KNOWLEDGE SHARING AND GLOBAL COLLABORATION ON ONLINE KNOWLEDGE EXCHANGE PLATFORMS

by

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Abstract

KNOWLEDGE SHARING AND GLOBAL COLLABORATION
ON ONLINE KNOWLEDGE EXCHANGE PLATFORMS

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This thesis reports on three empirical studies that focus on questions concerning knowledge sharing and construction in communities of practice and global knowledge exchange platforms.

The first essay presents an exploratory case study on a particular academic community of practice — *AISNET* and its central knowledge exchange platform, the *ISWorld Mailing List* — over a four-year period from 2002 to 2006. Using content analysis of archival data, the study not only finds that this particular case of knowledge platform offers a highly efficient communication tool for knowledge dissemination to the IS community but also that its usage has been shifting strongly towards information broadcasting and away from interactive knowledge exchange and creation.

The second study investigates the major drivers of internationalization of online communities of practice. A research model is presented, that extends conventional approaches based on differences in economic and technological infrastructure. The model also incorporates language proficiency and cultural differences as additional major factors that determine active user participation. Using panel data across six years (from 2002 to 2008), I examined the antecedents of digital inequality on AISNET knowledge platform. The results of the study

confirmed previous digital divide research that found that economic and technological conditions are positively associated with the active usage of global online resources.

The third study further extends the research model developed for study 2. In this model, the multi-language options of knowledge platforms are proposed to mitigate the effects of language and socio-cultural barriers. In the test model, other platform features such as platform type ("brick-and-click vs. pure click") and platform focal country ("United States vs. Non United States') are included as antecedents. Using a data set comprising of two-hundred leading online knowledge exchange platforms, the test results regarding national factors are consistent with all of the hypotheses proposed except for the effect of technological readiness, which shows significant negative effects. In terms of platform features, availability of a multi-language option shows significant moderating effects on language barriers but not on cultural distance.

The thesis concludes with a discussion of the linkages across the three studies and the key contributions of my research, and some suggestions for possible future research.

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CHAPTER 1: RESEARCH AGENDA

This thesis is concerned with problems that arise in online communities that are organized around Internet-based platforms and designed to support knowledge creation and sharing and to foster collaboration among community members, possibly in global settings. More specifically, this research examines the question of how knowledge is constructed and shared in collaborative processes, and I am focusing my attention on those that are supported by online knowledge exchange platforms, which have become increasingly important and prevalent in the era of the global knowledge society. Knowledge exchange platforms refer to online platforms, which contain knowledge repositories and support interactive communications among users. I present three specific empirical studies that contribute to a better understanding of the phenomenon.

The first study is explorative and uses a particular case of a global online community of practice to document and discuss knowledge sharing and knowledge creation activities and collaboration. It finds interesting asymmetries across different participation levels (e.g., knowledge dissemination vs. interactive knowledge construction activities) and also points to the presence of digital inequality in terms of usage of the community's knowledge platform from member of different countries. Following up on this finding, the second study develops a formal, testable model that explains the antecedents of internationalization (based on the data from this particular case). The third study extends the model to include a platform design variable and tests

the model on a data set drawn from a sample of two-hundred leading online knowledge platform web sites.

My research indicates that contrary to the popular beliefs that advances in information technology have leveled the playing field which should particularly apply to non-profit oriented knowledge platform services, substantial friction remains, even when technological and economic barriers to access are largely removed. Cultural differences at the national level play a crucial role in regards to when and how people from different countries utilize the available knowledge resources. However, as discussed in the current management literature, a number of important issues continue to require more work, such as the conceptualization of internationalization and measurement of cultural distance.

1.1 Introduction

Knowledge has been recognized as the fundamental key to success for both organizational and individual knowledge workers; it has drawn increasing attention from researchers in both organizational management and information systems. The advancement of information technologies, especially those related to the internet, has brought new meanings to issues regarding traditional knowledge dissemination and sharing, professional training, and knowledge creation. The interactive possibilities of information technology platforms and systems encourage active forms of participation from their individual users and have the potential to harness their contributions. Various online knowledge platforms leverage information technology to propel knowledge creation and collaborative work to a higher level,

both within and across organizations, and possibly across countries. Such knowledge platforms are strategic resources for both individual users and organizations.

Although fully aware of the importance of these knowledge platforms, both practitioners and academic researchers face challenges to successfully design and implement such knowledge platforms (Alavi and Leidner 2001). Knowledge management on online platforms is a multifaceted issue, demanding both micro and macro perspectives, and involving both qualitative and quantitative research methods. At the micro level, the effects of the design features, users' characteristics, group composition, and task orientation are specific issues that have been investigated previously in the literature about user acceptance and technology usage. At the macro level, extant research has considered the alignment between the objectives and implementation of knowledge platforms, and the development of knowledge platforms over time and across nations. In terms of research methods, qualitative and quantitative methods play quite a different role in revealing facts and understanding about knowledge platforms. Qualitative methods offer more detailed and richer descriptions about how a knowledge platform develops and evolves over time. On the other hand, quantitative methods are used to propose and validate predictive models regarding specific aspects of a knowledge platform.

In the previous literature, the usage and adoption of information systems have been overwhelmingly investigated with survey research methods, which are appropriate to proxy the behavioral intention of the users (e.g. Jarvenpaa and Staples, 2000). Contrastingly, the three studies in my thesis measure the active participation of users by using secondary, archival, and web trafficking data; these data can more accurately indicate to what extent users are involved in the knowledge sharing and creation activities on the platforms. Since knowledge contains both

explicit and tacit components, knowledge cannot be simply treated as deliverable artifacts (Nonaka, 1994; Nonaka and Takeuchi, 1995). On knowledge exchange platforms, active participation and involvement, which help users to efficiently clarify ambiguities and construe meanings, is emphasized throughout my research.

In my doctoral dissertation, I investigate from multiple perspectives and with multiple research methods, research questions about how to explain the active usage of knowledge platforms and how platform owners (or sponsors) can bridge existing gaps between users with different backgrounds.

1.2 Research Outline

In Chapter 2, I conduct a qualitative study using content analysis on an academic community of practice—AISNET. Online communities of practice represent typical knowledge management initiatives, usually sponsored by organizations or professional associations. AISNET and its central knowledge platform—the ISWorld mailing list, sponsored by the Association for Information System (AIS), form a major online community of practice for information systems educators, researchers, and professionals, globally. In the case study, I investigate the IS World Mailing List at both the macro and micro level. At the macro level, I examine the alignment between the observed performance of the mailing list and the key objectives of the AIS organization, as well as the evolution of the list's communication and collaborative knowledge activities over time. At the micro level, I attempt to profile users' involvement at different communication levels based on their characteristics, such as gender and

nationality, and explore the relationships between user characteristics and communication patterns.

The main aim of the study is to identify the what role ISWorld plays in practice, in terms of helping to fulfill the AIS's objectives, and to understand how this particular community conducts collaborative knowledge processes over its online platform. While I find that the list is a very efficient tool for dissemination of knowledge, I also find that the list is gradually moving away from supporting more interactive knowledge construction and exchange. I strongly believe that the IS World mailing list performs a valuable service in helping disseminate information to the IS academic community, but I hope that the reduced interactivity in the mailing list is compensated by other tools that could support interactive knowledge exchange. Based on data concerning these aspects, I offer some recommendations for design-, management-, and governance-related enhancements of ISWorld and related tools in order to improve overall communication and knowledge effectiveness, and to achieve better alignment with the organizational objectives of the AIS.

In the case study, users from various countries tend to use the ISWorld mailing list quite differently. There are gaps between the users from English speaking countries and those from non-English speaking countries and between the users from economic advanced countries and those from economic underdeveloped countries. To thoroughly investigate the phenomenon of digital inequality on knowledge platforms I propose, in Chapter 3, a causal research model about internationalization of knowledge platform based online communities of practice. In the model, at the national level, economic advancement, technological readiness, social cultural differences and language proficiency play significant roles in predicting the internationalization of online

communities of practice. Using panel data across six years, I investigate the antecedents of digital inequality on AISNET. The results not only confirm previous digital divide research that found that economic and technological conditions are positively associated with active usage of global online resources, but also suggest that digital inequality factors at the national level, cultural distance, and language deficiency are negatively associated with active usage of global online resources.

In the following chapter, I extend the research model of internationalization of knowledge platforms by adding a platform feature variable—multi-language options— as a moderator. Specifically, I propose that multi-language options for using knowledge platforms can mitigate the effect of language barriers and socio-cultural barriers. I identified two-hundred leading internationalized knowledge platforms through the directory of the web site information firm that tracks Internet traffic and metrics known as Alexa.com. Web trafficking statistics, web features, and national level indicators were collected for the study. In order to measure internationalization of different knowledge platforms across countries, I develop an instrument of internationalization of knowledge platforms derived from web statistics and national internet users. I conducted multiple linear regression analyses to test the research hypotheses proposed with the research model. In terms of national factors, the testing results are consistent with the hypotheses except for the role of technological readiness. The opposite effects of technological readiness in the study are believed due to the sample selection and the abundances of local knowledge resources in technological advanced countries. In terms of platform features, the test results show that multi-language options can substantially mitigate effects of language barriers, but cannot effectively mitigate the effects of cultural barriers.

In Chapter 5, I summarize the findings and contributions of the three studies. I also suggest the implications of the findings. To promote knowledge sharing and creation activities, more interactive and effective communication media are suggested in the design of knowledge platforms. To mitigate cultural barriers, I recommend a personalized interface design and the use of multi-language options. I conclude the dissertation by outlining some possible future research directions.

CHAPTER 2: AN EXPLORATORY STUDY ABOUT AIS/ISWORLD

2.1 Introduction

The term community of practice (CoP) refers to groups of people who hold similar domain knowledge or expertise, who communicate informally with one another, and who share knowledge on an ongoing basis (Lave and Wenger, 1991; Wenger et al., 2002). Innovations in Internet and other information technologies have enabled the development of online communities of practice in which individuals can share knowledge and express opinions about topics of interest and deepen their understanding and expertise through interactive electronic communication (Preece, 2000; Schoberth et al., 2003). Professional online communities can help organizations and individuals build social contacts and relationships and acquire critical knowledge to answer questions and solve problems (Wenger, 1998; Jones and Rafaeli, 2004).

In the academic area, researchers and educators participate in various virtual communities to pursue and share useful professional, social, and research-related information (Matzat, 2004). In the Information Systems (IS) area, the Association for Information Systems (AIS) organization and its members constitute the most important community of practice. Their virtual offspring, aisnet.org, offers a number of features and resources for the community, including the widely adopted ISWorld Mailing List. The mailing list represents an online knowledge exchange platform that the AIS has made available for the IS community. Used along with other computer-mediated tools, ISWorld is critical to the fulfillment of the AIS's stated organizational mission and objectives.

In this chapter, I investigate the ISWorld Mailing List at both the macro and micro level. At the macro level, I examine the alignment between the observed performance of the mailing list and the key objectives of the AIS organization, as well as the evolution of the list's communication activities over time. At the micro level, I attempt to profile users' involvement at different communication levels based on their characteristics, such as gender and nationality, and explore the relationships between user characteristics and communication patterns. The main aim of the study is to identify the role ISWorld plays in practice, in terms of helping to fulfill the AIS's objectives. While I find that the list is a very efficient tool for dissemination of knowledge, I also find that the list is gradually moving away from supporting more interactive knowledge construction and exchange. I do believe that the IS World mailing list performs a valuable service in helping disseminate information to the IS academic community, but also hope that the reduced interactivity on the mailing list is going to be compensated for by other tools that could support interactive knowledge exchange. Based on data concerning these aspects, I suggest some guidelines for design-, management-, and governance-related enhancements of ISWorld and related tools in order to improve overall communication and knowledge effectiveness and to achieve better alignment with the organizational objectives of the AIS.

This chapter is organized as follows. In the section 2.2, I briefly introduce the Association for Information Systems, describe the ISWorld Mailing List and highlight the institution's organizational mission. In Section 2.3, I discuss the theoretical foundation and the coding scheme I use for the content analysis of our data. In Section 2.4, I report on the data collection and content analysis process. In Section 2.5, I present the results of our analysis. In Section 2.6, I summarize the chapter and discuss some implications of the study and conclude

with suggestions for the AIS on how to better use the ISWorld list and other, similar knowledge platforms and communication tools on its web site.

2.2 AIS, AISWorld Net, and the ISWorld Mailing List

2.2.1 AIS and AISWorld Net

The Association for Information Systems was founded in 1994 and is considered the premier global organization for academicians in Information Systems[1]. The AIS has been recognized for taking a leadership role among the various IS research communities (Loebbecke et al., 2003). Fostering a professional community for IS educators, researchers, and professionals is one of its primary missions. The AIS hosts international conferences, promotes IS research and education, publishes books and journals, and cooperates with other organizations that share similar purposes. Special interest groups have been established for a number of important, specific research areas in the Information Systems discipline. More than twenty local chapters are located in different countries and regions throughout the world.

Content on the AIS website is organized by categories such as "Today's ISWorld," "Research and Scholarship," "Teaching," "Professional Activities," and "Country and Language Group Pages." The first category, "Today's ISWorld", gives an overview of AISWorld Net and provides access to various knowledge repositories such as JAIS, CAIS, eLists, eLibrary, and Directory. JAIS and CAIS are two IS journals sponsored by AIS. The eLibrary offers online access to conference proceedings and journal articles. The website also contains a link to a

[1] Association for Information Systems; < http://home.aisnet.org/ >.

directory of professional affiliations and contact information of individual AIS community members. The link to the eLists section connects its members to three mailing lists, including the subject of our study: the ISWorld Mailing List.

Table 2.1: AIS Online Community Goals and Objectives	
General Community Goals	**Original Specific Objectives from the Mission Statement**
Knowledge Management	**Knowledge Repository:** Providing access to information related to research, teaching, and our professional activities. **A Learning Organization:** Learning through immediate worldwide availability of examples and summaries of phenomena. **Theory Development:** Seeking to find or formulate theories that will permit the generalization of our experiences and research.
Social Networking and Professional Development	**Linked to Practice and Policy:** Bringing universities, governments, and the private sector more closely together. **Builders of the Future:** Being at the forefront of the design of a networked global world through action research. (Helping to build a networked world requires that we help create that world.) **Recognizers of Accomplishment:** Creating designs that capture and disseminate the contributions of individuals and institutions. **Distribution Channel:** Controlling (i.e., pulling versus pushing) access to the information systems academic marketplace throughout the world.
Community Development	**Evaluators of Our Enterprise:** Testing through use and experimentation the systems and knowledge repositories we design and build. **Open in Our Operations:** Maintaining open access to information about and governance of ISWorld Net. **Distributed in Our Management:** Providing common goals, structure, and tools while leaving implementation in the hands of individuals or institutions.
Universal Access	**Committed to Freedom:** Embracing the democracy of unfettered access to information. **Advocates for Universal Access:** Striving for equal access to information.

According to the community's mission statement, the website was designed and is maintained to:

> *"… provide information management scholars and practitioners with a single entry point to resources related to information systems technology and promote the development of an international information infrastructure that will dramatically improve the world's ability to use information systems for creating, disseminating, and applying knowledge."* [http://www.aisnet.org[2], emphasis added]

It further lists twelve specific objectives, which I have abstracted, for the purpose of this study, into four general and larger online community goals: knowledge management, social networking and professional development, community development, and universal access (cf. Table 2.1).

2.2.2 The ISWorld Mailing List

The ISWorld Mailing List is a major online knowledge exchange platform and communication channel for members in the IS community. In addition to online communication, various academic conferences and workshops serve also as forums in which the ISWorld users may interact in more traditional face-to-face contexts. The ISWorld Mailing List is unique in that it provides global online connections for all IS academic professionals across different regions and specific interests. Therefore, participation in the ISWorld listserv in the form of either receiving or sending emails is considered a leading indicator of member involvement in the AIS community (Te'eni and Schwarz, 2004). The typical subscribers to ISWorld Net are IS researchers and educators. ISWorld introduces itself as follows (ISWorld Net Webpage, 2006).

[2] Retrieved on February 29, 2008.

> *"We believe that our worldwide community consists of approximately 5,000 [people] of whom many are accessible through our faculty directory. Approximately 2,500 of them also monitor ISWorld, our discussion list."*

The inaugural ISWorld message was posted on November 14, 1994. From the list's archive, users can retrieve messages from 1994/11/14 to 1998/11/30 and again from 2002/04/01 to the present day. Unfortunately, however, because of technical problems that occurred when the list migrated to a new host system, some messages posted during the period 1994/11/14 through 1998/11/30 were lost. Thus, in this study I take our sample only from the continuous data—that is, the messages posted from 2002/04/01 through 2006/04/30. Since September 2001, list activities have been governed by a set of strict rules (cf. Appendix A). For example, administrators have enacted a policy of banning advertisements, file attachments, and duplicate postings in order to reduce irrelevant postings and information overload. List members can post any question related to research, teaching, or academic administration on the ISWorld listserv. Readers are encouraged to respond directly to the information-seeker off-list, instead of broadcasting back to the entire community. The information-seeker is then urged, once he or she has collected sufficient responses to the question, to post a summary of such responses to the list. ISWorld discourages off-topic postings and only permits discussion that is "directly IS-related and of significant importance to a large majority of ISWorld subscribers (ISWorld Net Webpage, 2006). These list policies and norms are typical practice in many online professional communities with a large number of subscribers. They help to establish focus and relevance, control information overload, and avoid redundancy.

