secure location. We will not collect email or IP addresses and if an email address is provided, it will not be kept with or linked to survey responses. All information provided will be kept confidential and no one outside the research team (University of Waterloo and IBM) will see your completed survey.
- We plan to share the results of this study at national conferences, in academic and in industry journals in aggregated and statistical form. Your name will not appear in any thesis or report resulting from this study.
- This project has been reviewed and received ethics clearance at the University of Waterloo, Waterloo, Ontario, Canada. If you have questions about your rights as a research participant you may contact Dr. Susan Sykes, Director of the Office of Research Ethics at 519 888 4567 ext. 6005 or email at ssykes@uwaterloo.ca.

Thank you for considering this request.

Sincerely,
Gerry Mahar
Doctoral Candidate
Department of Management Sciences
Faculty of Engineering, University of Waterloo.

Demographics

INTRODUCTION

The survey will begin with a few demographic questions and ask about your experience with this community.

i) Gender

Male

Female

ii) Age

17 or younger

18 - 29

30 - 49

50 - 64

65+

Participation in Online Knowledge Communities

iii) Education

- High school or less
- Some college
- College grad or more

iv) Income in \$US

- Less than \$30K
- \$30K to \$50K
- \$51K to \$75K
- More than \$75K

v) In what country do you live?

A1 Now, I would like to inquire about this community and your participation in it. Overall, how satisfied are you with the community?

- Very satisfied
- Somewhat satisfied
- Neither satisfied or unsatisfied
- Somewhat unsatisfied
- Very unsatisfied

A2 How did you find out about the community? (Check all that apply)

- Word of mouth
- WWW search engine
- Employer
- Friends and associates
- Invitation from member
- User group
- Other (please specify)

Participation in Online Knowledge Communities

A3 What attracted you to this community?

(Select all that apply)

- Offer my expertise
- Access expertise
- General understanding
- Something to do
- Enjoy myself
- Entertain others
- Play games
- Build professional relationships
- Read conversations and stories
- Tell stories and make conversations
- Make friends
- Get empathic support
- Get answers to questions
- Become a community member
- Other (please specify)

A4 What else attracted you to this community?

A5 When did you start visiting this community? About

- less than 1 month ago
- 1 month ago
- 2 months ago
- 3 - 6 months ago
- 7 -12 months ago
- 13 - 24 months ago
- Over 25 months ago

A6 Currently, how many communities are you a member of ?

Participation in Online Knowledge Communities

A7 In each row, please order in terms of importance the reasons why you joined this community?

	1 Most important	2	3	4	5 Least important
To get pointers and answers to questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To obtain membership news and to keep updated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To discuss technical issues/work problems with the community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To make and maintain personal relationships with the community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To learn about participating in this community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

A8 Is your participation voluntary?

- Voluntary - self interest
- Voluntary - job related
- Required by employer

A9 As far as you can tell, is there a distinct purpose and focus to the community?

Yes

If yes, what is the focus?

No

If no, why is there no focus or purpose?

A10 This community is about.....

	1 Strongly agree	2	3	4	5 Strongly disagree
Asking questions and getting answers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Developing innovative solutions to technical problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sharing technical ideas and work experiences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION B - YOUR PARTICIPATION ACTIVITIES

Participation in Online Knowledge Communities

Your participation activities

B1 How often each month do you visit the community from home, work and elsewhere?

	1-5 visits	6-10 visits	11-15 visits	16-20 visits	21 or more	Never
HOME	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
WORK	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ELSEWHERE	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

B2 On an average visit, how much time do you spend at this community?

B3 If possible, would you spend more time each visit at this community?

Yes No

B3 a If yes, how much more time would spend in the community?

B4 Do you feel like a member in the community?

Yes No

B4a If yes, how long were you in the community before feeling like a participant?

01 month
 02 months
 03 months
 04 months
 05 months
 06 or more months

B5 Do you recognize other participants as individuals?

B5 a What part of the community do you feel close to?

Whole community Individual members Groups of members

Participation in Online Knowledge Communities

B6 About how many people in the community do you feel close to?

	0	1-2	3-5	6-10	More than 10
1 Very close	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5 Not very close	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

B7 Regarding the whole community, where do you think most participants live and work?

In my city
 In my state or province
 In my country
 Worldwide

B8 For participants you contacted in the community, please indicate how you made contact. (Check all that apply)

Face to face meeting
 Telephone conversation
 Emailed messages only
 Social context
 Conference meeting
 Other (please specify)

B9 Overall, please rate the community discussion in terms of quality, relevance to your interests, range and depth of topics.

	1 Excellent	2	3	4	5 Poor
Quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relevance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Range of content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Depth of content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

B10 How often do you find the discussion and topics to be useful for your job?

1 Always
 2
 3
 4
 5 Never

SECTION C - MESSAGE CONTRIBUTION AND PARTICIPATION/INTERACTION

Forms of community participation

Participation in Online Knowledge Communities

C3 How often do you any of these activities with any community members?

	Hourly	Daily	Weekly	Monthly	Never
Email messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Telephone call	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Face to face meeting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborate on a project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

C4 If you DID NOT post messages to this community, please check any reasons that might apply.

- Just reading/browsing is enough
- Wish to remain anonymous
- Unsure about how I will be viewed by others
- Others respond the way I would
- No requirement to post
- Had no intention to post from the outset
- Posting for me means making a commitment
- May not have appropriate knowledge or information
- Wrong group for me
- Don't know how to post to this community
- Still learning about the community
- There are too many messages already
- Poor quality of messages or community
- Community treats newcomers badly
- Concerned about aggressive or hostile responses
- Long delay in responses to postings
- Not enough time to post
- May not be worth my time or effort
- Cannot post from my workplace
- Concerned about monitoring of messages
- Don't want to make a mistake in public
- Other reasons you don't post (please specify)

C5 Please rate your subject knowledge relative to other community members?

1 Much higher 2 3 4 5 Much lower

Participation in Online Knowledge Communities

C6 Do you scan any parts of a message before reading further?

- Subject headings
- Senders name and affiliation
- Number of responses
- Message body
- Other (please specify)

C7 How do people respond to your questions?

- Factual answers
- Practical solutions
- Conceptual information
- Theory based information
- Timely solutions
- Other (please specify)

C8 Did you know participants of the community before you participated?

- Yes No

C9 Overall, do you feel more involved as a result of posting messages to the community?

- 1 Less involved 2 3 4 5 More involved

C10 Do your messages convey something about yourself?

- Yes No

C11 How much do you care about what your messages convey about yourself?

- 1 Do not care 2 3 4 5 Care very much

C12 What is your estimate of the daily message volume received within the community ?