2.3 Theoretical Perspective

In order to analyze list performance and evolving communication patterns, we draw on previous research in the communication studies literature. In particular, I use the construct *interactivity* as a theoretical concept with which to examine the communication patterns of the ISWorld users over a four-year period. I distinguish two levels of communication—one-way communication and two-way communication—to develop the code scheme we used to analyze the observed data. It is important to point out that two-way communication is theoretically linked to two key aspects of knowledge management: 1) knowledge exchange and reuse and 2) knowledge creation and construction.

2.3.1 Interactivity

Interactivity is a useful construct for mapping out computer-mediated communication (Rafaeli, 1988; Lowry et al., 2009). It is a process-related construct that is independent of the communication medium. It can vary in intensity depending on the particular task and communication process. The specific implementation of a communication process strongly impacts the level of interactivity that the communication tool can effectively support. People have a need for interaction and a certain level of interactivity during communication can satisfy that specific need as well as motivate people to communicate with others more actively (Rafaeli and Sudweek, 1997). Theoretically, the interactivity construct is strongly related to various outcomes in communication settings such as acceptance and satisfaction, engagement, performance quality, learning, openness, and sociability (Rafaeli, 1988). In particular, Lowry et al. (2009) have proposed a computer-mediated communication interactivity model and shown that interactivity improves communication quality and increases process satisfaction among the

members of a work group that has participated in the communication process. However, research in human-computer interaction (HCI) has also shown that too much interactivity can cause fragmentation of knowledge work processes, create disruptions, increase cognitive complexity, and thus negatively impact the overall performance of knowledge workers. This applies in particular to knowledge tasks that are well-structured and well understood so that they can be successfully completed at lower levels of interactivity (Gillie and Broadbent, 1989; Reder and Schwab, 1990; Mark, Venolia and Neustaedter, 2003). Hence, it is crucial for designers to choose the right level of interactivity when modeling knowledge work processes and implementing communication tools. Knowledge work tasks with different underlying communication processes may require different levels of interactivity to achieve task-efficient performance and user satisfaction (Bailey and Konstan, 2006).

Researchers take different perspectives—related to feature, process, or perception—to define interactivity (McMillan and Hwang, 2002). It can refer to system features in communication software like search engines or instant-messaging applications. In the process perspective, on the other hand, researchers use interactivity to indicate communication activity. Finally, in the perception perspective, interactivity describes communication that users qualitatively characterize as interactive without any real measures. These three perspectives are neither independent of one another nor mutually exclusive; on the contrary, they are strongly interdependent. The features of communication media and tools will shape user behavior in terms of different levels of interactivity. Both media features and users' communication activities will affect users' perceptions (McMillan et al., 2003). But because the study focuses on user activity, I adopt the process perspective as the most appropriate of the three when applying the interactivity construct to develop our framework for content coding and analysis.

Following Rafaeli and Sudweek (1997), and as depicted in Figure 2.1, I view interactivity as a continuum in which one-way communications represent the lower end of the spectrum and two-way communications the higher end. One-way communication refers to messages that originate from a sender who communicates declarative information to an audience that can comprise a single person or groups of various sizes. The information flow in one-way communication is largely in one direction only, from the sender to the audience, with little or no opportunity for the recipients to provide feedback. Figure 2.1 illustrates a one-way communication as a process where user U1 is sending a single message (M1) to the intended audience (online community). Examples of one-way communication processes include announcements, broadcasts, and monologues. Two-way communication, on the other hand, refers to message exchanges that start with a message from an original sender to the audience but then allow recipients to respond to the original message. The information flow in two-way communication is bi-directional. The complexity of two-way forms of communications can vary substantially depending on the specific structure of the underlying communication process. Differently structured two-way communication processes trade-off level of communication complexity with interactivity.

For example, Figure2.1 shows a simple two-way communication process (which Rafaeli also calls reactive two-way communication) where the original sender (U1) sends out message M1 to the entire community and some recipients (e.g. U2, U3, U4) react by sending messages (M2, M3, M4) that respond to M1 back to U1, who in turn may or may not decide to send out a follow-up message responding to the feedback she received (e.g. commenting on or summarizing M2, M3, M4). In this case interactivity is supported, but interactivity is limited in that users U2, U3, and U4 cannot interact directly with each other. For example, user U2 will not be able to see

the response messages, M3 or M4 that were sent by other users and relies on the original sender U1 to act as an inter-mediator and relay relevant information back to the community. While this specific, reactive, and sequential structure limits interactivity in the communication processes, it gives the original sender control which she can exercise to keep the communication focused and goal-oriented. This kind of reactive two-way communication can be an efficient way of designing tools to support well-structured information-seeking tasks like, for example, query-response exchanges.

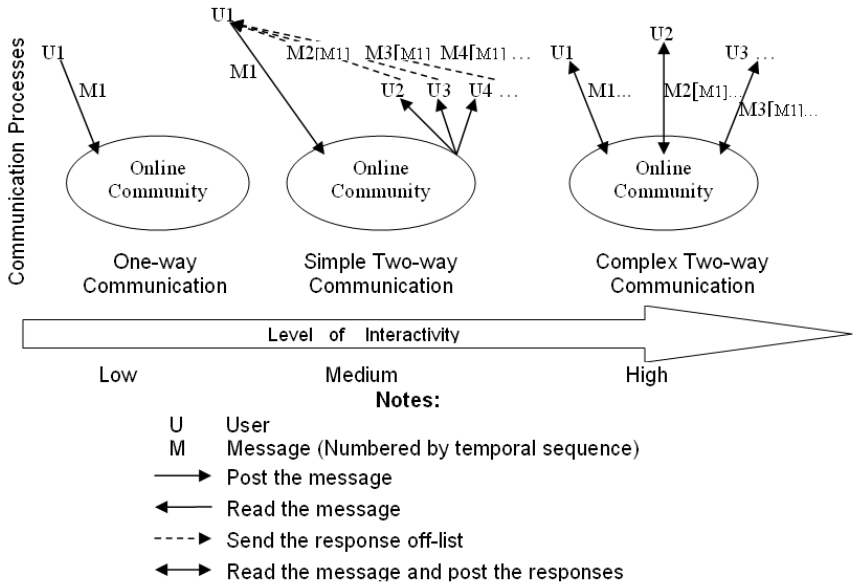


Figure 2.1: Levels of Interactivity [adapted from Rafaeli and Sudweek, 1997]

Finally, Figure 2.1 also shows a depiction of a complex (or fully interactive) communication process in which any user can jump into a discussion in any sequence and send new messages to the community that respond to both the content of previous messages on the current topic as well as to the process of the previous message exchange. This structure is highly interactive, promotes the sharing of ideas, recommendations, and opinions from multiple perspectives, and is particularly suited for unstructured knowledge tasks and exploration of novel

problems. In this case, the originator of the discussion retains very little control over the process, which can easily move in different directions with unanticipated outcomes and undefined closure. An open discussion forum would be an example of a complex communication process that is characterized by high levels of interactivity.

It has been theorized that the higher the level of interactivity of a particular medium the more it can satisfy people's need for interaction (Rafaeli and Sudweek, 1997) and increase user performance and process-outcome quality (e.g., Sicilia et al., 2005). Empirical studies also indicate that the presence of high levels of interactivity may not only positively influence user satisfaction with respect to the communication media, but may also positively impact active user participation in the media (Ghose and Dou, 1998; Coyle and Thorson, 2001; Teo et al., 2003). The literature on communities of practice suggests that community development requires its members to conduct interactive communications regularly on the issues that are relevant to their knowledge domain (Wenger et al., 2002).

2.3.2 Interactivity and Knowledge Management

The different levels of interactivity presented in Figure 2.1 are all present in the ISWorld Mailing List. People routinely broadcast messages containing information and knowledge through one-way communication channels to the entire ISWorld user community. To that extent, one-way communication processes are the preferred method to support information dissemination. For other purposes, such as exchanging existing knowledge and creating new knowledge, members of the list use two-way communication processes. A simple two-way communication in the form of a query-collection-resubmission process supports knowledge exchange and reuse in the community. Following standard list practice, members ask specific

questions (query) on the list, then collect responses from the community off-list through personal email, and finally post a summary of the received feedback to the list so that not only the original knowledge seeker but also the community in general can benefit from the knowledge sharing activity. Complex two-way communication takes place on ISWorld as well. It is mainly used to engage in open-ended discussions that generate new knowledge, as well as raise novel questions or controversial issues. In these cases, message threads pertaining to a focal issue evolve over time and contain multiple responses, opinions, judgments, and sometimes eventual solutions to problems and debates. In short, ISWorld uses forms of two-way communication that enable higher levels of interactivity to support tasks that require dynamic communication, which are primarily related to knowledge exchange, reuse, and creation. Table 2.2 summarizes how these two levels of communication support different knowledge-management functions in the ISWorld community.

Table2.2: Levels of Interactivity and Knowledge Management in ISWorld

Type of communication process	**Level of interactivity**	**KM support role**
One-way communication	Low	Information dissemination
Two-way communication (simple, complex)	Medium to high	Knowledge exchange, knowledge reuse, and knowledge construction

According to social constructivist theory, interactive communication processes provide participants with an opportunity to engage in collaborative knowledge construction (Jonassen et al., 1995). Interactive communication asks participants to explain, clarify, elaborate, and defend their contributions, yielding sense and knowledge construction through cognitive processes such as integrating, elaborating, and structuring ideas (Brown and Palinscar, 1989). Providing

effective knowledge sharing and creation platforms and inviting members to join knowledge-creating collaborations can be a strong motivator to members to contribute to developing a participatory community, especially in the context of communities of practice that are concerned with knowledge-intensive work. User involvements within and across task categories indicate how well the domain inspires and motivates member participation (Wenger et al., 2002).

Applying to the specific case of the ISWorld Mailing List the theoretical and empirical findings on the relationship of interactivity on communication quality in terms of both process satisfaction and process outcome as well as its relation to functions of knowledge management in the general context of computer-mediated communication processes that we have discussed in this section, I can put forth some design principles that leverage the potential benefits of interactivity in order to achieve its stated goal to "*promote the development of an international information infrastructure … for creating, disseminating, and applying knowledge."* (AISNET).

First, I have established that the ISWorld Mailing List is both an example of a computer-mediated communication system (an online community with a discussion forum in form of a mailing list) and an example of a knowledge management tool for the AIS community of practice in the sense that ISWorld has been deployed specifically to aid core knowledge management functions (knowledge dissemination, knowledge reuse and application, and knowledge creation). Second, I recognize that effectively supporting different knowledge management functions requires different levels of interactivity. Third, the specific communication processes that are implemented should incorporate the appropriate level of interactivity for the different communication tasks and knowledge management functions.

In the next two sections, I will empirically examine the communication patterns of the ISWorld Mailing List using content analysis and identify the specific communication tasks and knowledge management functions that the list supports and determine the level of interactivity that is present in the observed communication processes.

2.4 Content Analysis

2.4.1 Data Collection

The data I used for this study came from three basic sources: (1) the ISWorld listserv, (2) the AIS faculty directory, and (3) the World Wide Web. We used web searches occasionally to clarify the background of members whose list postings contained ambiguous information or to identify members whose records in the faculty directory were incomplete. All messages used in the study were collected from the ISWorld listserv archive. In most cases I was able to obtain member information related to the ISWorld community from the faculty directory on the AIS website, but in some cases I had to search their own personal web pages to find the data I needed.

Because of a system modification that occurred in the ISWorld archive in 2002, I faced some problems in retrieving email messages before April 2002. Hence, I limited the data set to messages sent after April 2002, for which the data is continuous, and collected all email messages (8353 pieces) posted in the 49 months from April 2002 through April 2006. Each message used included its author's name, date of posting, subject heading, and the body of the message itself.

2.4.2 Software to Aid Content Analysis

The auto-coding function of ATLAS.ti 5.0 was used in the early stage of data coding. This function helped me organize information such as author name and email address, date of posting, and subject heading into a unified spreadsheet. For the purposes of further analysis, I used MS Excel for sorting specific information fields and retrieving them from the data records. I then used SPSS to perform frequency counts of users and messages across different categories.

2.4.3 Development of the Coding Manual

The coding manual I developed has two parts. The first contains information about users while the second defines the codes for message content based on topical categories. Messages were organized along the interactivity dimension, grouped by levels of interactivity in the underlying communication process.

Coding Manual Part I: Information about the User

Given the inherent limitations of secondary data analysis, I constrained collecting user characteristics to information easily accessible in faculty directories and on the World Wide Web. This secondary source was only used if the directory information were incomplete or ambiguous. This included information about gender, occupation (academic or non-academic), academic position (if applicable), affiliation, and geographic location. Geographic location is deducted from the top-level-domain name of the corresponding email address, and this part of data is used in the study of Chapter 3, but not presented in this chapter. Coding Manual Part I (Table 2.3) shows the codes and resources used to collect the user information.

Table 2.3: Coding Manual Part I: User Information		
Code	**User Information**	**Source of Information**
i.	**Gender of User:** Male (M); Female (F); Unknown (U).	World Wide Web.
ii.	**Occupation:** Academic (1); Non-Academic (2); Unknown (3).	AIS faculty directory; World Wide Web.
iii.	**Academic Rank (if applicable):** Student (1); Post-Doc/Research Associate (2); Assistant Professor/Lecturer (3); Associate Professor/Professor/Senior Lecturer/Reader (4).	AIS faculty directory; World Wide Web.

Coding Manual Part II: Message Content Coding Scheme

The coding scheme shown in Table 2.4 is structured based on the aforementioned framework of interactivity theory. At level 1, I include eight one-way communication tasks and supporting processes that are characterized by low levels of interactivity (represented by codes 1 through 7). At level 2, there are four two-way communication tasks that are supported with communication processes with higher levels of interactivity (codes 8 to 11). The first three of them are highly structured query processes and present examples of simple two-way communications. The last process (code 11), however, refers to open forum discussions which represent instances of highly interactive, complex two-way communications. The unit of analysis used in this study is the message (posting), assuming that each message has a specific purpose that can be discerned and content-coded. A content analysis was performed on a subset of the messages posted on ISWorld in order to identify the salient communication tasks and processes

that were supported by the list. The coding scheme was developed based on the following procedure.

Step 1: Two members of my dissertation committee and me read and analyzed messages taken randomly from one of the 49 relevant months. After several meetings and rounds of discussion, we created a first draft of the coding scheme to be used later on.

Step 2: We then sampled 300 messages and conducted a pilot test. We compared and analyzed the coded results and discussed all conflicting coding decisions until agreement was reached. As a result, codes with similar meaning were combined while the definitions of some other codes were revised. This process resulted in the coding scheme presented in Table 4. This scheme satisfied the requirements of typical quantitative content analysis research methods (Bryman and Bell, 2004; Krippendorff, 1980). Importantly, the thirteen defined codes are discrete, exhaustive, and mutually exclusive categories with clear coding instructions (Bryman and Bell, 2004; page 205). While the categories themselves are mutually exclusive, some messages did not fit into just one dominant category and therefore were treated as "compound category" messages, bearing more than one category of content within the one message.

Step 3: To validate the coding scheme, we conducted two further rounds of pilot tests. In each test, we randomly sampled 200 messages from the data set of 8353 messages. Then each of the three researchers coded the data independently. Then I calculated Cohen's Kappa to measure inter-rater reliability following (Fleiss, 1981; page 225). The Cohen's Kappa values for the two pilot tests are 0.8120 and 0.8492, respectively. Both inter-rater reliabilities are higher than the recommended threshold of 0.75.

The topical categories that emerged from the data represent the knowledge tasks and communication processes that define the usage of the list by the ISWorld community.

Table 2.4: Coding Manual Part II: Message Content Coding Scheme		
Code	**Knowledge Task & Communication Process**	**Task-Process Description and Examples**
0	Ads	Spam, e.g., "Burn fat faster" and "Don't be a fuddy-duddy."
	Level 1:	**One-Way Communication (low levels of interactivity)**
1	Conference Announcements	Conference (workshop, consortium, symposiums) announcements, call for a paper, call for participation.
2a	Journal CFPs	Journal call for paper, e.g., "Special Issue of Decision Support Systems."
2b	Journal TOCs	Journal table of contents, e.g., "TOC: MIS Quarterly 26 (2) June 2002."
3	Book Announcements	Call for chapter, e.g., "Call for SA&D Volume Chapters."
4	Job Positions	Announcement of a faculty position, post-doc position, PhD position, e.g., "Job Opening: Associate Professor."
5	Administrative Announcements	Announcement of change in editorship, call for nominees, AIS announcements, conference location selection, e.g., "AIS 2002 Election Results."
6	People	Obituaries and awards, e.g., "Dr. Peter Chen to Receive IEEE-CS Goode Award."
7	Miscellaneous	Social networking newsletters and bulletins, e.g., "SIG ES meeting at AMCIS."
	Level 2:	**Two-Way Communication (medium to high levels of interactivity)**
8	Teaching Queries	Requests for course materials, textbooks, group project coordination, e.g., "Course Material."
9	Research Queries	Request for research-related assistance, e.g., "Request for Reference."
10	Administrative Queries	Request about managerial issues, e.g., "Developing a Computer/Information Security Curriculum."
11	Open Discussions	Discussing open questions and debating controversial issues, e.g., "Please comment: Is our community headed in the wrong direction?"
	Double-Coding Instances	e.g., "ISOneWorld2005-hosted by Bob Galliers" coded as 1&6. e.g., "EM-13(3) New Issue TOC & Reminder CfPs" coded as 2a&2b.

2.4.4 Data Coding

After validating the coding scheme, I coded the remaining data independently. Typically, I was able to code a message by inspecting the subject line alone. Occasionally, however, the subject line alone was inconclusive and I was unable to discern a definite primary cue in it and had to examine the body of the message for a secondary cue in order to classify the message. Thus, of the 8353 messages, 117 were double-coded and treated like two messages delivered in one envelope, and therefore counted twice, yielding a total of 8470 messages.

2.5 Data Analysis and Results

2.5.1 General Characteristics of the ISWorld Mailing List

After eliminating advertisements, spam, and other irrelevant messages, we extracted 8390 usable messages posted by 1678 unique users during the study's time period. Figure 2.2 shows the distribution of users by level of activeness (i.e., number of messages posted). The shape of the curve in Figure 2.2 largely follows a power law distribution, commonly found to describe participation in online communities (Shirky, 2008, pp 123-30). Starting from its highest point, where 582 users contributed a single message to the list during the period in question, the curve drops sharply and reaches its elbow point, depicting 52 users who posted six messages during the time period under analysis. After the elbow point, the curve flattens out and gradually approaches zero around point 50, indicating that only very few users posted 50 or more messages during the relevant period.

Previously, in Section 2.3, I theorized that the communication processes that are governing the ISWorld list can be grouped into two categories, one-way and two-communication. I further argued that one-way communication describes uni-directional message exchanges while two-way communication refers to structured and unstructured bi-directional message exchanges. In this section, I will present empirical data in accordance to the theoretical conceptualization of communication processes, that is, we will aggregate the data, where appropriate, over the individual message categories that were defined in table 2.4 and compare the aggregate one-way and two-way communications.

In the theoretical discussion, I also made a subtle distinction within the two-way communication category and called sequentially structured message exchanges simple two-way communication and unstructured message exchanges complex two-way communications (cf. Figure 2.1). However, when I analyzed the data set we found the pattern of communication between the two subcategories to be similar for ISWorld. Hence, unless when specifically noted, we will simply show two-way communications as one aggregate data category, and not show simple and complex two-way communications separately. This aggregation of sub-categories helps the paper present the comparison between one-way and two-way communication more effectively.

Figure 2.2 shows the distribution of the active list members, i.e., those who posted at least one message during the relevant period. The approximately 1400 silent users who posted no message at all were not included in the graph. Moreover, I cut off the chart's long flat tail, which represented eight additional users who contributed more than 60 messages each. These eight highly active users account for only about one-half percent of the total 1678 users but

contributed 8.7 percent of the total posted messages. (The single most active user posted 184 messages alone.)

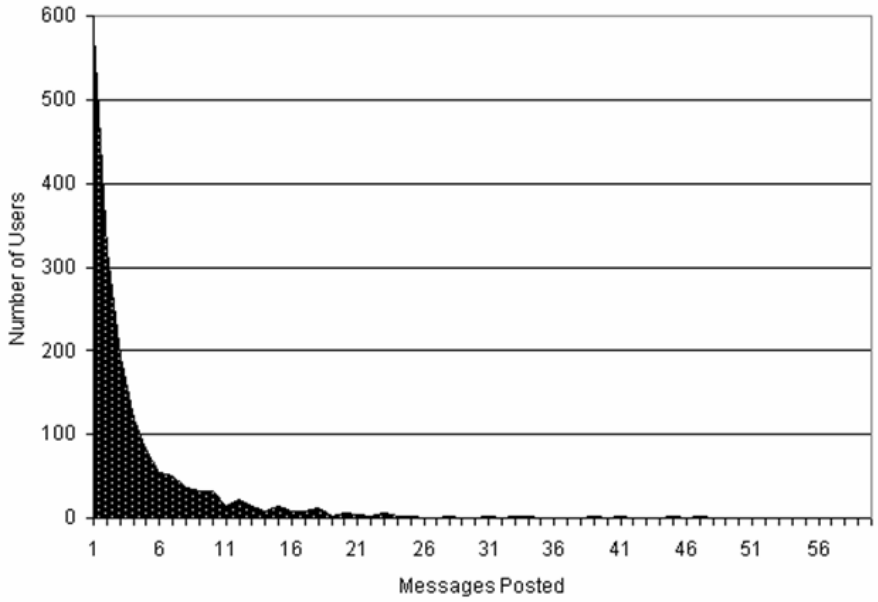


Figure 2.2 Distributions of Users by Level of Activity

Figure 2.3 displays a summary of the observed communication activities. Among the twelve topical categories, conference announcements with 3273 messages, accounts for 38.64% of the total 8470 contributions. This pattern is consistent with Te'eni and Schwarz's findings (2004)[3], in which conference attendance ranked first among community members' reasons for assessing their level of involvement. Following conference announcements, calls for journal papers, research queries, and job positions account for 9.53%, 9.37%, and 8.56% of the total messages, respectively. Interestingly, there are only 388 messages in the open discussion task category, which represents less than 5% of the total messages. It should be noted that posters use the list for their own personal, professional interests but also to post on behalf of their institution or in some other service role. The roles can overlap and are often inseparable. Not surprisingly, a

[3] However, Te'eni and Schwarz's findings were based on a survey study that used a relatively small sample of self-reported, cross-sectional data.

significant number of messages in task categories 1, 2a, 2b, 3, 4, and 5 were primarily institutional messages. However, since all messages were posted by individual community members for the purpose of communicating with the IS community, I treat them like person-to-person communications.

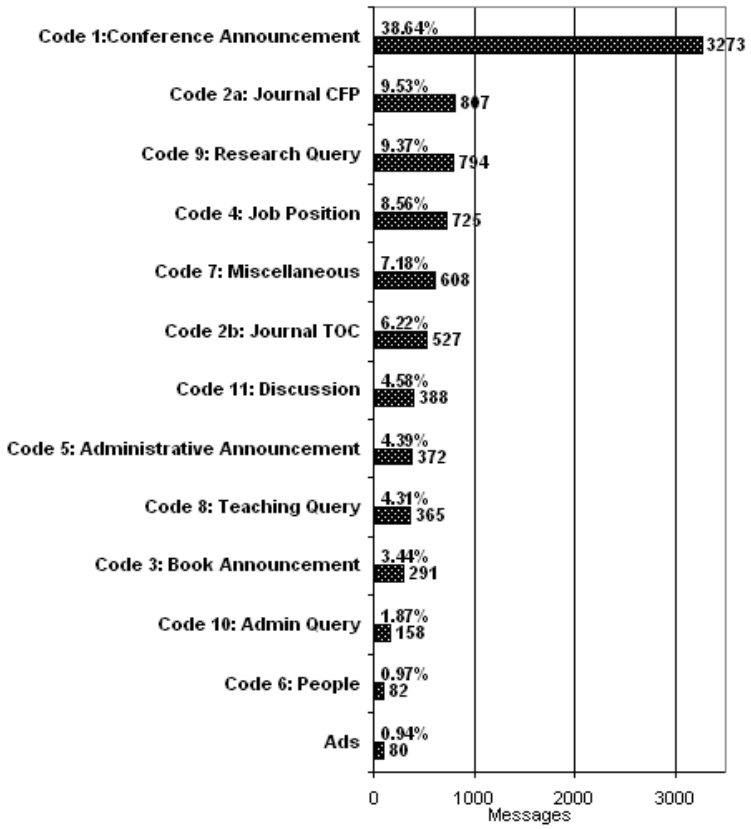


Figure 2.3 Messages Posted by Task Categories

2.5.2 Alignment between the ISWorld Design and Community Objectives

As a major knowledge exchange platform on ISWorld.org, the ISWorld Mailing List is designed to support the mission of the larger AIS online community. One-way communication processes account for most messages (78.9%), while two-way communication accounts for 20.1% of the total messages (the remaining 1% was considered spam). Table 2.5, which extends

Table 2.2, indicates that during the observed period the less interactive forms of communication dominated the list's activities. Table 2.5 also indicates the extent to which the specific communication tasks and processes that take place on ISWorld support the chief knowledge management functions.

Table 2.5: ISWorld Communication Process Type and Knowledge-Management Support

Communication Process	KM Support Role	Code	Messages	Share
One-way communication	Information dissemination	1, 2a, 2b, 3, 4, 5, 6, 7	6685	78.9%
Two-way communication	Knowledge exchange, knowledge reuse and Knowledge Construction	8, 9, 10,11	1705	20.1%

Next, I can explore the usage of the ISWorld and identify the role of the communication tool with regard to its effectiveness in achieving the community's four larger goals and objectives (as shown in Table 2.1 in Section 2.2). Table 2.6, which is an extension of Table 2.1, shows that all communication processes that support the community objectives concerning knowledge management (goal I) were two-way communications supporting tasks related to knowledge exchange, reuse, and construction. About 20% of the messages posted on ISWorld were related to knowledge management. Similarly, goal II, social networking and professional development, was supported with communication processes from the categories of information dissemination processes which combined accounted for 74.5% of all messages. A relatively small portion (4.4%) of the messages, administrative announcements, supported the objective of community development and administration (goal III). Our content analysis did not include a

task category that related specifically to universal access, which we listed as the fourth community goal. Universal access is, however, supported by aisnet.org by promoting listserv subscription to all community members. Subscribing to the list is easy to do for IS educators and researchers and free of charge.

The archival analysis shows that there are more messages about professional development and social networking than there are directly related to knowledge management. These results are largely consistent with previous survey findings by Te'eni and Schwarz (2004). But while Te'eni and Schwarz's study relied on perceptions based on survey data, this research uses actual postings. Moreover, the present study differs in terms of how the actual postings on the ISWorld Mailing List support the functions of knowledge management. The functions of knowledge exchange and knowledge construction both are supported at a much lower level (at 15.5% and 4.6%, respectively) than were similarly construed functions in the results self-reported in Te'eni and Schwarz (66% and 9%, respectively) (2004)[4].

I conclude that ISWorld serves as a highly efficient tool for dissemination of knowledge that has been widely adopted by the community to effectively support social networking and professional development, thus playing a major role in fulfilling one of the strategic goals from the AIS mission statement (goal II in table 2.6). There is also some limited support for knowledge management objectives (goal I) by taking advantage of the interactive capabilities of the ISWorld list, although the list was not necessarily designed originally to specifically address that objective as well.

[4] In addition to self-attribution bias, self-selection bias may also have contributed to the higher numbers reported in the survey.

Table 2.6: AIS Community Goals and Communication Task and Process Types

General AIS Goals	Specific Community Objectives	Communication Type	Number of Messages
I: Knowledge Management	**Knowledge Repository:** Providing access to information related to research, teaching, and our professional activities. **Learning Organization:** Learning through immediate worldwide availability of examples and summaries of phenomena. **Theory Development:** Seeking to find or formulate theories that will permit the generalization of our experiences and research.	Code 8: (365) Teaching Query Code 9: (794) Research Query Code 10: (158) Managerial Query Code 11: (388) Discussion	1705 (20.1%)
II: Social Networking and Professional Development	**Linked to Practice and Policy:** Drawing universities, governments, and the private sector more closely together. **Builders of the Future:** Being at the forefront of the design of a networked global world through action research. (Helping to build a networked world requires that we help create that world.) **Recognizers of Accomplishment:** Creating designs that capture and disseminate the contributions of individuals and institutions. **Distribution Channel:** Controlling (i.e., pulling versus pushing) access to the information systems academic marketplace throughout the world.	Code 1: (3273) Conference Announcement Code 2a: (807) Journal CFP Code 2b: (527) Journal TOC Code 3: (291) Book Announcement Code 4: (725) Job Position Code 6: (82) People Code 7: (608) Miscellaneous	6313 (74.5%)
III: Community Development and Administration	**Evaluators of Our Enterprise:** Testing through use and experimentation the systems and knowledge repositories we design and build. **Open in Our Operations:** Maintaining open access to information about and governance of ISWorld Net. **Distributed in Our Management:** Providing common goals, structure, and tools while leaving implementation in the hands of individuals or institutions.	Code 5: (372) Administrative Announcement	372 (4.4%)
IV: Universal Access	**Committed to Freedom:** Embracing the importance of democracy of unfettered access to information. **Advocates for Universal Access:** Striving for equal access to information.	N/A	N/A

The above data analysis also shows a strong link between the online community aisnet.org and its offline parent, the AIS organization. Most of the information disseminated

among the online community (pertaining, e.g., to conference administration, employment opportunities, and people's individual professional development) is directly related to community building and cultivation that takes place off-list in the real world (goal III).

2.5.3 Evolution of the ISWorld Mailing List Over Time

In this section I present a trend analysis of posting behavior on ISWorld and in order to allow me to compute quarterly and yearly figures, I am using only the first 48 months of the data set. I investigated the yearly data to study different communication-activity trends and also analyzed quarterly data to account for potential seasonal patterns.

Figure 2.4 displays the trends of the two broad types of communication processes compared with the evolution of the whole mailing list. Overall, the list grew 38.9% in terms of annual message volume over the four years considered. Of the two types of communications, one-way communication went up steadily over the observation period and contributed disproportionately to the overall trend by growing in message volume by 72% from 2002-03 to 2005-06—thus increasing its share from 69.8% to 86.6%. Clearly, the bulk of communication was in the form of message broadcasts and institutional announcements—and increasingly so. At the same time, two-way communication decreased steadily in terms of both absolute volume and share. In this category, the number of messages (231) contributed in the fourth year halved when compared to those of the first year (460), resulting in a substantial loss in communication share from 25.8% in 2002-03 down to just 9.3% in 2005-06. This result clearly indicates that the ISWorld Mailing List has been very effectively used by its community to achieve community objectives related to information dissemination, Other objectives, those linked to knowledge-

management support functions like knowledge sharing, reuse, and the construction of new knowledge, are also addressed by the list, but to a lesser degree.

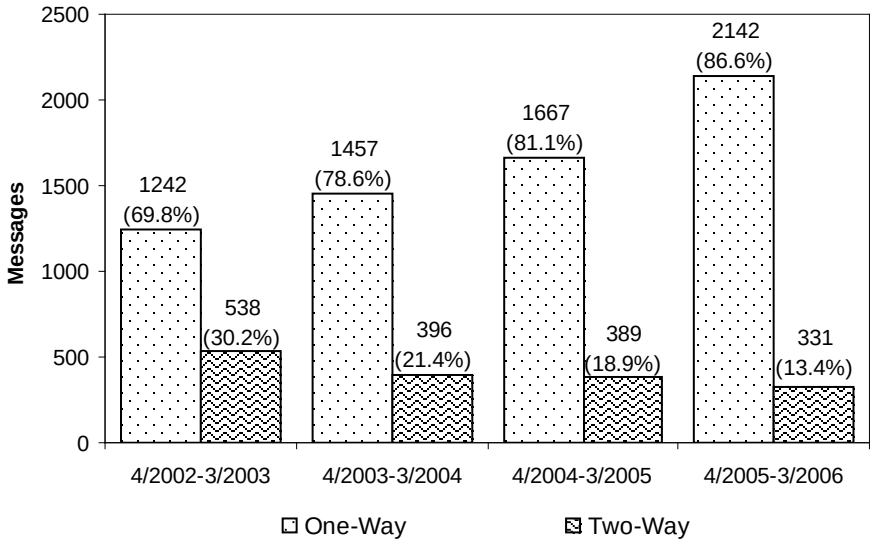


Figure 2.4 Messages Posted over Time

Figures 2.5, and 2.6 show the yearly trend for all twelve types of communication activities observed over the four-year time period. Among the eight specific types of one-way communication activities (Figures 5 and 6), conference announcement (Code #1), journal call for paper (Code #2a), journal table of contents (Code #2b), call for book chapters (Code #3), and people (Code #6) are steadily going up over time, while administrative announcement (Code #5) and miscellaneous (Code #7) show a mixed trend over time. The overall increasing trend of all of these communication activities is likely amplified by the growth of the population of ISWorld listserv subscribers over the four years covered by the study. However, job position postings (Code #4) largely went down. The reverse trend of job postings was likely affected by the external environment of the IS job market and may reflect a weakening of the market for IS

faculty openings from 2002 to 2006 rather than a fundamental switch to other, non-mailing list recruitment tools in the IS community.