- 01-04 05-30 31-65 66-100 101-200 Over 200 per day

Section D

Your Participation Activities

Participation in Online Knowledge Communities

D1 Check any below that describe your involvement with the community.

- Follow the community discussion
 - Keep up contact with people I know
 - Contacted new people who share my interests
 - Collaborated with some members on projects
 - Other (please specify)
-

D2 How much is the message content of the community related to your job interests?

- 1 Unrelated
 2
 3
 4
 5 Much related

D3 How often do you do these activities in the community?

	Hourly	Daily	Weekly	Monthly	Never
Browse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Read messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Post questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reply to questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Post comments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reply to comments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Post announcements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Send email to individual members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D4 How do you prepare your messages for posting?

- Have not posted messages
- Write and post immediately
- Write, edit and post immediately
- Write, edit, sit on it and post later
- Write, sit on it, and edit before posting

Participation in Online Knowledge Communities

D5 Describe the content of messages that you post to the community?

- Have not posted messages
- Post messages that are factual and to the point
- Post mostly work related and or experienced-related information
- Other (please specify)

D6 How often each month have you RESPONDED to questions from the community?

- Never
- 1 message
- About 2-4 messages
- About 5-9 messages
- About 10-14 messages
- About 15-20 or more messages
- Other (please specify)

D7 How often each month have you posted brief comments in the community?

- About 16 or more times
- About 11-15 times
- About 6-10 times
- About 3-5 times
- About 1-2 times

D8 How often each month have you posted detailed comments in the community?

- About 16 times or more
- About 11-15 times
- About 6-10 times
- About 3-5 times
- About 1-2 times

Participation in Online Knowledge Communities

D9 Indicate your level of agreement for the following statements about your participation in this community.

	1 strongly agree	2	3	4	5 strongly disagree
I keep track of current ideas, issues and events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I obtain quality and timely assistance not available to me locally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I interact informally free from constraints of organizational hierarchy (managers) and local rules (status)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Community participation enables me to learn how to participate in online communities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel part of a larger community and not working by myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I express ideas and thoughts in the community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
As a member I've increased my contact with people having similar interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D10 What do you do with the information found in the community?

- Copy some of the message information for future use.
- File the entire message in a folder for use at work.
- Browse to get an overview of the technical discussion.
- Copy any useful information and send directly outside the community to associates.
- Other (please specify)

Participation in Online Knowledge Communities

D11 Rate your use of the community.

	1 Most Important	2	3	4	5 Least Important
Network with others who have similar interests.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meet new people working in this area.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Keep up my contact with others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Build on contacts I met at in-person meeting and technical conferences.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D12 Participation in this community implies that one

- Makes connections with others in the community
- Trusts others and feel safe to publicize one's level of knowledge of topics
- Tries to appreciate and to understand the viewpoints of members
- Makes a public commitment by contributing messages
- Cooperates and shares ideas with members
- Other (please specify)

D13 How important are the following community activities to you?

	1 More Important				5 Less Important
Information received	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People met	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Discussion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Timeliness of messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D14 Describe the way you participate in the community.

- Listen mostly to others in the discussion
- Express my own views
- Express my own views and sometimes debate ideas with others
- Other (please specify)

Participation in Online Knowledge Communities

D15 Please rank who you are most likely to approach for information in the community.

	1	2	3	4	5
Friend or acquaintance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Colleagues at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Frequent poster with expertise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The whole community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D16 I feel part of the community by (Check all that apply)

- Following some discussions and contributing to relevant technical topics
- Being able to participate in a community that would not otherwise occur in a face-to face meeting
- Browsing messages to understand the tempo of the community
- Finding and contacting others who share my work interests
- Discovering what others are doing and what's new
- Contacting others who are working on related tasks and problems
- Other (please specify)

D17 I enhance my reputation in the community when I contribute messages.

1 Strongly agree 2 3 4 5 Strongly disagree

D18 I obtain a sense of community membership when I help others with a problem or a question.

1 Strongly agree 2 3 4 5 Strongly disagree

D19 Sharing ideas by posting messages is an important aspect public participation in any community.

1 Strongly agree 2 3 4 5 Strongly disagree

Participation in Online Knowledge Communities

D20 Please indicate any benefits that you receive from public participation the community.

- Recognition from colleagues
- Praise from colleagues
- A sense of belonging to the community
- Gratitude
- Respect
- Other (please specify)

D21 Do you have any doubts or ambivalence about the usefulness of the community?

- Yes No Undecided

D22 Select any item(s) that best describes your doubts and ambivalence towards the community.

- Doubts about benefits of participation
- Amount of time and energy needed to participate
- Characteristics and tone of the community interaction
- Other (please specify)

D23 More satisfactory communities would have

- a more defined purpose
- a more defined and focused participants
- require less time to follow and to participate
- Other (please specify)

Participation in Online Knowledge Communities

D24 What are your plans for future participation in this knowledge community?

- Planning to leave the community very soon
- Have doubts about staying in the community
- Mostly would prefer to stay in the community
- Definitely will stay in the community
- Usually come and go from the community (leave and rejoin)

D25 For participants that you meet in the community, please check activities that apply.

- Record their names and email addresses in a directory
- Follow-up and exchange ideas off-line by personal email
- Try to develop relationships with members from the community at in-person meetings or conferences
- Other (please specify)

You have finished the survey. Thank you.

To receive a copy of the survey report, please give us your email address. This will also enable us to contact you if we need to follow up with a short telephone interview. However, if you are not comfortable doing this, it is not required.

Your identity and survey responses are protected and will remain confidential!

- I am willing to participate in a follow-up interview, if needed.
- Request summary of survey report
- My email address is

If you are younger than 18, parental permission is required. Please enter the email address of a parent or guardian who is authorized to give permission. We will request permission for your participation from this person. This permission is required by the university. If permission is not given, your survey responses will be deleted from the survey results.

Are you 18 years old or older?

- No
- Parent email address

Participation in EUREKA

Invitation to the study

Hello Eureka User:

You are being invited to participate in a survey that asks participants about their activities in Eureka, why they participate and what they feel they are gaining from their participation in Eureka overall. This study's objective is to help expand the body of knowledge about why and how individual and group participation leads to a viable and sustainable knowledge community.

To study the dynamics of participation, of course, means going to Eureka participants, such as yourself to help us answer these questions. The survey is being conducted within Eureka worldwide and all participants are invited to participate. To respond to our survey questions will take about 20-30 minutes and your participation will make a real contribution to the accuracy and success of the study. You should know that:

- This study is supported by Xerox.
- Your participation is completely voluntary and there are no known or anticipated risks to participating in the study. You can decline to answer particular questions, if you wish and reminder notices will not be sent to those of you who have responded.
- Data will be kept indefinitely in a secure location. We will not collect email or IP addresses and if an email address is provided, it will not be kept with or linked to survey responses.
- All information provided will be kept confidential and no one outside the research team (University of Waterloo and Xerox) will see your completed survey.
- We plan to share the results of this study at national conferences, in academic and in practitioner journals in aggregated and statistical form. Your name will not appear in any thesis or report resulting from this study.
- This project has been reviewed and received ethics clearance at the University of Waterloo, Waterloo, Ontario, Canada. If you have any questions about your rights as a research participant you may contact Dr. Susan Sykes, Director of the Office of Research Ethics at 519 888 4567 ext. 6005 or by email at ssykes@uwaterloo.ca.

If you have any difficulty logging in, please email gjmahar@engmail.uwaterloo.ca

Thank you for considering this request.

Sincerely,
Gerry Mahar
Doctoral Candidate
Department of Management Sciences
Faculty of Engineering, University of Waterloo.

Demographics

INTRODUCTION - The survey begins with a few demographic questions and asks about your experience in EUREKA.

A1) Gender

Male

Female

A2) Age

18 - 29

30 - 49

50 - 64

65+

Participation in EUREKA

A3 On which products do you work? (check all that apply)

Black and white Low range copier, printer (less than 35 copies or prints per minutes)

Black and white Mid range copier, printer (35 to 65 copies or prints per minutes)

Black and white High range copier, printer (greater than 65 copies or prints per minutes)

Colour products

Printing System

Wide Format

Other (please specify)

A4) What is your profession?

A5) In what country do you live?

A6 When did you start using EUREKA?

less than 1 month ago

1 month ago

2 months ago

3-6 months ago

7-12 months ago

1-2 years ago

2-5 years ago

5-8 years ago

over 8 years

A7 Please indicate below your level of satisfaction with Eureka

	very satisfied	satisfied	neither satisfied or unsatisfied	unsatisfied	very unsatisfied
The contents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The delivery mechanism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The participation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The technical detail	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Participation in EUREKA

A8 What are your reasons for using EUREKA?

Offer my expertise
 Access others expertise
 Follow standard work process
 Find solutions
 Get empathetic support
 Other (please specify)

A9 What else attracted you to use EUREKA?

A10 In how many online sites like CHAT, CONFERENCE and GSN have you participated?

A11 Please order in terms of importance the reasons why you use EUREKA? (check all that apply in each row)

	1 Most important	2	3	4	5 Least important
To get pointers and answers to questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To obtain technical info and to keep updated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To examine technical issues/work problems within EUREKA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To make and maintain personal relationships within EUREKA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
To learn about how to author and how to use EUREKA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Participation in EUREKA

A12 EUREKA is about.....

	1 Strongly agree	2	3	4	5 Strongly disagree
Asking questions and getting answers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Developing innovative solutions to technical problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sharing technical ideas and work experiences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION B - YOUR PARTICIPATION ACTIVITIES

B1 How often each week do you search EUREKA at work?

- 1-5 visits
- 6-10 visits
- 11-15 visits
- 21 visits or more
- Never

B2 How do you use EUREKA? (check all that apply)

- Authoring
 - Reading
 - Feedback
 - Validation
 - All of the above
 - None of the above
 - Other (please specify)
-

B3 If possible, as a user, would you spend more time each day in EUREKA?

- Yes
- No

B3 (a) If yes, how much more time would you spend each day?

B4 If possible, as a validator, would you spend more time evaluating tips?

- Yes
- No

B4 (a) If yes, how much more time would you spend each day?

Participation in EUREKA

B5 Do you feel like a participant in EUREKA?

Yes No

B6 What makes you feel like a participant of the Eureka? (check all that apply)

Authoring
 Validating
 Reading messages
 Giving feedback
 Other (please specify)

B6 (a) If yes, how many times did you use EUREKA before feeling like a participant?

1-5 6-10 11-15 16+

B7 Regarding the whole of EUREKA, where do you think most participants live and work?

In my city In my state or province In my country Worldwide

B8 For those users you contacted in EUREKA, please indicate how you made contact. (check all that apply)

Face to face meeting
 Telephone call
 Emailed messages outside EUREKA
 Emailed author or validator using email link to their name
 Social context
 Other (please specify)

B9 Overall, please rate the content of the EUREKA in terms of quality, relevance to your interests, range and depth of topics. (check all that apply in each row)

	1 Excellent	2	3	4	5 Poor
Quality	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relevance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Range of topics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Depth of topics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Participation in EUREKA

B10 How often do you find the topics and content to be useful for your job?

- 1 Always
 2
 3
 4
 5 Never

SECTION C - CONTRIBUTING TIPS & INTERACTION

C1 How often do you do these activities with EUREKA participants?

	Hourly	Daily	Weekly	Monthly	Never
Email messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Make a telephone call	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arrange a face to face meeting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contact others with my pager	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

C2 What are some reasons for NOT authoring Tips in EUREKA? If you DID NOT author Tips. (check all that apply)

- Just reading/browsing is enough
- Wish to remain anonymous
- Unsure about how I will be viewed by others
- Others respond the way I would
- No requirement to author
- Had no intention to author from the outset
- Authoring for me means making a commitment
- May not have appropriate knowledge or information
- Wrong group for me
- Don't know how to author tips in EUREKA
- Still learning about EUREKA
- There are too many Tips already
- Poor quality of Tips
- EUREKA treats newcomers badly
- Concerned about aggressive or hostile responses
- Long delay in responses to authoring
- Not enough time to author
- May not be worth my time or effort
- Cannot author during the workday
- Concerned about monitoring of Tips
- Don't want to make a mistake in public
- Other reasons you don't author (please specify)

Participation in EUREKA

C3 Rate your technical & product knowledge relative to field TIPS in EUREKA.

- 1 Much lower 2 3 4 5 Much higher

C4 Do you briefly read records after closing the BUS update? (check all that apply)

- Subject headings
 Author's name and country
 Length of the threaded message
 EUREKA record
 Other (please specify)

C5 How would you describe solutions in the EUREKA system? (check all that apply)

- Factual answers
 Practical solutions
 Conceptual information
 Theory based knowledge
 Timely solutions
 Other (please specify)

C6 Did you know EUREKA users before you began using EUREKA?

- Yes No

C7 Overall, how involved has authoring Tips made you in EUREKA?

- 1 Less involved 2 3 4 5 More involved

C8 Do your Tips convey something about yourself?