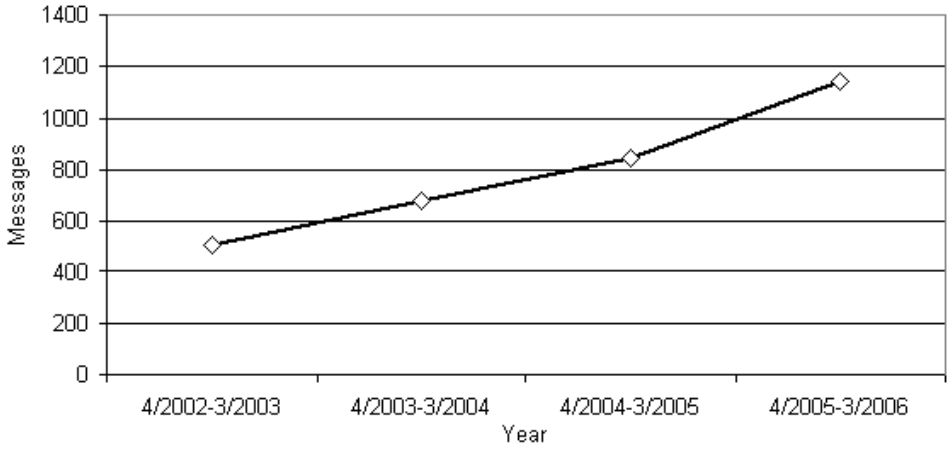


Figure 2.5 Conference Announcements over Time

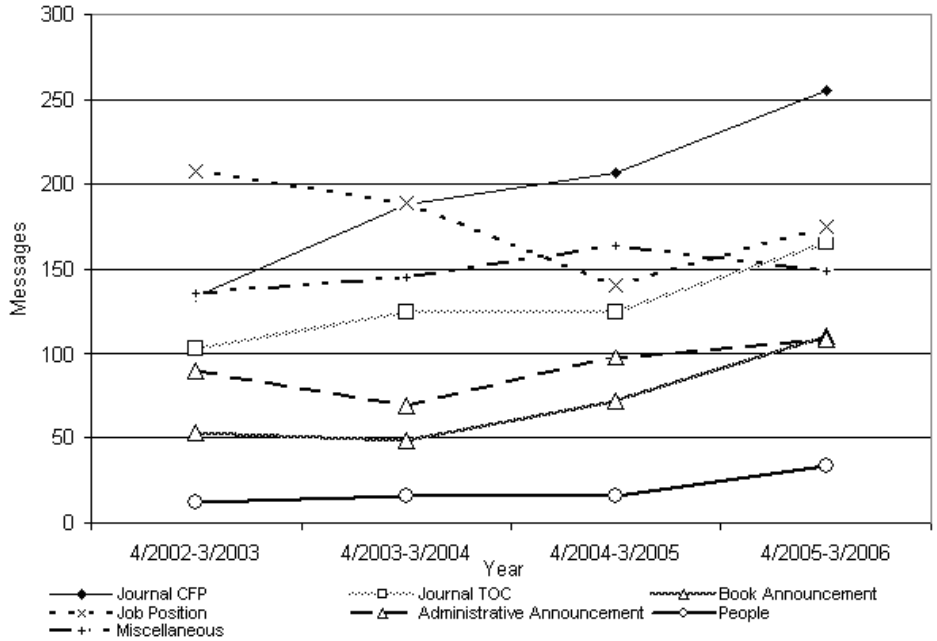


Figure 2.6 Other Announcements over Time

Under closer scrutiny, two of the eight specific types of announcements, conference and job position announcements, also show some seasonal patterns in each academic year (cf.

Appendix B, Figure B.1 and Figure B.2). Specifically, the trend lines of conference announcements and job opening announcements show strong seasonal effects, consistent with regular academic routines for each academic year.

The data analysis about communication activities over time offers us some interesting insights on several levels. For one, the trend analysis of the different communication activities we observed on the ISWorld Mailing List provides us with a detailed account of the online community life over the four-year period of 2002-2006. Also noteworthy is that two-way communication has not been keeping up with one-way communication activities as the community has grown and matured. The opposing trends—that is, the growth of one-way communication and the decline of two-way communication——show that users tend to increasingly use the ISWorld Mailing List more as an information-dissemination tool, and primarily for institutional purposes, rather than as a personal knowledge-exchange and construction tool. The steady increase in announcements (as seen in Figures 2.4, 2.5, and 2.6) reflects the efficiency and effectiveness of the list as a communication tool for the community, but also indicates the growth and maturity of the AIS on the whole.

This finding raises the question of whether the community achieves its full potential value from ISWorld. One may suggest that the list's original design and its current policies support basic information dissemination very effectively, but that the design could possibly be revisited in order to better support the fostering and sharing of individual member knowledge and stimulating construction of new knowledge and ad-hoc collaborations as well. Alternatively, ISWorld could also be redesigned to become a dedicated, focused information broadcasting service delivering community news and updates, if there are other viable alternatives to foster

interactive communication and discussion online. Later, in Section 2.6, I will return to this point and briefly discuss some possibilities of applying some new media technologies to design new communication features that specifically support interactive member communication as complements to the mailing list.

2.5.4 User Characteristics and Communication Patterns

To investigate further the communication patterns of different types of users, I looked at three more aspects. First, I counted the overall number of users and postings. This gave me an overview of participants' backgrounds and their levels of involvement in different sets of activities. Second, I counted the number of postings in each coding category for different users and calculated the concentration of the different types of users and specific communication activities. This construct serves as a scale-free measurement across different users by which we can see the percentage of effort given to a specific communication activity. This analysis helped us to better understand why people use the list and how they behave across specific communication activities. Third, I aggregated the communication activities within the level of communication interactivity and compared the posting activity concentrations.

2.5.5 Users and Level of Activity

In accordance with the definitions established by Butler et al. (2002) and Te'eni and Schwartz (2004), I use the term lead user to represent top contributors to the ISWorld Mailing List, silent users to indicate users who may read but never post messages, and active users to represent those users who posted at least one message. In this study, lead user refers specifically to an individual who posted more than 20 messages during the observation period. Active users are those who posted between one and 20 messages, while silent users, as in most other studies,

are list subscribers who did not post anything. To further differentiate the analysis in terms of participation levels, I distinguished among light, moderate, and heavy (active) usage. Accordingly, we split active users into three subgroups of equal size[7] in which light active users refers to people who posted from one to five messages, moderate active users from six to ten, and heavy active users from eleven to twenty. I determined the number of lead users and active users using the data within the 49-month observation period and estimated the percentage of various types of users using the total number of ISWorld listserv subscribers (3084) as the potential size of the online community (Table 2.7). Table 2.7 shows that the relatively few heavy active users and lead users play a critical role in the active usage of the mailing list.

Table 2.7: Silent, Active, and Lead Users

	Silent Users (0 messages)	**Light Active Users** (1 through 5 messages)	**Moderate Active Users** (6 through 10 messages)	**Heavy Active Users** (11 through 20 messages)	**Lead Users** (>20 messages)
Users (3084)	1404 (45.55%)	1297 (42.08%)	207 (6.72%)	115 (3.73%)	59 (1.91%)
Messages (8390)	0 (0%)	2689 (32.1%)	1594 (19.0%)	1671 (19.9%)	2436 (29.0%)

In analyzing the concentration of users at different levels of activity (Tables 2.8 and 2.9), I found that the more active a user is, the less likely he or she is to concentrate on two-way communication. From light active users to lead users, the concentration on teaching and research related postings go down steadily, while the concentrations on conference announcements and journal TOC-related postings go up steadily. In other words, the findings indicate that while some community members take leadership on list activities linked with information

dissemination, leaders have not (yet) emerged to spearhead list discussions or ad-hoc collaborations that require higher levels of interactivity.

Table 2.8: Messages and Concentrations by Topic and User Activeness

Users		1	2a	2b	3	4	5	6	7	8	9	10	11	Total
Light Active Users	**Messages**	921	191	35	125	437	77	17	143	176	388	61	118	2689
	Concentration (%)	**34.25**	7.10	**1.30**	4.65	16.25	2.86	0.63	5.32	**6.55**	**14.43**	2.27	4.39	
Moderate Active Users	**Messages**	668	145	54	43	140	75	16	121	69	160	34	69	1594
	Concentration (%)	**41.91**	9.10	**3.39**	2.70	8.78	4.71	1.00	7.59	**4.33**	**10.04**	2.13	4.33	
Heavy Active Users	**Messages**	712	209	156	57	93	68	8	83	51	122	32	80	1671
	Concentration (%)	**42.61**	12.51	**9.34**	3.41	5.57	4.07	0.48	4.97	**3.05**	**7.30**	1.92	4.79	
Lead Users	**Messages**	972	262	282	66	55	152	41	261	69	124	31	121	2436
	Concentration (%)	**39.90**	10.76	**11.58**	2.71	2.26	6.24	1.68	10.71	**2.83**	**5.09**	1.27	4.97	

Table 2.9: Messages and User Concentration by Interactivity and User Activeness

		One-Way	Two-Way	Total
Light Active Users	**Messages**	1946	743	2689
	Concentration	72.37%	**27.63%**	
Moderate Active Users	**Messages**	1262	332	1594
	Concentration	79.17%	20.83%	
Heavy Active Users	**Messages**	1386	285	1671
	Concentration	82.94%	17.06%	
Lead Users	**Messages**	2091	345	2436
	Concentration	85.84%	14.16%	

2.5.6 Gender Differences

Among the 1678 community members who posted messages, 1270 men posted 6792 messages and 376 women posted 1523 messages (Table 2.10). An additional 50 messages were posted using the names of organizations; no gender was attributed to these. For another 22 users responsible for a total of 25 messages, we were not able to determine the senders' gender.

Table 2.10: Gender and Messages Posted			
	Users	**Messages Posted**	**Average Messages**
Male	1270	6792	5.34
Female	376	1523	4.05
Unknown	32	75	2.34
Total	1678	8390	

Regarding involvement in various message categories, there are no significant gender differences in the twelve communication categories (Tables 2.11 and 2.12)—with the important exception of open discussions (code #11), which interestingly represents the only complex two-way communication category. On average, 5.09% of total postings by men were contributed to open discussion, while only about half that percentage (2.59%) of total postings by women went to this category. This finding suggests that men tend to dominate open-discussion threads on ISWorld wherein participants state and defend opinions, argue positions, and propose solutions to open questions.

Table 2.11: Messages and User Concentration by Topic and Gender														
		1	**2a**	**2b**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Total**
Female	**Messages**	622	120	77	34	135	88	21	166	46	153	22	39	1523
	Concentration (%)	40.84	7.88	5.06	2.23	8.86	5.78	1.38	10.90	3.02	10.05	1.44	**2.56**	
Male	**Messages**	2612	680	446	257	585	282	61	437	316	635	135	346	6792
	Concentration (%)	38.46	10.01	6.57	3.78	8.61	4.15	0.90	6.43	4.65	9.35	1.99	**5.09**	

Table 2.12: Messages and User Concentration by Interactivity and Gender				
		One-Way	**Two-Way**	**Total**
Female	**Messages**	1263	260	1523
	Concentration	**82.93%**	17.07%	100.00%
Male	**Messages**	5360	1432	6792
	Concentration	78.92%	21.08%	100.00%

2.5.7 Academic Rank and Communication Patterns

The vast majority (91.5%) of the 1678 users who posted messages were academic users. They posted 7505 messages, which account for 89.5% of the total postings (Figure 2.7). I further categorized academic users into four groups based on their position and rank: 1) students, 2) post-docs and research associates, 3) junior faculty, and 4) senior faculty.

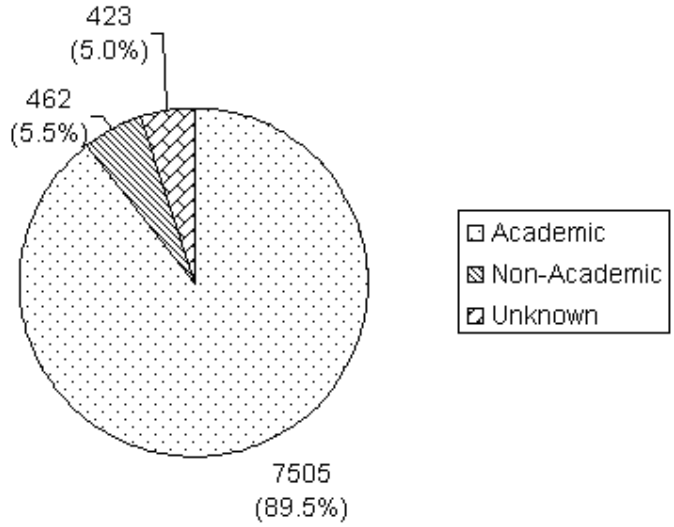


Figure 2.7 Messages by User Rank

The majority (56.2%) of active academic users are senior faculty while post-doctoral students or research associates account for only about one percent of all active academic users

(Table 2.13). This is partially because IS departments are usually housed in business schools (in Northern America and most of Europe, at least), which typically employ few post-docs or other non-faculty research associates. Among active academic users, senior faculty members proved more active than junior faculty or students. On average, every active senior faculty member posted 6.12 messages, while an active junior faculty member and active student posted only 3.58 and 2.69 messages, respectively. Although it is arguable that junior faculty would benefit the most from participation in list discussions as they develop their research skills and teaching portfolios, they are in fact less active list users than their more experienced senior colleagues.

Table 2.13: Academic Rank and Messages

	Active Users	**Messages Posted**	**Average Posting**
Student	**177**	477	2.69
Post-Doc/Research Associate	16	34	2.13
Junior	**480**	1718	3.58
Senior	862	5276	**6.12**
Total	1535	7505	

Table 2.14 shows that academic rank corresponds with different types of communication patterns. While users of different rank exhibit similar concentrations on conference announcements, they have different concentrations in the other categories. Different concentration patterns show how ISWorld meets individual users' needs differently. The main purpose of active participation in the ISWorld listserv for PhD students is to help them solve research-related problems. Junior faculty typically have some administrative and/or editorial obligations, but for the majority of them research and teaching are their priorities. Senior faculty

members, on the other hand, tend to take on more professional and institutional service responsibilities beyond basic research and teaching.

Table 2.14: Messages and Concentration by Topic and Rank														
Rank		**1**	**2a**	**2b**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Total**
Student	**Messages**	189	11		5	9	10		21	20	181	8	23	477
	Concentration (%)	39.62	2.31	0.00	1.05	1.89	2.10	0.00	4.40	4.19	37.95	1.68	4.82	
Post-Doc /R A	**Messages**	15	3		2	3	0		2	1	8	0	0	34
	Concentration (%)	44.12	8.82	0.00	5.88	8.82	0.00	0.00	5.88	2.94	23.53	0.00	0.00	
Junior	**Messages**	747	164	29	63	145	70	8	95	123	160	39	75	1718
	Concentration (%)	43.48	9.55	1.69	3.67	8.44	4.07	0.47	5.53	7.16	9.31	2.27	4.37	
Senior	**Messages**	2058	570	409	189	541	228	60	353	192	341	104	231	5276
	Concentration (%)	39.01	10.80	7.75	3.58	10.25	4.32	1.14	6.69	3.64	6.46	1.97	4.38	

The communication pattern shows that academic users' concentrations shift from two-way communication to one-way communication as their rank increases (Table 2.15). Concentrations on two-way communications went down from 48.64% to 16.45% as rank climbed from graduate student to senior faculty. However, the concentration of one-way communication went up from 51.36% to 83.55%. In other words, it seems senior faculty members find ISWorld an effective communication tool to inform the community about their own specific professional activities as well as to promote events they are involved with, and they often use it on behalf of their institutions and service functions. By contrast, junior faculty and PhD students, who tend to be primarily concerned with producing research papers and developing teaching skills and methods, use the list in a more personal and interactive fashion, to try to solve specific problems or access and share experiences with the community.

Table 2.15: Messages and Concentration by Interactivity and Rank				
Rank		**One-Way**	**Two-Way**	**Total**
Student	**Messages**	245	232	477
	Concentration	**51.36%**	**48.64%**	100.00%
Post-Doc/ Research Associate	**Messages**	25	9	34
	Concentration	73.53%	26.47%	100.00%
Junior Faculty	**Messages**	1321	397	1718
	Concentration	76.89%	23.11%	100.00%
Senior Faculty	**Messages**	4408	868	5276
	Concentration	**83.55%**	**16.45%**	100.00%

2.6 Chapter Summary

2.6.1 Limitations

The study has two major limitations. First, given the constraints of archival data, some user characteristics could not be identified accurately. Fortunately, the missing values represent only a small percentage of the entire data setting. Second, archival data provide a lot of information about the relationships between communication patterns and individual user differences, but they cannot show us user perceptions, which might convey additional information about user motivation and satisfaction with respect to participating in this online community.

2.6.2 Conclusion

The chapter reports on an exploratory investigation about how the ISWorld Mailing List has been used historically. Archival data created over 49 months were coded and analyzed. The data analysis presented in Section V supplied both macro- and micro-level perspectives of the observable usage of the ISWorld Mailing List over a four-year period. At the macro level, the analysis demonstrates the list's major functions and trends over time. At the micro level, the analysis shows different users' communication patterns.

The four major organizational goals of the AIS online community are to support professional development, knowledge management, community development and administration, and universal access. The observed use of the mailing list is largely consistent with these four objectives, although the mailing list primarily serves the professional-development-related functions. Analysis concerning the evolution of the ISWorld Mailing List shows that the list on the whole has been growing and maturing over time, but growth across different levels of interactive communication activities is unbalanced. On the one hand, one-way communication (e.g., announcement broadcasts) showed steady growth, which reflects a healthy development and cultivation of the AIS community. On the other hand, some of the higher levels of interactive communication activities, especially research-related exchanges, declined or stagnated during the period under observation. It is important to acknowledge the possibility that if the overall trend towards list usage with low levels of interactivity continues, it may in the long term reduce members' motivation to use the ISWorld list for serious discussions and eventually marginalize two-way communication.

The data analysis of the user characteristics and communication patterns shows that users with different characteristics tend to use it for different purposes and in different ways. For example, senior male members of the academic community from North America dominate the mailing list; their specific characteristics appear related to their preference for certain forms of communication. Most community members do not actively participate frequently and post very few messages. Those users who do use the list's more interactive communication features are mostly junior-level members.