- Yes No

C9 How much do you care about what your Tips convey about yourself?

- 1 Do not care 2 3 4 5 Care very much

C10 Within your work domain, what is your estimate of the daily Records Transfer volume in BUS Update?

- 01-04 05-30 31-65 66-100 101-200 Over 200 per day

Participation in EUREKA

Section D - Further Participation Activities

D1 Check any below that describe your involvement with EUREKA. (check all that apply)

- Reading Tips
- Authoring Tips
- Providing feedback
- Validating Tips
- Contacting people who share my work interests
- Collaborating with users on work projects

D2 How is the information content of EUREKA related to your job interests?

- 1 Unrelated
- 2
- 3
- 4
- 5 Much related

D3 How often do you do these activities in EUREKA (check all that apply for each row)

	Hourly	Daily	Weekly	Monthly	Never
Browsing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reading	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Authoring Tips	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Validating Tips	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feedback to Author	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feedback to Validator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D4 How much time and care do you take to prepare Tips when authoring a record in EUREKA?

- Have not authored Tips
- Author immediately
- Author, edit and submit immediately
- Author, edit, sit on it and send later
- Author, sit on it, and edit before sending

Participation in EUREKA

D5 Describe the content of Tips you author to EUREKA? (check all that apply)

- Have not authored any Tips
- Problem, Cause, Solution
- Author factual, to the point messages
- Mostly work related
- Mostly experienced related
- Other (please specify)

D6 Monthly feedback in Eureka.

	16 +	11-15	06-10	03-05	01-02	Never
How often each month do you provide feedback in Eureka?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often each month have you emailed feedback to Author and or Validator in Eureka?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

D7 How do you handle a large volume of daily records?

- Ignore most messages using subject headings to decide
- Read first few lines of message body and then discard them
- Read sender's name and make a decision
- Other (please specify)

Participation in EUREKA

D15 Indicate any benefits that you receive from public participation in EUREKA. (check all that apply)

- Recognition from colleagues
- Praise from colleagues
- A sense of belonging in EUREKA
- Gratitude
- Respect
- Other (please specify)

D16 Do you have any doubts or ambivalence about the usefulness of EUREKA?

- Yes No Undecided

D17 (a) Select any item(s) that best describes your doubts or ambivalence about more frequent use of EUREKA. (check all that apply)

- Time & energy needed to use EUREKA
- Style and tone of EUREKA interaction
- Other (please specify)

D18 In my opinion, a more satisfactory EUREKA would have.....(check all that apply)

- Less search time to find information
- More focus on topics by participants
- A more defined sense of purpose
- Take less time to keep up and to author Tips

D19 What are your plans for ongoing participation in EUREKA?

- To have lower level of participation
- To have same level of participation
- To increase my participation slightly by reading more Tips
- To increase my participation by authoring Tips
- To increase my participation by validating more Tips

Participation in EUREKA

**D20 For users that you find in EUREKA, please check activities that apply.
(check all that apply)**

- Record their names and email addresses in a directory
- Contact and exchange ideas off-line by personal email
- Try to develop relationships with EUREKA users at in-person company meetings or industry conferences
- Other (please specify)

Thank you kindly for participating in this study.

*** If you wish to receive a summary of the survey findings, please enter your email address below**



Growing community knowledge through a socio-technical tip sharing system

"Eureka is a tip sharing system that has been deployed across Xerox Corporation to facilitate the work of service technicians. But it is also a technologically advanced system that has been fitted to the working style of the service technicians."

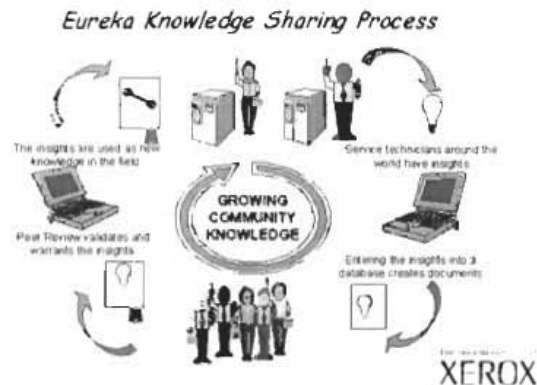
• Introduction

Some of the most important information your company possesses isn't stored in computer memory, or in company documents. It's in the minds of employees. It changes constantly with daily experience. And, if made accessible to people throughout the organization, it can increase sales and profits, improve products, decrease the cost and time of service calls, win customer satisfaction, and augment employee loyalty. This is the domain of Xerox PARC's Eureka. Eureka is a system that captures individual or local know-how and best practices ("tips"), and disseminates them throughout the service community. But Eureka is more than just a technology: it is a special methodology for Knowledge Sharing that succeeds by working the way people do. Eureka was built around, engineered and designed to fit the service technician's work practices. Service technicians are faced daily with the unknown. When on-site at a customer, alone in front of a failing machine, and with no possible help from the documentation, they have to invent new solutions. Some of these solutions will later be told as "war stories" to their local work groups, written down on personal "cheat sheets", or shared with trusted colleagues. But most of these innovative solutions will go unnoticed from the wider service community. A system for sharing their tips had to honor these practices, while leveraging modern technologies to provide the best support to the users. Trust, expertise and working styles meet laptops, databases and Internet connectivity.

• Technology

Service technicians are equipped with laptop computers they can use to search for solutions in the electronic documentation, manage parts, and

run diagnostics on the machine. But they can also search and use tips in the local replica of the Eureka database. Whenever convenient, they can also connect through the Internet to the central Eureka knowledge base for synchronization of their laptop computer. All these steps strongly reflect PARC's in-depth analysis of this community's practices:



• Authoring Tips

This phase accommodates the different ways people express themselves. Although simple for the end-user, the process is flexible and allows creativity. Along with the written suggestion, the author can attach diagrams and sound. The name of the user is listed on the tip form not only to assure credit when credit is due, but also to ensure the seriousness of the entry. Next time the user connects through the Internet, the tip is put into a pending knowledge base for review.

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Growing community knowledge through a socio-technical tip sharing system

• Validating Tips

The review is conducted by respected, trusted local experts that the authors normally turn to for help and confirmation. These validators check out the pending tips by downloading them from the server to their laptops. The author is automatically notified, the validator's name added to the Tip, and the result of the check uploaded to the server. There, the validated tips are placed in the community knowledge base for use by everyone.

• Sharing Tips

The system simulates the telling of anecdotes and the sharing of cheat sheets by spreading confirmed solutions within and outside work groups. The new solutions are downloaded from the knowledge-base server to individual laptops, with notification and subscription service.

• Using Tips

The user can then very easily seek out and implement solutions in many different situations. The practical advice is easily accessible through the SearchLite search engine and its customizable search procedures.

• Application

Eureka has been deployed in Xerox service communities around the world. After a field trial in France using the Minitel technology, it is now available on the Internet for Canadian and American service representatives, and is on its way to the worldwide community. Many benefits came along: over a three years working trial, it greatly raised consumer confidence and employee morale. And, more pragmatically, service costs and time spent at customer sites have gone down 5 to 10 percent. Furthermore, all this knowledge shared within the service community could also benefit the documentation and engineering groups, to bring better quality products and more complete manuals.

• Conclusion

Eureka from Xerox PARC is a tip sharing system for service technicians. It is very successful because the software was not simply made to run seamlessly on whatever platform is used: it was designed to work the way people work. It replicates the work practices of service technicians and gives them a system they can trust and rely upon. This socio-technical system is also a very flexible solution, adaptable to complex needs within an organization. The benefits of Xerox Eureka are both internal and external. It's a tool that brings employees together with the common goal of sharing solutions. And it creates an extra bond of confidence with customers.

• Few Statistics

- o 6 Month of development 1996 (4 persons)
- o 1100 Technical Expert (Validator)
- o 23,000 Users around the World
- o 330 Different databases
- o 300,000 solved per year
- o 12\$ Millions saved each year

*Michel Boucher
Xerox Canada
Eureka
Database Quality Coordinator
4898 Levy
Ville Saint-Laurent
H4R-2P1
Michel.Boucher@Xerox.Com*

Appendix 4: Xerox Global Service Net (GSN)

Xerox Global Service Net



GSN ID: (User name)
 Password:

This GSN logon page accepts the user name in either the GSN ID or S3 ID format.

Internal users may click here to log on GSN with S3. (Click here for Sales Leads.)
 (If you have a XEAN connection, the S3 logon links require a Xerox proxy.)

This site contains Xerox Private Data. Unauthorized access is prohibited. If you have inadvertently come upon this site, please visit our main corporate site at <http://www.xerox.com>.

The Xerox WebBoard employee portal is at <https://www.webboard.xerox.com>. WebBoard requires an S3 logon.

If you have forgotten your GSN password you can use the Password Reset page.

If you are a new user and need a user name and password:

- 1 Someone who already has a GSN account can use the **sponsored new user signup** on the 'Account Help' tab at the top of the GSN home page.
- 2 If you are an **XMS employee** in the United States, please ask your manager to use the **sponsored new user signup** on the 'Account Help' tab at the top of the GSN home page.
- 3 If you are an **FMMS** or **FMTS** in United States and cannot access the website using your **S3 ID** in order to sponsor a new user, please contact the IT Help Desk at 1-800-217-7773.
- 4 If another user is not available to help you sign up, please send email to USA.GSN.Admin@xerox.com.

You must have cookies enabled to log on the GSN.

Verify that you have the correct date and time set. If you keep getting bounced back to this page with no other indication of an error, the system time on your PWS may be incorrect.

Still can't log on? Contact your PWS Help Desk for assistance. In Europe contact your local PWS support team.

The Global Service Net is a private system of the Xerox Corporation. Access is limited to Xerox Customer Service employees and partners. Access is monitored. Xerox Customer Service has taken considerable precautions to help ensure the security of this site and the business you conduct when logged into it.

All materials transmitted or received using Xerox systems must comply with Xerox Business Guidelines. In addition, any text or graphic material that is pornographic or sexually explicit in nature is strictly prohibited. Disciplinary action will be taken for any violations.

By choosing to access the Global Service Net, you accept these terms. Otherwise, please disconnect.

from the Global Service Net.

This site collects, records, stores, processes, transmits and otherwise handles certain personally identifiable information to provide you with the services that this site offers.

In addition this site shares certain personally identifiable information with the following applications so they can provide their services to you: ACM Online, Oracle Non-Production Purchasing, Communications Expense Reporting Tool, Xerox Asset Management Tool, Emergency Order Notifications, Corporate Ethics, Identical Equipment Replacement, US IT Help Desk Ticketing System and the Mobile Data Portal.

Xerox takes reasonable measures to provide secure systems and processes for the appropriate handling of the user's personal information.

Accessing logon.xrsgsn.com with Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0; SYMPA) from 74.12.150.246
Last update: October 23, 2005 07:25:43 PM

**Appendix 5: Personal communication from M. Boucher at Xerox to G. Mahar
at the University of Waterloo**

INBOX: RE: Gerry Mahar from UWaterloo ---a few questions ... (641 of 641) #	Move Copy	This message to
--	-------------	-----------------

Delete | Reply | Reply to All | Forward | Redirect | Blacklist | Message Source | Save | Back to INBOX as | Print | Report as Spam

Date: Thu, 14 Dec 2006 07:26:02 -0500

From: "Boucher, Michel" <Michel.Boucher@xerox.com>

To: "Gerry J. Mahar" <gjmahar@engmail.uwaterloo.ca>

Subject: RE: Gerry Mahar from UWaterloo ---a few questions about Eureka membership

Part(s): 2 _eureka-for-visitor.doc application/msword 101.27 KB

Gerry,

Start date of Eureka on Minitel technology in France was 94. I started the deployment in Canada Dec 1996, USA July, 1998.

We are about 20k users now. See attach document for process details.

Michel
Michel Boucher
Eureka (DQC)
Database Quality Coordinator
514-832-7635
+278-7635

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

gerrymahar@sympatico.ca | My Groups ▾ | Favorites | Profile | Help | My Account | Sign out

Google Web Images Video News Maps more »

Search Groups Advanced Groups S Preferences

My groups Create a {





Single-column » View: {

 <p>ibm.software.db2.udb.-windows2000 89 web views last week</p>	 <p>ibm.software.-websphere.mq.-programming 2 messages 1205 web views last week</p>	 <p>ibm.software.-websphere.-mqintegrator 10 messages 7 new topics 1092 web views last week</p>
 <p>ibm.software.-websphere.portal-server 174 messages 70 new topics 5199 web views last week</p>	 <p>ibm.software.-websphere.-application-server 169 messages 51 new topics 11120 web views last week</p>	 <p>ibm.software.-websphere.application-server.as400 814 web views last week</p>
 <p>ibm.software.-websphere.win2000 229 web views last week</p>	 <p>ibm.software.-websphere.http-servers 11 messages 6 new topics 791 web views last week</p>	 <p>ibm.software.db2.beta 415 web views last week</p>
 <p>ibm.software.db2.udb.-v7beta 51 web views last week</p>	 <p>ibm.software.-websphere.studio400 20 messages 4 new topics 552 web views last week</p>	 <p>comp.databases.ibm.db2 35 messages 12 new topics 5711 web views last 43 hours</p>
 <p>ibm.software.-websphere.usergroup 1 message 694 web views last week</p>	 <p>ibm.software.-websphere.studio 4 messages 2 new topics 1479 web views last week</p>	