Although the archival data from the ISWorld Mailing List show only the tip of the AIS iceberg, several interesting insights emerge from the study. The findings indicate that the ISWorld Mailing List generally shows healthy growth over time. It has become an increasingly valued communication platform used by its community members for various purposes. As of April 2006, its reach had extended to include at least 57 countries or regions. (It must be noted, however, that some of this observed growth may be due to the parallel growth of AIS in absolute terms, rather than the increased relative usage of ISWorld.) While the list supports various activities of community cultivation and professional development, the results were mixed in terms of supporting knowledge management functions. While communication activities at low levels of interactivity (i.e. knowledge dissemination using one-way communication) flourish, there appears to be a decline in using higher-level forms of interactive communication to also support knowledge sharing and knowledge construction. However, it might not be necessarily effective for the list to address all three objectives. Rather, one possibility may be to redesign the list by capitalizing on its current strength that is to focus even more on the role it plays in terms of knowledge dissemination, and to complement the list with new two-way communication

features and tools that are more specifically designed to address the knowledge sharing and knowledge construction objectives.

The vast majority of users exhibit mostly passive behavior on the list. Most users go to the list primarily to obtain information, not so much to actively communicate with others. A healthy community should be able to stimulate activity at a broader level. Another problem concerns user stratification. While universal access is one of the stated major objectives for ISWorld, it attracts more users with certain attributes than others. Male users and users with senior academic status tend to be the major players. This suggests that the list does not meet the needs of its community members equally. It is also a concern that the majority of potential members does not actively use the list—or, worse, does not even sign up for it. For example, PhD students arguably could be the most active users in terms of knowledge-seeking and exchange communications, but the use of the list is not geared towards offering these students a helpful platform.

There are some possible ways to address the problems. Modifying list policies, governance structure, and the technological design of the user interface and the features and tools offered to the community are potentially fruitful ways to improve ISWorld's effectiveness.

One possibility is to provide customized filters and relax list policy in order to encourage more interactive communications. Using technology to help users navigate a more complex communication space will be critical for allowing people to partake more easily in conversations they find relevant and useful for their specific needs, while also protecting them from unnecessary information that may otherwise overwhelm and deter them from participating actively in list activities. ISWorld could allow users to manage their personal accounts by

providing filter options that categorize email messages by content, purpose, and communication types. The codes we use in this paper could provide a useful starting point in constructing such categorization. In this model, since users would receive only email messages that interest them, information overload would be considerably reduced.

Another possibility is to split the ISWorld Mailing List into two or three sub-lists based either on types of communication process or user (including prospective user) attributes. If based on communication types, two basic sub-lists could be created. For example one might be an "information dissemination" listserv (one-way communication tool) and the other an "interactive communication" listserv (two-way communication tool), addressing user needs in two different respects. Given the current policy constraints of the ISWorld Mailing List, two separate mailing lists could serve the community better than a unified list. If based on user attributes, an additional sub-list could be set up for PhD students and their mentors (and perhaps similarly for junior faculty), who might benefit most effectively from better support in the areas of professional development and knowledge sharing. Finally, I would also propose better integration with related lists from local chapters and SIGs, so that members can use ISWorld as their main community platform while also interacting with colleagues on specific professional interests in refined sub-media.

To overcome some of the current technological constraints, I would suggest adopting new and more effective communication media such as social networking tools, wikis, and blogs in the ISWorld community. These tools can be used to augment the ISWorld Mailing List specifically by facilitating interactive communications. Although (in 2008) ISWorld.org launched some research wikis on its website, they have not yet drawn significant attention from

community members. While these nascent efforts to facilitate knowledge construction are a welcome development, much work remains to be done to encourage both bottom-up approaches (e.g., wikis on specific research topics initiated by members) and top-down approaches (e.g., developing marketing materials to promote the IS specialization). I strongly believe that AIS should take an active role in creating and maintaining wikis on topics in an organized manner, such as creating "official" AIS wikis, while still allowing the member-driven creation of wikis on any relevant and appropriate topic (these could be known as organic but "unofficial community wikis"). Introducing social networking capabilities would offer another powerful layer to the site[5]. All of these social media tools could provide users with better opportunities to express themselves and exchange and create knowledge with fewer boundaries. With more effective communication media harnessed to meet and perhaps even exceed the more specific needs of ISWorld's members, the traditional ISWorld Mailing List could then be used purely for its current strength: as a highly efficient tool in the dissemination of critical yet general professional community information.

Moreover, one the major objective of AIS community is to support universal access, especially AIS community expects global IS professionals could get equally involved in the knowledge sharing and creation activities through the online platform. However, there is a clear gap between the users with different nationalities, in the sense that the users from economically advanced countries tend to use the online community more actively and frequently than the users from economically underdeveloped countries. The gap between the users with different backgrounds is even widened over time. The phenomenon is consistent with the knowledge gap

[5] Since my study was conducted in 2008, AISNET has been updated couple of times (as of December 2011). Consistent with the recommendations I derived from my own research, various social media features, such as Twitter and Facebook linkages, are now available on the AISNET's platform.

hypothesis and related to digital inequality issues, which also inspired me to conduct the studies in the following two chapters.

CHAPTER 3: DIGITAL INEQUALITY IN GLOBAL ONLINE COMMUNITIES OF PRACTICE—AN EMPIRICAL INVESTIGATION OF AISNET

3.1 Introduction

In this chapter I follow up on one of the key findings presented in chapter 2, namely that significant digital inequality was present in the case of the global community of practice AIS/ISWORLD. This observed phenomenon is particularly interesting because internationalization of the community is part of the organization's mission statement and technical and economic barriers to accessing the AIS knowledge exchange platform were largely removed. Nevertheless, digital inequality in terms of active participation from members of different countries occurred. While the previous chapter revealed this phenomenon and offered some possible explanations for it, I next develop a predictive model for internationalization on knowledge exchange platforms.

In his influential book, *"The World is Flat"*, Thomas Friedman (2005) argued that globalization driven by various political (esp. increasing global trend towards democracy), economic (esp. increasing trend towards more open markets globally), and technological (esp. emergence of global connectivity though the Internet) factors have flattened the world and created a significantly more level playing field. Thus, organizations and individual users alike can now easily get access to knowledge resources made available online, with increasingly equal opportunity, largely independent of the country they reside in.

Friedman's popular argument draws on free trade theory in international trade economics (e.g. Gomory and Baumol, 2000, and Bhagwati, 2004), which generally postulates that the lowering of trade barriers will increase international trade, including the import and export of goods and services, but also – and more importantly for the purpose of this paper – the cross-border flow of knowledge and ideas. The falling cost of information and communication technologies in combination with the rapid growth of the Internet, with its open and global architecture, have profoundly lowered the barriers of exchanging information, both within and across countries. Hence, according to free-trade economic theory, we should expect, first, to see an overall increase in global information and knowledge flows. Second, we would expect a trade surplus in knowledge in the developed world (more knowledge exports than imports), and a trade deficit in the developing world (more knowledge imports than knowledge exports). Over time, this trend would reduce the knowledge gap between developed and developing world, contributing to a flatter, more equal world.

In contrast, however, researchers in international business (e.g., Ghemawat, 2001 & 2007) and economics (e.g., Stiglitz, 2006) have argued that the majority of phone calls, web traffic, and business investment are still local, and that Friedman's American-centric perspective may have distorted and exaggerated the effects of globalization.

Global online CoPs represent important interactive knowledge resources, which are developed by the community members, who are professionals working for institutions in different countries and regions. They are offered to participating users over globally accessible knowledge sharing platforms and knowledge repositories. Such global online CoPs have the

potential to transcend boundaries across nations and bridge gaps among the traditionally isolated regional communities.

However, while early digital divide research suggested that the emerging Internet communication technologies would lower the barriers to participation in online information markets and create a more level playing field, these knowledge resources are not equally used among the users from different countries, despite having the technical means and capabilities to do so. The users from the countries with specific economic or socio-cultural backgrounds have some advantage over the others and hence can use the resources in the global online communities of practice better (Siau et al. 2010). These underrepresented groups of users represent a critical example of digital inequality in the online society. The digital inequality issue, in general is a complex and multidisciplinary issue (Hsieh et al. 2008; Payton 2003). Particularly, it has not been well investigated in the context of international or global organizations and communities.

Different from the concept of *digital divide*, which narrowly focuses on the accessibility, *digital inequality* addresses more generally the different levels of usage of digital products or services among its users, including different user backgrounds and characteristics (DiMaggio et al., 2004;Kvasnay, 2002; Kvasny and Trauth, 2002). Recently researchers have highlighted the importance of developing a better understanding of the phenomenon from both theoretical and practical perspectives (Hsieh et al. 2008). Previous studies tend to construe generic predictive models of digital inequality, overwhelmingly focusing on user's intention to use a technology-supported platform based on technology acceptance literature (Hsieh et al. 2008; Merikivi and Mäntymäki, 2009). However, in global communities of practice, both national economic and

social factors play a pivotal role in shaping the users' communication patterns. Hence, in this study we incorporate the effects of users' national backgrounds to provide readers with an answer to the question why global digital inequalities remain a persistent phenomenon even when digital divides are overcome.

Drawing on the literature in the four areas of communities of practice, innovation diffusion, international business, and the digital inequality, we develop four specific hypotheses and propose a research model with three national-level antecedents, *accessibility*, *capability* and *socio-cultural distinctions*, which determine the development of global online communities of practice. The data used in the study was collected from the same international professional online community that was used in chapter 2, the Association for Information Systems (AIS), an organization of academicians in the information systems field. My empirical results indicate that high accessibility and capability are positively associated with global expansion of an online community of practice, and the socio-cultural distinctions between nations are negatively associated with the global expansion of an online community of practice.

This chapter makes two main contributions. First, it contributes to research in communities of practice by showing that digital inequalities can present a serious impediment for CoPs that aim to expand globally, even when digital divides in terms of economic and technological barriers are removed. Second, the paper also contributes to digital inequality research as it offers one of the first empirical studies that look at digital inequality factors in global setting.

3.2 Conceptual and Theoretical Background

The phenomenon of globalization of communities of practice is emerging as an important multi-disciplinary research topic as many CoPs have adopted Internet-based community platforms and started to transform into more international organizations. Three, largely independent literatures – communities of practice research, social inequality research, global innovation diffusion research –provide us with the necessary conceptual and theoretical basis to understand the phenomena of globalization of CoPs from mulitple perspectives. The first stream of literature basically conceptualizes the phenomenon of communities of practice, including online communities of practice, and defines and theorizes the various issues and contextual factors that are relevant to its development and its impacts. The second stream includes a set of studies that highlight the issue of social inequality occurring among users of information technological-based platforms. In this literature, the concepts of digital divide and digital inequality are introduced and examined, largely in terms of Internet access, Internet usage, and the usage of other information technologies. The third stream, drawing from both international business literature and innovation diffusion literature, provides us with a solid understanding about the global adoption and diffusion of technological and managerial innovations. Even though these three streams of literature do not address the phenomenon about uneven usage and development of global online communities of practice specifically, they do offer a theoretical and conceptual basis about the phenomenon from different perspectives.

3.2.1 Communities of Practice

Lave and Wenger (1991) introduced the concept of communities of practice (CoP), which refers to groups of individuals who share some common interests and expertise and sustain social

interactions informally over time. CoPs are built on a shared knowledge base, a group of competent and trustworthy members, and the meanings that are embedded in the social interactions among its members (Wenger et al., 2002; Brown and Duguid, 1991). Given the advancement of the Internet, the online extensions of communities of practices have emerged, which connect their members across temporal and spatial boundaries (Sarker et al. 2005). Researchers have formally conceptualized an online community of practice as a group of professionals, who interact around shared, work-related interests, through computer mediated communication (Wasko and Faraj,2005; Lee et al. 2003; and Preece 2000).

In online communities of practice, knowledge is shared and socially constructed through the shared practice and social interactions. A number of organizations have successfully experimented with linking their internal knowledge management initiatives with relevant online communities of practice. International organizations and multinational companies such as Shell Oil Corp., Buckman Labs, Siemens, Reuters, and the World Bank have carefully developed and cultivated online communities in order to create global knowledge network and repositories (Wenger et al., 2002; Pan and Leidner, 2003; Nielsen and Ciabuschi, 2003; Lacity, and Fox, 2008). Transcending geographical and social boundaries and attracting active users have been major objectives behind these initiatives. Therefore, communities of practice increasingly represent valuable digital resources, and can be considered an important knowledge management innovation (Rutkowski et al. 2002).

Wenger et al. (2002), however, also argued that major disorders are likely to occur in global communities of practice, including localism, disconnections and stratifications, when they cannot overcome the challenges of social and cultural boundaries. According to Wenger, social

and cultural differences are the critical barriers impeding the communication and coordination among users.

3.2.2 Digital Inequality

Research in digital inequality is rooted in sociology and is based on the premise that digital resources are not equally accessible to everyone, and even when they are, they are not evenly used among the users who exhibit different socio-cultural backgrounds. In this literature, the issues about the accessibility of digital resources are called digital divide, and the uneven usage of the digital resources are called digital inequality. Digital inequality refers to the phenomenon that people with different backgrounds tend to use digital resources, especially internet resources, in different behavioural patterns. Some of the users tend to use them more proactively, effectively or persistently than others. DiMaggio et al. (2004) emphasized that digital inequality issues cannot be solved merely through improving technology access. Researchers argued that digital inequality is grounded in deeper socio-economic inequality. The social inequality literature suggests that higher socio-economic status relates to richer resources, such as income, education and surrounding environments, which could facilitate the individuals to acquire additional resources. Warschauer (2003) argued that one of the major causes of the digital inequality is literacy. He emphasized that literacy here refers to not only technical skills but also social practice, and acquisition of literacy is not only a matter of education but also of power. Online communities of practice are a special type of digital resources. Even though theoretical and empirical studies have investigated the digital inequality issue in a variety of settings, surprisingly digital inequality in online communities of practice has not been thoroughly examined, especially not in a global context.

3.2.3 Global Innovation Diffusion

In the global context, two research areas, international business and global innovation diffusion, address how social or technological innovations get accepted across countries. International business studies address the issues of how an international business enters foreign markets, how a business establishes itself, and how it survives in the foreign environment. The internationalization of online communities of practice is similar to the global expansion of an international business in that it aims to attract customers (users) from foreign countries. The theoretical and empirical findings in international business suggest roles of national differences in the internationalization (Shane 1994, and Kim 2003). These studies show that national differences in culture and economics will affect the entry mode, and the successfulness of an international business in a foreign country (Shane 1994). Recent studies suggest that cultural distance between nations is negatively associated with the internationalization of Internet companies (Kim 2003).

The theory of diffusion of innovation indicates the various social and economic antecedents of innovation diffusion (Rogers 1983). Research in this area has addressed the phenomena of global diffusion of information technology. However, most studies in this area focus primarily on the technology accessibility side of the phenomena rather than actual usage. The empirical results of these studies show that economic factors such as GDP per capita and financial cost to access the technology constitute the major antecedents of information technology accessibility at the country level (Kiiski and Pohjola, 2002). However, more researchers argue that, theoretically, capability related factors such as literacy, language

proficiency and educational investment play important roles in predicting the usage of the technology.

Table 3.1 Summary of Literature Review

Antecedents	Indicators	Dependent variables	Key Studies	Research Literature
Accessibility Technological Accessibility Affordability Awareness Location	GDP per capita Access cost Telecommunication policy Regulatory regime and standards Property Right Infrastructure Location Urban population	ICT penetration Internet penetration Digital Wireless Growth of e-commerce	Caselli and Coleman (2001) Pohjola (2003) Hargittai (1999) Wallsten (2003) Dasgupta et al. (2001) Ho et al. (2006) Chen and Wellman (2004) Kauffman and Techatassanasoontorn (2005)	Digital divide; Diffusion of innovation
Capability Technological Literacy Technological skills Social and cognitive skills Education Professional proficiency	Human Capital English Proficiency Education Year of schooling Technology literacy Language	ICT penetration Internet penetration Digital Wireless Growth of e-commerce	Hargittai (1999) Ho et al. (2006) Quibria et al. (2003) Kiiski and Pohjola (2002) Chen and Wellman (2004) Guillén and Suárez (2005)	Digital divide; Diffusion of innovation;
Socio-cultural distinctions	National Culture Social Capital -Trust	ICT adoption e-Government Readiness ERP adoption Product diffusion US based Internet portals Entry mode of foreign company Dissolutions of International Joint Ventures	Van Everdingen and Waarts (2003) Erumban and Jong (2006) Kovacic (2005) Dwyer et al. 2005 Selwyn, N. (2004) Kim (2003) Kogut and Singh (1988) Barkema and Vermeulen (1997) Shane (1994 & 1995)	Diffusion of Innovation; Internationalization; Communities of practice

3.3 Hypotheses Development and Research Model

Digital inequality in global communities of practice is a multifaceted social phenomenon, which demands a multi-disciplinary approach incorporating the literature in communities of practice, digital inequality, and global innovation diffusion. These theories or studies suggest that at the national level, accessibility, capability, and socio-cultural distinctions are three major

drivers of digital inequality. Table 3.1 accordingly groups the relevant literature into three major categories—accessibility, capability and socio-cultural distinctions. Accessibility and capability specifically determine the access to innovation and the engagement with innovation and content, while socio-cultural distinctions determine the attitudes and motivations toward the active usage of innovations.

Global online communities of practice are socio-technical systems and present a special type of organizational innovation, one which requires active participation from its users. Online communities of practice offer communal knowledge resources, including knowledge sharing and knowledge creation platforms, which are continuously developed, used, and refined by the active participation of the individual members (von Krogh et al. 2000; von Krogh, 2002). Online communities of practice have their own identities, values, and norms, which emerge and evolve over time, and which are embedded in the sustained communications and interactions between members (Wenger 1998; von Krogh, 2002). Every active participant is an element of the dynamic and interactive knowledge network, and active forms of participation like online communication contribute to shaping the identities and norms of the online communities. The internationalization of an online CoP. is reflected by the extent to which the active participation is distributed across members from different countries. Synthesizing the theoretical findings based on the research summarized in Table 3.1, I propose the following research model for explaining and predicting active participation in global online communities of practice (Figure 3.1).

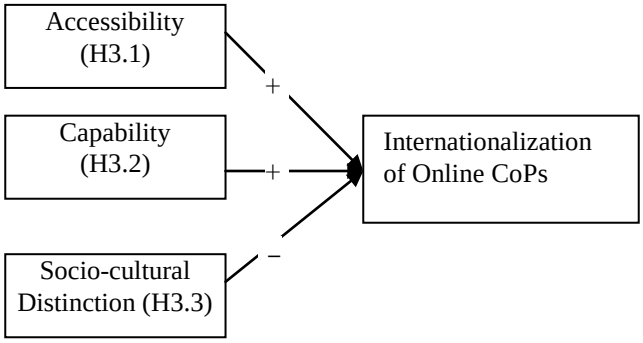


Figure 3.1: Internationalization of Online Communities of Practice

3.3.1 Accessibility

According to the digital inequality studies, there are two chief sources of inequality in the adoption of technological innovations (Dewan and Riggins, 2005; DiMaggio et al., 2004). One is the *access* to the innovation, and the other is the *ability to use* the innovation. In my predictive model, accessibility represents the technological availability and economic affordability at the national level. Various factors impact availability and affordability, such as GDP per capita, cost for Internet access, telecommunication infrastructures, regulatory regime, and national location (cf., Table 3.1). These factors represent the basic economic, political or geographical barriers to a country to access productively use ICT-based application systems (cf., Table 3.1). In this study, I employ GDP per capita (purchasing power parity method) to indicate the accessibility at the national level. Therefore, I propose

Hypothesis 3.1*: A country's GDP per capita positively affects active participation in a global online community of practice.*

3.3.2 Capability

The second type of digital inequality refers to the variations in the use of innovations, which result from multifaceted literacy (Dewan and Riggins, 2005; DiMaggio et al., 2004; Chen and Wellman, 2004). Digital inequality studies suggest that people with higher IT skills or education levels tend to know how to harness the value of Internet better than others. At the national level, education, IT skills, English language proficiency, and professional proficiency have been theorized to indicate these capabilities (cf., Table 3.1). A digital inequality study by the OECD shows that "in July 2000, more than 94% of links to pages on secure servers (almost 2.9 million links) were in English" (OECD 2001)[6]. English has become a basic professional proficiency in the global knowledge economy. In the specific case of global CoPs, both English proficiency and professional expertise are necessary personal skill sets. Thus, Hargittai (1999) employed English proficiency and education together to measure the human capital by country.

On the one hand, members in the countries with high information technology literacy typically hold high information technological self-efficacy and tend to participate in the online communication and social interaction more often. In this study, I chose the Network Readiness Index (NRI) to indicate information technological literacy at the country level. According to The Global Information Technology Reports (2001-2008), the Networked Readiness Index is

> *"defined as a nation's or community's degree of preparation to participate in and benefit from information and communication technology (ICT) development, and is a major comparative assessment of countries' capacity to exploit the opportunities offered by ICTs"*

[6] Web content in other languages has been growing strongly since 2000, but English remains the most important language for sites with international professional audiences.

The NRI, derived from the composition of items such as quality of education and research, and R&D investment, can appropriately indicate the capacity to employ the information resources, besides the accessibility of information technology. Therefore I propose

> ***Hypothesis 3.2a****: A country's NRI positively affects active participation in the online communication in global online communities of practice.*

> ***Hypothesis 3.2b:*** *A country's English proficiency positively affects active participation in the online communication in global online communities of practice.*

3.3.3 Socio-cultural Distinctions

The innovation and diffusion literature additionally suggests that socio-cultural distinctions across nations could impact the adoption of innovations (cf., Table 3.1), especially for innovations which contain cultural values and involve social interactions. These socio-cultural factors, such as norms and values can shape the individual user's attitude toward innovations. With respect to online communities of practice, these norms and values could impact user's attitude to communication and social interactions. Cultural differences can cause misunderstanding and may thus compromise communication (Wenger et al., 2002; Hofstede, 2001). In a global online CoP, cultural conflicts might hinder the development and growth of the community. Empirical studies suggest that national culture may explain cross-national innovation diffusion rates (Dwyer et al. 2005). Drori and Jang (2003) have assessed different antecedents of IT diffusion across nations and suggested that cultural factors are the primary causes. In previous research, various indicators have been employed in representing national values, norms and cultures. Among these indicators, Kogut and Singh's (1998) multidimensional

measure, culture distance, which estimates the national cultural difference between the US and the host country based on Hofstede's (1984) four cultural dimensions, is widely used in the international business and the innovation diffusion literature. Empirically, the indicator of the cultural distance shows parsimonious and nomological validity.

Table 3.2. Hofstede's Five Cultural Dimensions (adapted from Hofstede, 2001)

Cultural Dimension	Description
Power distance index (PDI)	The extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally. A high power distance index refers to a society with high level of inequality.
Individualism (IDV)	The degree to which individuals are integrated into groups. A high individualism index refers to a society in which the ties between individuals are loose and everyone is expected to look after him/herself and his/her immediate family.
Masculinity (MAS)	The distribution of roles between the genders which is another fundamental issue for any society to which a range of solutions are found. A high masculinity index refers to a masculine society in which women are less assertive and competitive than men.
Uncertainty avoidance index (UAI)	The extent to which a culture programs its members to feel either uncomfortable or comfortable in unstructured situations. A high uncertainty avoidance index refers to a society in which people try to minimize the possibility of the unstructured situations by strict laws and rules.
Long Term Orientation (LTO)	Long-term orientation, towards the future, is represented by values such as perseverance, thrift, and having a sense of shame. Short-term orientation, toward the past and present, is represented by values such as personal steadiness and stability, saving face, respect for tradition, and reciprocation of greetings, favours, and gifts.

Hofstede's (1984, 2001) national culture index is used commonly by scholars as a theoretical construct to indicate the cultural features of different countries. A key assumption of Hofstede's cultural framework is that values are stable over time. This assumption has been empirically confirmed by Barkema and Vermeulen (1997). The five dimensions of Hofstede's cultural framework can be defined and summarized as follows (Table II). The last dimension, long-term orientation, was added later to the original framework (Hofstede 2001), but

empirically, it is not yet widely applied, largely because it has only been surveyed in about 30 countries. Therefore, in the present study, long-term orientation is not included in the formal research model.

Cultural distance is an integrated constructed derived from the above four dimensions of Hofstede's national cultural dimensions. The cultural distance construct has been widely used in international business study to indicate the cultural difference between two nations. Particularly, in this study, the studied professional community of practice is established and developed in United States, and culturally is dominated by majority of American based users. Therefore, we use cultural distance between a country and the United States as a indicator of socio-cultural difference. Based on the theories and empirical findings discussed above, we propose the following hypothesis.

> ***Hypothesis 3.3:*** *Cultural distance between a country and the U.S. negatively affects active participation in an U.S.-centric global online community.*

3.4 Method

3.4.1 Research Site

The research setting of the present study is again the ISWorld mailing list of AIS website (AIS Net), sponsored by Association for Information Systems (AIS). The association was founded in 1994 and is considered the premier global organization for academics in the Information Systems field. The AIS takes a leading role in a number of IS research communities (Loebbecke et al., 2003). Fostering an international professional community for IS educators,

researchers, and professionals is one of its primary missions. The ISWorld mailing list is the major communication medium for AISWorld Net users. It has a subscription base of about 2,500 people, mostly IS researchers and educators. Through the various academic conferences and workshops, ISWorld users have plenty of opportunities to get to know other colleagues in traditional face-to-face situations. Aside from basic communication, ISWorld is an online platform supporting collaborative work among academics in the IS field. The first message was posted on November 14, 1994. In the mailing list archive, users can retrieve all messages from 1994/11/14 to 1998/11/30 and then again from 2002/04/01 to the present. Due to some glitches that arose when ISWorld switched its electronic mailing list software application, several messages were lost during the 1998-2002 interim. Moreover, while most of the data ranging from 1994/11/14 to 1998/11/30 is still available, it is not continuous. Therefore, in this study we use only the continuous data from 2002/04 to 2008/03. In the present study, we use number of total posters and number of total messages posted by country in a specific year to indicate the active participation in the virtual community of AIS.

Even though it has been a key AIS community objective to promote global collaboration and free flow of ideas across institutional and geographic boundaries, my research presented in chapter 2 suggests that the information system research community is regionally divided in terms of dominant research paradigms and practices and is generally North-America centric. It has also been found by other researchers that the majority of highly productive IS researchers come from United States when using publications in top journals as a metric – however imperfect and flawed that might be (Galliers and Meadows, 2003; Gallivan and Benbunan-Fich 2007). One of the research purposes of the present study is to identify the antecedents of the divide existing in the AIS community.

3.4.2 Data Collection and Coding

To test our four research hypotheses developed in the previous section, we collected six-year panel data from the ISWorld mailing list. The online data included messages posted from April 2002 to March 2008. Each posting contained information about the sender, date of posting, subject of message, and message content.

Table 3.3 A Summary of the ISWorld Panel Data

Year	2002	2003	2004	2005	2006	2007	Total
Messages	1757	1808	2010	2416	2643	2718	13352
Posters	676	676	676	793	885	849	4555

Notes: Data was collected from April 2002 to March 2008,
so that data of 2002 means the data from April 2002 to March 2003.

We identified message posters' country of origin through top level domain (TLD) of their email addresses, and identified conference registrants' nationality through their listed affiliations. We dropped the data from 29 message posters with 495 messages, because those could not be properly identified. The resulting data are displayed in Table 3.3. Finally, we obtained the six-year email message data including 4555 posters with 13352 messages, from 65 countries (same user, appearing in two different years, were counted twice). A total of 71 countries at least posted one message once.

3.4.3 Measures

Dependent Variables:

The dependent variable *active participation of a country in the online CoP* is measured by the number of posters and messages posted in a specific year.

Independent Variables:

GDP per capita [ppp method] --- yearly data about GDP per capita were collected from the World Bank.

Network Readiness Index (NRI) --- yearly data were collected from World Economic Forum. The values of the NRI in year 2003 and 2005 were normalized based on the other four-year NRI data. The NRI is based on multi-item survey data. While the basic research model and survey items were unchanged, two different methods were applied to aggregate the multi-item results into one index. The two different methods of aggregation resulted in two types of scales. In 2002, 2003, 2006, and 2007, NRI figures were reported on a scale of 1 to 7, but in the reports of year 2004 and 2005, the NRI was reported mostly on a scale between -3 to 3. To normalize the NRI's scale in year 2004 and 2005, we applied the following transformation. After the normalization, the new NRI scale in year 2004 and 2005 had same variance and mean as the scale in other four years.

$$X = \frac{\sigma}{\sigma_1}(X_1 - \mu_1) + \mu \qquad (3.1)$$

Where:

μ_1 =Mean of the NRI in year 2004 and 2005;

σ_1 = Standard Deviation of the NRI in year 2004 and 2005

μ = Mean of the NRI in year 2002, 2003, 2006, and 2007;

σ = Standard Deviation of the NRI in year 2002, 2003, 2006, and 2007

X_1 =Specific NRI score in year 2004 and 2005;

X =Normalized score of X_1

English Language Proficiency-- A dummy variable "Native English Speaking Country" was generated for the seven native English speaking countries other than the US—United Kingdom, New Zealand, Australia, Canada, Ireland, South Africa, and Jamaica. Since it is very difficult to create a precise measure for English Language Proficiency, I use the dummy variable of "Native English Speaking Country" as a proxy for *English Language Proficiency*.

Cultural Distance-- I chose the United States as the focal point of the AIS CoP due to the fact US that the community was originally founded in the US and has dominated in terms of membership, influence, and resource provision. To calculate cultural distance, I applied the four standard dimensions of Hofstede's (1984, 2001) culture index: power distance, individualism, masculinity, and uncertainty avoidance. The values for cultural distance between the US and the other countries were computed using the following method (adapted from Kogut and Singh 1988):

$$CD_j = \sum_{i=1}^{4} \{(I_{ij} - I_{iu})^2 / V_i\} / 4 \ , \qquad (3.2)$$

Where:

CD_j = cultural distance from the U.S. to the *jth* country,
I_{ij} = the index for the ith cultural dimension of the *jth* country,
I_{iu} = the index for the *ith* cultural dimension of the U.S., and
V_j = the variance of the index of the *ith* dimension.

The cultural difference index represents an average of the normalized squared deviations on each of the four dimensions of cultural difference in which the reference value is taken to be the cultural index of the U.S. Using the above formula, we have calculated the cultural distance between each of the 70 countries included in the study and the U.S.

Control Variables:

Population -- yearly data about national population were collected from the World Bank. Without having a more appropriate approach to normalize the dependent variables, I employed national population as control variables to rule out the effects of population size on the active participants.

Year dummy-- I created five dummy variables to model the differences in the years, in order to rule out any systematic effects of year differences.

3.4.4 Regression Model

The following log-linear regression model predicts online participation (formula 3.3). Specifically the model is used to test hypotheses H1, H2a, H2b, and H3. Since number of posters and messages are count data, we test the research models using Poisson regression rather than ordinary least squares (OLS) regression (Greene, 2008).

$$Log(online\_Y_{it}) = \beta_0 + \beta_1 CD_i + \beta_2 Log(GDP_{it}) + \beta_3 NRI_{it} + \beta_4 DumEnglish + \beta_5 Log(Population_{it}) + yeardummy + \varepsilon_{it} \quad (3.3)$$

Where:

$online\_Y_{it}$ = number of ISWorld Messages, or number of ISWorld posters from Country *i* in year *t*. *t==2002 ~2007*

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ =Coefficients;

CD_i = Cultural distance between Country *i* and the focal country, US;

$Log(GDP_{it})$ = Log(GDP per capita) [ppp method] of Country *i* in year *t***,** in econometric analysis Log(GDP) is used more often than raw GDP value.

NRI_{it} = Network Readiness Index of Country *i* in year *t***;**

DumEnglish = Dummy Variable for Native English Speaking Country

$Log(Population_{it})$ = Log (Population) of Country *i* in year *t*.

Yeardummy = Dummy Variables for the years 2002, 2003, 2004, 2005, 2006, and 2007.

ε_{it} = Error term

3.5 Data Analysis and Hypotheses Testing

3.5.1 Descriptive Statistics and Spearman's Correlation

The summary statistics, mean and standard deviation, and a nonparametric correlation are shown in Table IV. A Spearman's correlation analysis was carried out involving all dependent variables, independent variables, and the four dimensions of the cultural index. The result of the correlation analysis is consistent with the predictions from our four hypotheses. All relationships between dependent variables and independent variables were significant and in the assumed direction.

The correlation tests offer some preliminarily support for our hypotheses. Moreover, the correlation tests about the four cultural dimensions are also consistent with previous theoretical explanations. In table 3.4, almost all of the four cultural dimensions were significantly correlated with the two dependent variables. Among the four dimensions, Power Distance and Uncertain Avoidance are negatively associated with the dependent variables, and Individualism and Masculinity are positively associated with the dependent variables. The correlations between these individual dimensions and active participations are consistent with the propositions of Erumban and Jong (2006). High correlation (0.97) between ISWorld Posters and ISWorld Messages suggests that the two indicators are consistent and interchangeable.

Table 3.4 : Descriptive Statistics and Spearman's Rho Correlation

		Mean	STDV	N	1	2	3	4	5	6	7	8	9
1	ISWorld Message	17.45	33.47	420	-								
2	ISWorld Poster	5.66	11.02	420	.970**	-							
3	Power Distance	57.86	21.38	342	-.478**	-.522**	-						
4	Individualism	45.02	23.04	342	.595**	.631**	-.601**	-					
5	Masculinity	50.63	18.01	342	.241**	.189**	.044	.168**	-				
6	Uncertainty Avoid	64.12	22.72	342	-.151**	-.213**	.146**	-.194**	-.062	-			
7	Cultural Distance	2.48	1.34	342	-.509**	-.551**	.564**	-.855**	-.368**	.289**	-		
8	Native English	.10	.300	420	.327**	.346**	-.380**	.411**	.304**	-.402**	-.498**	-	
9	LogGDP	9.43	1.02	420	.641**	.665**	-.512**	.613**	.017	-.121*	-.443**	.169**	-
10	NRI	4.22	.79	389	.650**	.691**	-.606**	.581**	-.114*	-.329**	-.461**	.207**	.847**

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

3.5.2 Hypotheses Testing and Results

Since count data usually follows a Poisson distribution, we conducted a Poisson log-linear regression to test the proposed hypotheses (Table 3.5). The results are summarized in Table V. I used the STATA 10 software package for the data analysis. In the Poisson log-linear regression, the Z test is reported based on robust standard error. In national level studies, missing values are very common in various index lists. The group sizes differ across different variables in our panel data set. In the data analysis process, we excluded the observations with missing values.