Manage my memberships
Add My Groups to your Google homepage

Explore groups What is Google Groups? Take the tour »
Find out what people are doing with Google Groups

Search for a group

<p> Recreation KeepItNatural Beneteau Owners</p>	<p> People ...diet.low-carb ...support.marriage</p>
<p> Health ...fitness.weights misc.kids</p>	<p> Sci/Tech ...electronics.repair sci.astro.amateur</p>

My profile & stats

 gerrymahar@sympatic

Your 7-day activity
None

View your ful

ibm.software.db2.ldb.beta

About this group

Activity Low - 4 recent authors

Categories Usenet : [ibm.software.db2.ldb](#)
Language : English
Activity : Low

Access Public - Usenet

Feeds Latest 15 messages (RSS) - [View all available and Atom](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	D
2002									1		33	
2003	20	36	31	63	42	37	16	21	67	16	6	
2004		6	142	171	124	138	157	65	41	1	1	
2005		1	7	4	28	12	21	6	23	30	21	
2006	18	16	32	11	5	5	15	14	7	2	13	
2007	3	1										

Top posters

All time

248 [bia...@nospam.com](#)
39 [Pm3iinc NoS...@sympatico.ca](#)
36 [l...@ca.ibm.com](#)
31 [badama...@2muchspam.yahoo.com](#)
29 [adama...@2muchspamca.ibm.com](#)
28 [srie...@ca.eye-bee-em.ibm](#)
28 [jgartner_nos...@yahoo.com](#)
28 [hoym...@ca.ibm.com](#)
28 [team...@scotdb.com](#)
26 [stevep...@my-deja.com](#)

Related Groups

[ibm software db2.mvs](#)
Low activity, 109 subs
Usenet

[comp.databases.ibm-Problem resolution w database products](#)
Medium activity, 1748 subscribers, Usenet

[ibm software.webspht server - join](#)
Medium activity, 706 subscribers, Usenet

[View all related group](#)

Discussions

About this group

[Edit my subscription](#)

[This is a Usenet group - learn more](#)

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group: [Usenet: ibm.software.websphere.application-server](#)

Activity: [Medium - 50 recent authors](#)

Description:

Categories: [Usenet: ibm.software.websphere.application-server](#)
[Language: English](#)
[Activity: Medium](#)

Access: [Public - Usenet](#)

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998												9
1999	31	37	726	753	557	662	752	645	759	886	446	1195
2000	1481	1592	1681	1378	1596	1714	1899	2124	1281	1767	1819	1897
2001	2308	1661	1757	1575	2014	1836	2260	2139	1463	1302	1286	1108
2002	1211	1182	1251	1090	971	766	809	524	628	626	651	509
2003	666	580	687	581	559	484	659	595	554	459	327	404
2004	426	368	667	663	502	436	575	499	218	256	274	214
2005	265	215	202	498	483	451	751	364	601	615	603	588
2006	685	732	788	669	382	476	908	690	687	807	373	

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group : [Usenet: ibm.software.websphere.studio](#)

Activity: [Low - 18 recent authors](#)

Description:

Categories: [Usenet: ibm.software.websphere.studio](#)

[Language: English](#)

[Activity: Low](#)

Access: [Public - Usenet](#)

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	12	2	74	70	72	106	77	111	214	216	323	214
2000	330	386	277	190	313	233	189	126	103	204	140	148
2001	178	125	208	142	142	133	124	135	109	128	95	59
2002	110	82	60	64	92	81	86	87	90	106	130	108
2003	160	158	189	183	189	165	171	211	183	186	124	100
2004	134	74	141	195	110	124	185	101	44	49	39	69
2005	87	90	82	104	84	75	95	45	123	75	60	76
2006	71	73	99	49	35	38	48	48	35	52	29	

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group : [ibm.software.websphere:studio400](#)

Activity: Low - 6 recent authors

Description:

Categories: [Usenet: ibm.software.websphere](#)

[Language: English](#)

[Activity: Low](#)

Access: • Public - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000											6	45
2001	46	49	72	65	55	63	92	88	91	100	106	60
2002	85	64	105	70	77	176	182	171	88	122	85	94
2003	170	155	107	73	155	152	193	86	115	123	106	74
2004	72	71	81	167	180	101	90	78	61	68	53	28
2005	58	35	41	24	54	52	47	46	78	52	26	32
2006	43	27	22	29	26	36	74	50	35	66	28	

Appendix 6: Seventeen (17) sample reports of message statistics from [ibm.software](#) communities

About this group : [ibm.software.db2.udb.beta](#)

Activity: [Low](#) - 4 recent authors

Description:

Categories: [Usenet: ibm.software.db2.udb](#)
[Language: English](#)
[Activity: Low](#)

Access: [Public](#) - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002									1		33	14
2003	20	36	31	63	42	37	16	21	67	16	6	
2004		6	142	171	124	138	157	65	41	1	1	2
2005		1	7	4	28	12	21	6	23	30	21	33
2006	18	16	32	11	5	5	15	14	7	2	6	

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group **ibm.software.db2.udb.ee***

Activity: Low - 1 recent authors
 Description:
 Categories: [Usenet: ibm.software.db2.udb](#)
 Activity: Low
 Access: • Public - Usenet
 Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

This month's top posters

1 [k.radhesh@gmail.com](#)

All time top posters

40 [adama...@ca.ibm.com](#)
 18 [amoust...@pobox.com](#)
 18 [h...@relyontech.com](#)
 18 [dmcbr...@nosspam.tower.to](#)
 16 [fcru...@logisil.com](#)
 16 [rhar...@ca.ibm.com](#)
 12 [doo...@pacific.net.sg](#)
 10 [a_bor...@hotmail.com](#)
 10 [kenh...@nc.rr.com](#)
 10 [aamal...@statestreet.com](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998											<u>6</u>	<u>3</u>
1999		<u>2</u>		<u>3</u>	<u>5</u>	<u>2</u>	<u>2</u>	<u>2</u>		<u>1</u>		<u>28</u>
2000	<u>80</u>	<u>56</u>	<u>8</u>	<u>3</u>	<u>4</u>		<u>3</u>		<u>6</u>	<u>2</u>	<u>14</u>	<u>3</u>
2001	<u>11</u>	<u>7</u>	<u>4</u>	<u>8</u>	<u>19</u>	<u>27</u>	<u>11</u>	<u>5</u>	<u>13</u>	<u>8</u>		<u>4</u>
2002	<u>6</u>	<u>6</u>	<u>10</u>	<u>12</u>	<u>3</u>	<u>7</u>	<u>8</u>	<u>1</u>	<u>3</u>	<u>5</u>		
2003		<u>3</u>	<u>11</u>	<u>2</u>		<u>5</u>	<u>18</u>		<u>3</u>	<u>1</u>		
2004		<u>1</u>										
2006		<u>3</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>7</u>	<u>4</u>	<u>1</u>	<u>1</u>	

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group **ibm.software.websphere.studio.device-developer**

Activity: Low - 18 recent authors

Description:

Categories: [Usenet: ibm.software.websphere.studio](#)
[Language: English](#)
[Activity: Low](#)

Access: • Public - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002			17	5	4	5	3	1			76	192
2003	174	209	194	295	300	188	244	211	309	224	214	115
2004	231	161	362	289	148	174	108	157	173	100	62	77
2005	56	74	80	93	127	93	95	47	124	93	89	77
2006	117	56	103	110	70	69	70	49	43	46	32	

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group : [ibm.software.websphere.http-servers](#)

Activity: Low - 9 recent authors

Description:

Categories: [Usenet: ibm.software.websphere](#)
[Language: English](#)
[Activity: Low](#)

Access: • Public - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	5		57	68	43	77	70	99	174	224	233	181
2000	173	198	185	177	170	128	165	282	93	173	172	183
2001	225	206	195	207	215	205	219	272	155	150	146	101
2002	112	134	103	97	95	90	106	55	53	48	66	59
2003	62	89	86	77	60	33	59	38	53	67	66	45
2004	48	69	72	76	45	56	46	42	36	26	16	19
2005	55	35	14	46	29	35	21	19	48	48	49	27
2006	16	25	56	57	14	17	46	44	53	40	13	

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group: [Usenet: ibm.software.websphere.mg](#)

Activity: Low - 6 recent authors

Description:

Categories: [Usenet: ibm.software.websphere.mg](#)

[Language: English](#)

[Activity: Low](#)

Access: • Public - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001									<u>2</u>	<u>11</u>	<u>11</u>	<u>2</u>
2002	<u>3</u>	<u>9</u>			<u>8</u>		<u>8</u>	<u>2</u>	<u>3</u>		<u>27</u>	<u>88</u>
2003	<u>116</u>	<u>63</u>	<u>67</u>	<u>126</u>	<u>118</u>	<u>83</u>	<u>125</u>	<u>87</u>	<u>59</u>	<u>25</u>	<u>43</u>	<u>12</u>
2004	<u>27</u>	<u>43</u>	<u>44</u>	<u>45</u>	<u>37</u>	<u>31</u>	<u>29</u>	<u>14</u>	<u>14</u>	<u>32</u>	<u>39</u>	<u>11</u>
2005	<u>22</u>	<u>21</u>	<u>30</u>	<u>39</u>	<u>44</u>	<u>20</u>	<u>35</u>	<u>44</u>	<u>25</u>	<u>11</u>	<u>20</u>	<u>18</u>
2006	<u>12</u>	<u>18</u>	<u>22</u>	<u>23</u>	<u>19</u>	<u>13</u>	<u>19</u>	<u>13</u>	<u>13</u>	<u>18</u>	<u>9</u>	

Appendix 6: Seventeen (17) sample reports of message statistics from `ibm.software` communities

About this group : `ibm.software.db2.udb.windows2000`

Activity: Low

Description:

Categories: [Usenet: ibm.software.db2.udb](#)
[Activity: Low](#)

Access: • Public - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999												<u>4</u>
2000	<u>17</u>	<u>9</u>		<u>5</u>	<u>3</u>	<u>10</u>	<u>1</u>	<u>4</u>	<u>1</u>		<u>31</u>	<u>42</u>
2001	<u>46</u>	<u>63</u>	<u>82</u>	<u>104</u>	<u>80</u>	<u>59</u>	<u>84</u>	<u>148</u>	<u>60</u>	<u>61</u>	<u>55</u>	<u>41</u>
2002	<u>97</u>	<u>100</u>	<u>80</u>	<u>54</u>	<u>66</u>	<u>59</u>	<u>64</u>	<u>11</u>	<u>3</u>	<u>12</u>	<u>4</u>	<u>6</u>
2003		<u>4</u>	<u>12</u>	<u>3</u>		<u>8</u>		<u>2</u>	<u>7</u>	<u>4</u>	<u>1</u>	
2004		<u>2</u>	<u>1</u>	<u>2</u>	<u>6</u>	<u>1</u>		<u>5</u>	<u>1</u>	<u>5</u>		<u>7</u>
2005	<u>2</u>			<u>12</u>		<u>2</u>	<u>2</u>				<u>1</u>	<u>1</u>
2006	<u>1</u>		<u>1</u>							<u>1</u>		

Appendix 6: Seventeen (17) sample reports of message statistics from `ibm.software` communities

About this group : `ibm.software.websphere.studio.application-site-developer`

Activity: Low - 4 recent authors

Description:

Categories: [Usenet: ibm.software.websphere.studio](#)
[Language: English](#)
[Activity: Low](#)

Access: • Public - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001									9	6	6	26
2002	891	1028	905	787	676	538	587	378	357	599	598	588
2003	635	653	595	465	434	388	313	366	388	351	191	151
2004	194	183	172	137	157	108	91	91	73	111	36	117
2005	100	65	52	78	52	50	72	56	77	88	41	62
2006	68	47	64	31	35	23	19	39	25	23	8	

Appendix 6: Seventeen (17) sample reports of message statistics from [ibm.software](#) communities

About this group [comp.databases.ibm-db2](#)

Activity: [Medium](#) - 50 recent authors
 Description: [Problem resolution with DB2 database products.](#)
 Categories: [Computers > Databases](#)
[Usenet: comp.databases](#)
[Language: English](#)
[Activity: Medium](#)