Active Participation in ISWorld (Online Communication)

ISWorld Posters: In the Poisson regression model we used to predict the number of *Posters* using "*logGDP*", "*English*", "*Network Readiness Index* (*NRI*)", and "*Cultural Distance*" was statistically significant (Wald chi-squared= 3520.6, d.f.=10, p< 0.0000). In predicting ISWorld Poster, the model can explain almost 61.9% of the variation in the dependent variable. Each of the four predictors, *logGDP* (Hypothesis H1), the dummy variable of "*Native English*

Speaking Country" (Hypothesis H2a), *Network Readiness Index* (Hypothesis H2b) and *Cultural Distance* (Hypothesis H3) was statistically significant at 0.1%.

Table 3.5: Poisson Log Linear Regression for the Panel Data

	Log ISWorld Message	**Log ISWorld Poster**
Constant	-13.12*** (1.55)	-12.14*** (1.24)
Year 2002	0.21 (0.19)	0.15 (0.17)
Year 2003	0.12 (0.16)	-0.13 (0.14)
Year 2004	0.10 (0.15)	0.06 (0.13)
Year 2005	-0.02 (0.16)	-0.05 (0.14)
Year 2006	0.06 (0.16)	-0.05 (0.14)
Log Population	0.33*** (0.04)	0.34*** (0.03)
Native English Speaking	0.77*** (0.16)	0.53*** (0.13)
Cultural Distance	-0.23*** (0.07)	-0.37*** (0.05)
Log GDP per capita	1.24*** (0.20)	0.89*** (0.13)
Network Readiness Index	0.23 (0.17)	0.62*** (0.10)
R^2_p	0.594	0.619
N	323	323

*Significant at 5%; **Significant at 1%;***Significant at 0.1%;
The table reports coefficients with robust standard error

ISWorld Messages Posted: Finally, the Poisson regression model predicting number of messages posted using "*logGDP*", "*English*", "*Network Readiness Index* (*NRI*)", and "*Cultural Distance*" was statistically significant too (Wald chi-squared= 9707.5, d.f.=10, p< 0.0000). The model explained 59.4% of the variation. Among the four predictors, *logGDP* (Hypothesis H3.1),

the dummy variable of "*Native English Speaking Country*" (Hypothesis H3.2a), and *Cultural Distance* (Hypothesis H3.3) were each statistically significant at 0.1%, while *Network Readiness Index* (Hypothesis H3.2b) was not significant.

The test results based on the data show that in a global community of practice, *logGDP*, *English proficiency* and *Network Readiness Index* are significantly positively related to the active participation in online communication, while *Cultural Distance* is significantly negatively related the active participation.

Overall, the results strongly support the four research hypotheses (Table 3.6). In the empirical investigation of the AIS community of practice, my predictive model can explain the antecedents of active online participation very well.

Table 3.6. Hypothesis Testing Results

National Level Antecedents		**Active Participation**		**Hypothesis**	**Support**
Construct	**Indicator in use**	**Construct**	**Indicator in use**		
Accessibility	GDP per capita	Online Communication	Message/Posters	H3.1	YES
Capacity	English Proficiency	Online Communication	Message/Posters	H3.2a	YES
	Network Readiness Index	Online Communication	Message/Posters	H3.2b	NO/YES
Social Cultural Factor	Cultural Distance	Online Communication	Message/Posters	H3.3	YES

The slight differences between the results of ISWorld messages (community created knowledge content) and those of posters (knowledge contributors) imply that the capacities

indicated by NRI could explain the number of active posters well but they have no significant effect on the number of messages posted, which indicates the level of activeness.

3.6 Chapter Summary

In this chapter, I propose a predictive framework for digital inequality of global communities of practice, based on prior findings and theoretical lenses offered in the literatures on digital inequality, international business, and innovation diffusion. I suggest that accessibility, capacity and socio-cultural distinctions account for the different levels of active participation across countries in a global community of practice. To examine the research framework, I collected the panel data from a professional community of practice, the Association for Information Systems. Six years of online communication data, containing 70 countries with 4555 posters, 13352 messages, were employed to empirically test the proposed hypotheses. The empirical findings largely support our four research hypotheses.

The results suggest that accessibility and capability are significantly positively related to active participation of communities of practice, while socio-cultural distinctions are significantly negatively related to active participation of communities of practice. The present study has both theoretical and empirical implications. Theoretically, the present study has two implications. Frist, we proposed a novel predictive model for global digital inequality with three antecedents. The three antecedents, accessibility, capability and socio-cultural distinctions had only been proposed and tested separately in different earlier studies. In this paper, I have integrated the separately theoretical pieces into one unified model. Particularly, I highlighted the role of culture distinction, which has not been clearly emphasized in previous research models. Second, the

global digital inequality issue has not been clearly addressed in the extant online communities of practice literature, even though the digital inequality phenomenon has existed since the emerging of global communities of practice. This work attempts to theoretically and empirically link these two areas. Since global communities of practice play important roles in the international professional societies, the present study can serve as a benchmark for future studies on the internationalization of communities of practice.

Empirically, the study makes two contributions. First, the global digital inequality issue has not been tested using active participation data. Compared with information accessibility, digital inequality data are hard to collect especially for the cases across countries. The study presents a novel attempt to use active participation data to investigate global digital inequality, which arguably provides more solid evidence about the actual communication gaps among users. Second, the testing results indicate that national culture plays significant roles besides economic and technological advancement, and language advantages.

With respect to the global community of practice chosen in the study, AISNet with its knowledge exchange platform ISWorld, is very typical American-centric international community of practice, with a relatively high level of autonomy. While the AIS was founded as an international organization, it has been dominated from inception by its North American members. Over more than a decade of development, and despite its stated mission to promote globalization of the community, AISNet remains a US-centric organization as many of its resources and platforms are still located in the US and about half of the community's active users are from US-based academic institutions. Another special feature of our research site is its high level of autonomy. The AIS online community is sponsored and managed by a limited

managerial staffs of Association of Information Systems. Given the basic guidelines, most of online activities are voluntary and spontaneous without incentive mechanisms, organizational regulations, or business driven purposes. While there are some successful business cases in developing global online communities within multinational companies currently (Voelpel et al. 2005; Dennis and Vessey, 2005), these global communities of practice are more knowledge management initiatives, sophisticatedly managed and promoted through various incentive mechanisms, than communities of practice across organizational boundaries. With these representative features, the findings of the study might shed lights in the similar professional global communities of practice.

To reduce digital inequality in global online communities of practice, I suggest that both managerial as well as technical improvements of online communities of practice need to be considered. Managerial mechanisms should be applied in order to increase the visibility of the users from underrepresented nations. Multicultural features should be incorporated in the design of the online platform. More interactive and multifunctional online platforms and multi-language interfaces should be set up in order to reduce various barriers across boundaries. Studies in international technology transfer (Rebentisch, E. 1997) suggest that the increasing complexity of the knowledge transferred across nations demands more interactive and iterative forms of interactions (Carlile and Rebentisch, 2003).

The study reported in the chapter has two major limitations. Theoretically, the research model ignores the effects of the features of technology platforms. The technological features such as multi-language options, might affect the role of cultural barriers and language barriers. Empirically, the study's data sample was collected from a single case—AISNET, which

constrains the statistical power and especially the external validity of the study. To address these limitations, I generalize the model to generic knowledge platforms and incorporate the platform features as moderators, in chapter 4.

CHAPTER 4: AN EXTENDED MODEL TO PREDICT THE INTERNATIONALIZATION OF KNOWLEDGE EXCHANGE PLATFORMS

4.1 Introduction

In Chapter 3, I developed and examined a research model of internationalization of Global communities of practice, in which the country level characteristics such as economic advancement, technological capacity, language proficiency and social-cultural differences are conceptualized as antecedents for the internationalization of global communities of practice. The objective of the study is to extend the basic model presented in the previous chapter by including another theoretical dimension, the platform features, as antecedents. In addition, I will test the new model with a new, cross-sectional data set that is based on a data sample of 200 leading, international knowledge-based platform web sites.

The development of information technology has changed our lives, and also changed the traditional way of learning and knowledge sharing. Today, various knowledge exchange platforms are available, some of which are necessary supplements of formal education, while others are independent and indispensable resources relevant to our daily lives and career development. Among those, some of them have transcended the boundaries of nations and regions and achieve international popularity. These international knowledge-based platforms play an important role in knowledge dissemination and knowledge creation across countries. Conceptually, global online communities of practice are a special type of knowledge exchange

platforms, and include various knowledge repositories, interactive knowledge resources, and other knowledge management related initiatives. Theoretically, the basic research model for global online communities of practice (presented in Chapter 3) is still applicable for generic knowledge platforms. However, because different knowledge exchange platforms show different levels of tendencies towards internationalization, the features related to them must be identified and incorporated in the basic research model. According to the concept of *born global* in the international business literature, three platform features, platform home country, platform type (pure click vs. brick and click), and multi-language options, are identified as antecedents of internationalization of knowledge exchange platforms.

In the next section, the extended research model is introduced, and some research hypotheses are proposed. A group of website features, which are critical to internationalization of a knowledge exchange platform, are incorporated into the research model of internationalization of knowledge exchange platforms. The relevant hypotheses are proposed accordingly. In the following section, I discuss the research method used in the study, specifically, the data setting and measurements. Then data analysis and test results are presented. Finally, the chapter concludes with the key findings, major contributions, and limitations of the study.

4.2 Related Studies and Research Model

Previously internationalization issues about global knowledge exchange platforms have not been addressed specifically, even though the global expansion of knowledge exchange platforms have gradually become critical questions for both practitioners and academic

researchers. In this section, I review relevant studies, which have addressed different aspects of internationalization issues related to knowledge exchange platforms. I start the section with defining basic concepts of global knowledge exchange platforms and discuss the intricate issue of internationalization. Then focusing on the antecedents of internationalization of global knowledge platforms, I discuss the relevant studies about national factors and, platform features and their interactions.

4.2.1 Global Knowledge Exchange Platforms

At the end of the last century and beginning of the 21st century, various global knowledge exchange platforms were launched, serving different purposes, and sharing different kinds of knowledge on the platforms. Some of them, such as Siemens ShareNet and AISNET, were developed as global knowledge management initiatives by multinational corporations or international professional associations for the purpose to support global collaboration and knowledge reuse among their employees or members in different subsidiaries across nations. The knowledge shared on these organizational platforms is usually professional expertise related to specific industry practices or academic areas. On the other hand, platforms such as Wikipedia are established to serve universal users globally, for the general purpose of knowledge sharing and knowledge construction. The knowledge shared on these platforms can cover any aspect of our lives.

Even though previous studies examine the different types of global knowledge exchange platforms, such as global communities of practice and global knowledge management systems, there is no formal definition about it. An operational definition of knowledge exchange platforms is provided here to refer to all kinds of online platforms, equipped with knowledge repositories

and interactive communication tools, and used to support knowledge sharing and knowledge creation. Global knowledge exchange platforms refer specifically to knowledge exchange platforms that are to a significant extent used globally.

AISNET, the online community of practice examined in Chapter 2 and 3, is a specific case of global knowledge exchange platforms. Such knowledge exchange platforms might serve certain (private) organizational purpose and work as knowledge management initiatives for employees or affiliated professionals like online communities of practice, or might not serve any organizational purposes and merely work as (public) knowledge repositories for general users. As knowledge centers, various knowledge exchange platforms have increasingly attracted more users across spatial and temporal barriers. Some of these knowledge exchange platforms are online extensions of traditional brick and mortar knowledge institutions, such as museums and national archives. They might also be pure online players like Wikipedia and various online knowledge base discussion forums, which do not have an established presence in traditional educational or professional organizations. These online knowledge exchange platforms with different backgrounds and purposes provide new meanings to education and learning for both professionals and general users. Somehow they might even blur the traditional demarcations between educators and learners, and between knowledge providers and knowledge users. Like online communities of practice, these knowledge-based platforms encourage knowledge sharing and collaborative knowledge constructions, often in a global setting.

4.2.2 Degree of Internationalization (DOI)

Internationalization refers to a firm's growth or expansion into foreign markets (or countries). Degree of Internationalization (DOI) is a multifaceted construct and has been

investigated intensively in international business research (Ramaswamy et al., 1996). The literature suggests three aspects of DOI, which are performance, structural, and attitudinal attributes of DOI. Performance of DOI indicates how well a firm performs overseas (Vernon, 1971). Structural attributes of DOI refer to those organizational resources that are located overseas. And attitudinal attributes of DOI examine the top management's international goal and orientation. The measures of the three aspects of DOI are not absolute values. Instead they show relative concentrations of a firm in overseas markets in terms of its overall output. In the present study, I choose the performance aspect of DOI, because it has been commonly used and it can be measured by using archival data.

According to Sullivan (1994) five measures of DOI are foreign sales as a percentage of total sales (FSTS), research and development intensity (RDI), advertising intensity (AI), exported sales as a percentage of total sales (ESTS), and foreign profits as a percentage of total profits (FPTP). With respect to a specific foreign country, the entry time and entry mode are collected to indicate performance. However, both the entry mode and entry time as quantitative instruments of measuring internationalization lack in accuracy.

There is no established DOI measure for online platforms. Online platforms are quite different from traditional businesses. They are usually organized around some initiative or project and are usually embedded in an organization instead of being a separate company. For instance, the web portal of Harvard University is part of the university, but the university and portal serve different functions and they are quite independent from each other. The DOI of Harvard University cannot be used to indicate the DOI of its web portal, and vice versa. Performance of an online platform can rarely be indicated by the revenue-based measures of

business performance of companies. The performance of an online platform is usually indicated by number of unique visitors based on web trafficking statistics. Therefore, I operationalize the performance measure of DOI as the percentage of foreign visitors among total visitors (FVTV). A more detailed explanation and discussion of this operationalization is provided later, in section 4.3.

4.2.3 National Level Factors

The literature in the areas of digital divide, innovation diffusion, and international business suggests various country level factors that affect the international expansion of information technologies and internet companies (Kotha et al. 2001). National distinctions between the home country and a foreign country in international business studies are psychic distances, which incorporate economic advancement, level of education, language distinction, cultural differences, religion and political regime (O'Grady and Lane, 1996; and Dow and Karunaratna, 2006). In chapter 3, from the digital inequality perspective, I summarize the country level factors as three categories—accessibility, capacity, and socio-cultural difference. Specifically, accessibility is indicated by economic advancement (GDP per capita), capability is indicated by English language proficiency and Network Readiness, and socio-cultural difference is indicated by cultural distance.

4.2.4 The Features of Online Knowledge Exchange Platforms

The basic research model about digital inequality, presented in Chapter 3, is still applicable. However, given the various backgrounds of these knowledge exchange platforms, some critical features of these platforms must be incorporated in the model. In international business studies, the firms, which have targeted international market since their birth, are called

born global firms (Knight and Cavusgil, 2004). The born global firms, as early adopters of internationalization, are typically small size firms with limited founding resources and without established reputations, especially in the countries with small domestic markets (Moen and Servais, 2002). Among other possibilities, three specific features, home country of the platforms, type of platforms (pure click vs. brick and click), and multi-language options are identified with the born-global inclination for this study.

Brick-and-click platforms vs. Pure Clicks

Over time, the meanings of education and learning have been changing constantly. In the information age, traditional education or knowledge-based institutions have evolved and moved to new stages, often adopting various online platforms supported by information mediated communication technologies. Traditionally educational and learning centers such as universities, museums, libraries and archives have all launched some form of knowledge exchange platform. These centers not only provide their users with internet access to their traditional knowledge repositories, but also support communication and knowledge sharing among their users. For example, the web portal of the National Archives of United States not only provides the digital access to their traditional archival documents, but also supports various research projects that attract collaborative involvements from different users. Given the geographical and physical limitations, most of these institutions had been traditionally regarded as local resources that primarily serve their local or national users, but information technology now makes the local resources regional or even international. Online users across states or nations can much more easily get access to the knowledge repositories or directly participate in the research or learning projects.

Unlike the brick-and-click platforms, the pure-click knowledge exchange platforms (or pure players) are those who do not have any traditional physical establishment or any obligation to serve specific local audiences[7]. Various electronic libraries, knowledge-based discussion forums, and Wikis are examples of pure players. From the very beginning, these platforms were intentionally constructed to be knowledge centers without boundaries and attract users with different backgrounds. Some of these platforms work very well to fulfill their objectives and have earned their reputations in serving their international audiences. Wikipedia is one of the best examples among them. Though not a university or museum, Wikipedia represent nothing less than an educational institution in the cyber world, in the way that it successfully disseminates knowledge and encourages collaborative knowledge construction worldwide.