Access: [Public](#) - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

This month's top posters

- 20 [sto...@de.ibm.com](#)
- 15 [gregor.ko...@mikropis](#)
- 13 [srie...@ca.ibm.com](#)
- 12 [jefftyzzer](#)
- 9 [db2group88](#)
- 8 [Tonkuma](#)
- 7 [m00...@yahoo.com](#)
- 6 [sandeepshah@gmail](#)
- 5 [L...@nospam.net](#)
- 5 [roger.eri...@gmail.com](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995						52	185	244	156	154	255	220
1996	263	282	277	343	300	307	387	347	490	472	385	393
1997	486	596	543	486	432	442	522	284	419	525	462	453
1998	471	481	652	595	585	522	547	528	561	634	684	555
1999	850	770	833	828	750	871	758	833	906	973	1097	986
2000	1246	1095	1394	956	1100	1343	1601	1516	1292	1234	1241	1007
2001	1217	1105	1008	1194	1596	1798	1844	1453	1095	1479	1368	1032
2002	1649	1285	1352	1553	1734	1169	1491	1232	1374	1364	1363	815
2003	1211	1329	1187	1047	1267	1113	1224	984	1170	993	927	672
2004	990	1298	923	758	907	1454	702	717	633	948	571	522
2005	662	712	878	817	876	876	864	907	595	913	726	635
2006	774	852	1042	1021	863	971	766	896	795	736	215	

All time top posters

- 5162 [srie...@ca.ibm.com](#)
- 2324 [adama...@ca.ibm.co](#)
- 1659 [sto...@de.ibm.com](#)
- 1288 [nob...@nowhere.com](#)
- 1005 [ianb...@mobileaudio](#)
- 937 [m...@switchboard.ne](#)
- 785 [Pm3iinc.NoS...@sym](#)
- 756 [lsed...@us.ibm.com](#)
- 737 [lmen...@ca.ibm.com](#)
- 726 [woll...@us.ibm.com](#)

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group : [comp.databases.ibm-db2](#)

Activity: [Medium - 50 recent authors](#)
Description: [Problem resolution with DB2 database products.](#)
Categories: [Computers > Databases](#)
[Usenet: comp.databases](#)
[Language: English](#)
[Activity: Medium](#)

Access: [• Public - Usenet](#)

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995						52	185	244	156	154	255	220
1996	263	282	277	343	300	307	387	347	490	472	385	393
1997	486	596	543	486	432	442	522	284	419	525	462	453
1998	471	481	652	595	585	522	547	528	561	634	684	555
1999	850	770	833	828	750	871	758	833	906	973	1097	986
2000	1246	1095	1394	956	1100	1343	1601	1516	1292	1234	1241	1007
2001	1217	1105	1008	1194	1596	1798	1844	1453	1095	1479	1368	1032
2002	1649	1285	1352	1553	1734	1169	1491	1232	1374	1364	1363	815
2003	1211	1329	1187	1047	1267	1113	1224	984	1170	993	927	672
2004	990	1298	923	758	907	1454	702	717	633	948	571	522
2005	662	712	878	817	876	876	864	907	595	913	726	635
2006	774	852	1042	1021	863	971	766	896	795	736	229	

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group **ibm.software.websphere.portal-server**

Activity: Medium - 50 recent authors

Description:

Categories: [Usenet: ibm.software.websphere.portal-server](#)

[Language: English](#)

[Activity: Medium](#)

Access: • Public - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001							4			3		
2002		2	1			5				1	76	340
2003	435	380	375	402	392	381	360	422	465	425	202	241
2004	277	492	518	366	292	364	360	322	141	167	135	81
2005	129	154	195	266	123	234	398	277	443	367	382	335
2006	370	304	448	385	272	163	299	345	382	418	188	

This month's top posters

- 8 [adse...@examscam.com](#)
- 5 [msto...@fum.de](#)
- 5 [yam...@gmail.com](#)
- 5 [VmmS](#)
- 5 [topgun...@126.com](#)
- 4 [sand...@mcsil.com](#)
- 4 [rja...@us.ibm.com](#)
- 4 [y...@us.ibm.com](#)
- 4 [adwo...@pulpjava.com](#)
- 4 [khai...@vucominc.com](#)

All time top posters

- 268 [mever_oli...@gmx.de](#)
- 163 [saro...@hotmail.com](#)
- 153 [p...@none.com](#)
- 149 [Arvind Srinivasan](#)
- 131 [juanma_marti...@es.ibm.cor](#)
- 116 [jru...@jruske.com](#)
- 88 [f...@inf.ufsc.br](#)
- 87 [balakis...@yahoo.com](#)
- 75 [pvwet...@nospam.please.ho](#)
- 75

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group **ibm.software.websphere.portal-server**

Activity: Medium - 50 recent authors
 Description:
 Categories: [Usenet: ibm.software.websphere.portal-server](#)
[Language: English](#)
[Activity: Medium](#)
 Access: • Public - Usenet
 Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001							4			3		
2002		2	1			5				1	76	340
2003	435	380	375	402	392	381	360	422	465	425	202	241
2004	277	492	518	366	292	364	360	322	141	167	135	81
2005	129	154	195	266	123	234	398	277	443	367	382	335
2006	370	304	448	385	272	163	299	345	382	418	188	

This month's top posters

- 8 [adse...@examscam.com](#)
- 5 [msto...@fum.de](#)
- 5 [yjam...@gmail.com](#)
- 5 [VmmS](#)
- 5 [topgun...@126.com](#)
- 4 [sand...@mcsil.com](#)
- 4 [rja...@us.ibm.com](#)
- 4 [y...@us.ibm.com](#)
- 4 [adwo...@pulpjava.com](#)
- 4 [khol...@vucominc.com](#)

All time top posters

- 268 [meyer_oil...@gmx.de](#)
- 163 [saro...@hotmail.com](#)
- 153 [n...@none.com](#)
- 149 [Arvind Srinivasan](#)
- 131 [juanma_marti...@es.ibm.com](#)
- 116 [iru...@iruske.com](#)
- 88 [f...@inf.ufsc.br](#)
- 87 [balakis...@yahoo.com](#)
- 75 [pwet...@nospam.please.ho](#)
- 75

Appendix 6: Seventeen (17) sample reports of message statistics from ibm.software communities

About this group: [ibm.software.websphere.application-server.as400](#)

Activity: Low - 3 recent authors

Description:

Categories: [Usenet: ibm software websphere application-server](#)
[Language: English](#)
[Activity: Low](#)

Access: • Public - Usenet

Feeds: [Latest 15 messages \(RSS\)](#) - [View all available feeds \(RSS and Atom\)](#)

Archive

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000				4	151	144	191	245	122	217	245	239
2001	361	212	415	328	294	245	273	266	147	185	171	103
2002	199	146	170	151	253	156	121	133	80	95	81	49
2003	178	104	155	144	98	119	97	77	63	78	53	50
2004	64	72	72	58	57	29	72	57	29	29	44	21
2005	28	23	18	20	24	20	11	26	15	44	24	11
2006	19	11	13	1	3	9	11	7	5	6	7	