In terms of serving international audiences, pure players have some obvious advantages over brick-and-click platforms. First, most of the brick-and-click platforms treat their local users or registered members, who are mostly local, as their first priorities. Even though, the brick-and-click platforms may also successfully attract international users, their major focus is still the local user. These platforms somehow are internet-based extensions of their physical establishments, which often merely provide an alternative access for their local users. Second, within these brick-and-click platforms, the demarcations between knowledge providers and knowledge users are still clear. Though encouraging the collaborative work among users, the brick-and-click platforms still play the roles of traditional educators or knowledge authorities. In many cases, these roles are so important and indispensable that they cannot be simply replaced or eliminated. For example, the historical documents and systematic knowledge provide by the MIT University or the National Archives are regarded as highly reliable and precise. These

[7] Of course, there are also some exceptions.

demarcations, though necessary, somehow limit the users' involvement and active participation. Given these two major reasons, pure-click platforms tend to internationalize more intensively and more quickly than brick-and-click platforms.

Home Countries of Knowledge Exchange Platforms

It matters where a knowledge-based platform is established originally. Despite how well knowledge-based platforms serve their international users, none of them can ignore their local users. Local users are always their stable and close home base, because they can easily be observed and contacted. The size of local market will largely determine the local market orientation of a platform. In the English-speaking world, the United States has the largest population of internet users. For the knowledge-exchange platforms developed in the United States, to serve their local users well already means great success.

The English-based knowledge exchange platforms, with relatively smaller customer bases in their home countries, especially in Europe, have been inclined to attract international audiences since their origin. The design features of these knowledge platforms might incorporate multicultural elements in order to cater for the needs of their international users. The social norms and cultural values shared among the platform users at the beginning stage will affect and shape the continuous development of the platforms. Given the existence of various alternative knowledge resources, users tend to choose the one that culturally makes them feel comfortable and respected. To summarize the effects of the home countries, I propose that the knowledge-based platforms which are established in countries other than United States tend to attract international user better.

The Multi Language Option Feature

Today, English is lingua franca among most international users from many different countries. The importance of English proficiency has been addressed in previously. Some knowledge exchange platforms contain sub-platforms supported by different foreign languages. The sub-platforms attract people who share a language to join in the online communications. The knowledge-based platforms with a multi-language option can mitigate effects of the cultural barriers and language deficiencies to some extent. Compared with the pure English based platform, the platforms with multi language options tend to be more attractive to the international users especially those who have low English proficiencies.

4.2.5 An Extended Model

To incorporate the three features of online platforms mentioned above, an extended model for internationalization of knowledge platforms is proposed and illustrated in Figure 4.1. Consistent with the basic model, in Chapter 3, at the national level, accessibility and capability, which are indicated typically by GDP per capita and Network Readiness Index, are still positively associated with the internationalization of knowledge exchange platforms. On the other hand, social-cultural barriers, usually indicated by culture distance between the home country and user's country, are negatively associated with the internationalization of the knowledge-based platform. In terms of platform features, three factors are added to the model. Pure players tend to achieve higher levels of internationalization than the brick-and-click platforms. Platforms with multi language options tend to achieve higher levels of internationalization than the pure English platforms. The platforms established in the country

other than United States tend to achieve higher levels of internationalization than the platforms established in United States.

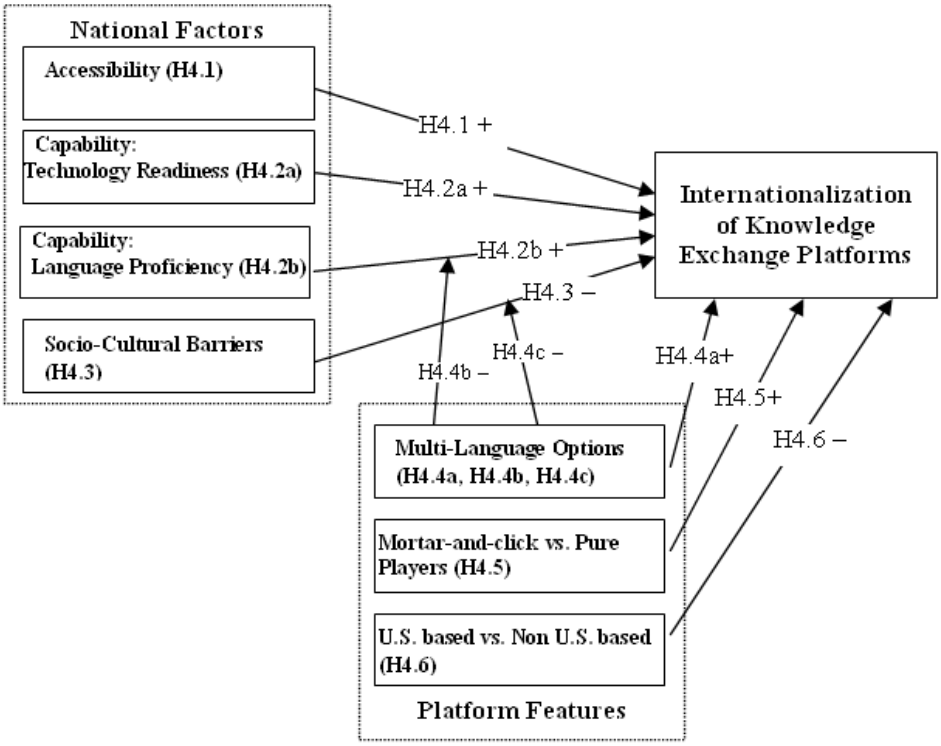


Figure 4.1: An Extended Model of Internationalization Knowledge Exchange Platforms

Based on the previous theoretical discussion, I propose the following specific research hypotheses. At the national level, three factors are accessibility, capability and social-cultural barriers.

H4.1: *User country's accessibility is positively associated with the internationalization of a knowledge exchange platform.*

H4.2a: *User country's technology readiness is positively associated with the internationalization of a knowledge exchange platform.*

H4.2b: *User country's English proficiency is positively associated with the internationalization of a knowledge exchange platform.*

H4.3: *The social cultural barriers between the user country and the home country of the knowledge exchange platform are negatively associated with internationalization of the platform.*

Additionally, three binary factors of platform that might affect the internalization of a knowledge-based platform are hypothesized as follows.

H4.4a: *The knowledge exchange platforms with multi-language options are associated with higher internationalization than those without multi-language options.*

H4.4b: *The multiple language options mitigate the effects of English language deficiency on internationalization of knowledge exchange platforms.*

H4.4c: *The multiple language options mitigate the effects of cultural barriers on internationalization of knowledge exchange platforms.*

H4.5: *The pure click types of knowledge- exchange platforms are associated with better internationalization than brick-and-click types of platforms.*

H4.6: *The knowledge exchange platforms with home countries other than United States are associated with better internationalization than the platforms with United States as home country.*

4.3 Method

4.3.1 Data Setting and Sample Construction

I constructed a sample of 200 knowledge-based platforms using the directory of Alexa.com, accessed in April, 2008 (c.f. Appendix C). Alexa.com is a renowned website providing free web-traffic statistics, sponsored by a nonprofit organization. In the directory of Alexa.com, the websites are casually categorized based on industry and application area. These

categorizations are not mutual exclusive. Under each major category, there are several subcategories. Within each category, the websites are listed based on their rankings of “Global Reach”, which indicates the percentage of the global users who visit the website. In the web traffic statistics of Alexa.com, internationalization is indicated by the percentage of users from specific countries. Only the countries with a percentage higher than 0.5% are identifiable in Alexa.com for each website. The websites with a longer list of nations largely have higher levels of internationalization.

I used the key terms, “knowledge”, “learning”, and “education” to search for categories and subcategories. From each of these categories or subcategories, the top 50 websites were selected. Initially, I identified the most popular six hundred knowledge exchange websites. Among these, some websites are duplicates of others, some websites are purely local or regional websites such as Baidu.com, and some websites serves secondary or lower educations. I then conducted a preliminary screening to eliminate these duplications or inappropriate websites. By checking the websites and their sponsors, the remaining websites were categorized as either brick-and-click platforms, such as National Archives, and MIT.edu, or pure online player platforms, such as Wikipedia. Within each of the two categories, a further screening was conducted. Some websites, such as Google.com represent multiple functional portals, of which knowledge platforms are only small parts. The individual performances of these sub platforms cannot be easily measured. Some websites are both highly international and highly localized. For example, Yahoo.com is linked to Yahoo.jp, and Yahoo.hk. These subsidiaries are independent web portals, but are still highly related to their parental websites. The complicated connections bring up tricky challenges of measurements. Hence, these websites were also eliminated. Finally, for each of the two categories, only the top 100 internationalized websites (Appendix C) were

left based on Alexa.com's measurement of internationalization, which means only the websites which are used across more than 8 identifiable counties.

4.3.2 Measures

Degree of Internationalization (DOI)

The construct of internationalization has not been clearly defined or measured before, though there are various studies that address the issue. Generally, an operational definition of internationalization is construed as how well a web platform has performed in a foreign country. To measure the internationalization of an online platform is even harder, because both national factors and website characteristics need to be considered. Hence, the measurement of Alexa.com cannot be directly used as an instrument of internationalization. The percentage of number of users from a country over the overall users of the website cannot show whether a website is used more in one country than another, because different countries have different numbers of internet users. Clearly, internationalization is different from "Global Reach", which can only show the popularity of a website but not its performance in specific countries. The absolute number of users from certain country on a website cannot be used to measure internationalization either, because a small percentage of users from a highly popular website can easily outperform a less popular website but this does not mean the popular website is more internationalized. To operationalize the measure of internationalization, the following formula, which normalizes for country size and internet population, is applied.

$$\Omega ij = (Wij/Cj)/(Wi/G) \qquad (4.1)$$

Where:

Ωij *= Internationalization of website i in a foreign country j;*

Wij=For website i, number of users from a foreign country j;

Wi=Number of total internet users of website i;

Cj=Number of total internet users of a foreign country j;

G= Total number of global internet users.

In the above Formula 4.1, the numerator *Wij/Cj* indicates the market share of a *website i*, in *country j*. This market share is an absolute value, which highly depends on the size or global reach of the website. The absolute value of market share is not comparable across the websites with different size. In order to eliminate the effect of the website's size, the denominator *Wi/G* is introduced in the formula. The denominator *Wi/G* indicates the global market share of website *i*, or global reach, which also represents the size of the website *i*. The intuitive explanation of Ω*ij* is the performance of website *i* over its overall performance. For instance, website A with 100 million global users attracts 10,000 users from a foreign country with 2 million internet users, while website B with a million global users attracts the same number of users from the same foreign country. The two websites have same market share, 1% (10000/1 million), in the country. However, in terms of internationalization in the country, the smaller website B performs much better, 100 times better, than website A.

The resulting scale, Ω*ij*, is specifically appropriate for internationalization research in general. First, this scale normalized the effect of country size, so that it is possible to compare a certain business's performance across nations. Second, this scale normalizes the effect of business size, so that it is possible to compare different businesses' performances in a certain foreign country. Therefore, using the scale, both national level and firm level factors can be incorporated.

Formula 4.1 can specifically be rewritten as formula 4.2 as shown below; this implies the foreign performance over the total performance weighted by the market size of the countries. Particularly, Formula 4.2 is used to derive Ωij in the present study.

$$\Omega ij = (Wij/ Wi)/(Cj /G) \qquad (4.2)$$

In Formula 4.2, the numerator, *Wij/ Wi*, is a three-month average percentage, collected from Alexa.com,. The number of internet users of a country and the number of global internet users are collected (also in Arpil of 2008) from World Bank database.

GDP per capita

GDP per capita is commonly used to indicate the economic advancement of a country. In the present study, GDP per capita is used to indicate the accessibility of a country. The GDP per capita in 2008 is collected from World Bank database.

Network Readiness Index

The Network Readiness Index is published in the Global Information Technology Report, released each year by the World Economic Forum. The index is used to indicate the overall readiness of a county in the information age. Similar to my previous study, the Network Readiness Index is used to indicate the technological capacity of a country. The Network Readiness Index of 2008 was used for my study.

English Language Proficiency

The English language proficiency is used to indicate the language capacity of a country. A binary instrument is generated for the variable. The countries, where English serves as the

native or an official language, are coded as one. Otherwise the countries are indicated as zero. 15 out of 61 countries are coded as English speaking for this instrument.

Cultural Distance

Consistent with the previous study, cultural distance, derived based on Hofstede's cultural dimensions, is applied again to indicate social-cultural barriers between the mother country of a website and a foreign country. To calculate cultural distance, we applied the four standard dimensions of Hofstede's (1984, 2001) culture index: power distance, individualism, masculinity, and uncertainty avoidance. The values for cultural distance between the mother country and the foreign countries were computed using the following method (adapted from Kogut and Singh 1988):

$$CD_{uj} = \sum_{i=1}^{4} \{(I_{ij} - I_{iu})^2 / V_i\} / 4 \ , \qquad (4.3)$$

Where:

CD_{uj} = *cultural distance from the home country k to the j th country,*

I_{ij} = *the index for the i* th *cultural dimension of the j* th *country,*

I_{iu} = *the index for the i* th *cultural dimension of home country, and*

V_i = *the variance of the index of the i* th *dimension.*

The cultural difference index represents an average of the normalized squared deviations on each of the four dimensions of cultural difference in which the reference value is taken to be the cultural index of the mother country of a website. Using Formula 4.3, we have calculated the cultural distance between each of the 61 countries included in the study and the mother countries.

Platform Features of the Websites:

Three binary scales are applied to measure the three features of websites.

- One is used to indicate the two major categories of the websites; brick-and-click platforms and pure click type of platforms.
- Another is applied to indicate whether a website has or has not multiple language options.
- A third binary indicator is used to indicate whether the home country of a website is United States or not.

Control Variables:

Two important web performance indicators are used in the study as control variables. The first one is the average time in minutes spent by per users per day, and the second is the number of pages viewed by per user per day. These two web performance indicators can show to what extent a website is being used by a user.

4.3.3 Regression Model

In Formula 4.4, regression model of internationalization of knowledge exchange platform is depicted. I take log transformations on internationalization and GDP specifically to achieve better normality.

$$Ln\,(\Omega ij)=\beta_0 + \beta_1\, Log(GDP_j) + \beta_2\,(NRI_j) + \beta_3\,(English\text{-}proficiency_j) + \beta_4\,(CD_j) + \beta_5\,(Pure\text{-}click_i) + \beta_6\,(U.S.\text{-}or\text{-}Not_i) + \beta_7\,(Multi\text{-}language_i) + \beta_8\,(Multi\text{-}language_i * CD_j) + \beta_9\,(Multi\text{-}language_i * English\text{-}proficiency_j) + \varepsilon_{ij} \qquad (4.4)$$

Where:

$\beta_{0\text{-}9}$ = Coefficients;

Ωij = Internationalization of platform *i* in country *j*.

CD_j=Cultural distance between Country *j* and the host country;

$Log(GDP_j)$ =Log(GDP per capita) [ppp method] of Country *j* **,** in econometric analysis Log(GDP) is used more often than raw GDP value.

NRI_j = Network Readiness Index of Country *j***;**

English-proficiency $_j$ = dummy variable for country *j*, where English is native language or official language

Pure-click $_i$ = dummy variable for Platform *i*, which is pure-click type of platform

U.S.-or-Not $_i$=dummy variable for platform *i*, with U.S. at its home country

Multi-language $_i$ = dummy variable for platform *i*, which contains multi-language options

ε_{ij} =error term

4.4 Data Analysis and Hypotheses Testing

4.4.1 Descriptive Analysis

Home Countries

Among the 200 knowledge-based platforms included in my sample, 151 platforms came from the United States, and 49 platforms, as summarized in Table 4.1, came from five other countries—United Kingdom, Canada, Australia, Germany and Netherlands respectively. The six home countries all represent Western cultures. Based on the statistics of Alexa.com, these six

countries are leaders in developing the English-based knowledge platforms. Particularly, 197 platforms out of the 200 highly international platforms were selected from the four countries with English as the native language. All of the six countries are economically developed and have technological advantages related to information technologies.

Table 4.1 Home Countries

Home Country	Abbreviation	Websites Selected
United Kingdom	UK	30
Canada	CA	9
Australia	AU	7
Germany	DE	2
Netherlands	NL	1
United States	US	151
Grand Total		200

Foreign Countries

Based on the statistics of Alexa.com, users from 97 foreign countries are identified to use the 200 knowledge-based platforms in the study. Originally, 3860 records about how the 200 platforms performed in the 97 foreign countries are generated correspondingly. At national level, the survey indicators, such as cultural dimensions, and Network Readiness Index, have missing values in some countries. In the analysis, these missing values are not examined in testing, and only 3603 entries of the 200 platforms across 61 foreign countries are applied in the test. Among the 61 foreign countries, 15 countries list English as official or native language.

Summary of Descriptive Analysis

The descriptive statistics of the 3603 entries of the 200 knowledge-based platforms across 61 foreign countries are summarized in the Table 4.2. The entries indicate the features and performances of the 200 platforms in the 61 countries.

Table 4.2: Summary of Descriptive Statistics

	N	Mean	Standard Deviation	Min	Max
Global Reach	3603	0.000985	0.007986	0.000004	0.087910
Page Viewed by per user	3603	2.80	1.51	1.14	15.10
Time used by per user	3603	2.64	1.24	0.70	8.50
Home country (U.S. vs. Non-U.S.)	3603	0.767	0.423	0	1
Multi-language	3603	0.129	0.336	0	1
Mortar-and-Click vs. Pure Player	3603	0.518	0.500	0	1
English-Speaking Countries	3603	0.359	0.480	0	1
Cultural Distance	3603	2.2108	1.5408	0.0229	7.2017
GDP per capita	3603	22156	14843	1374	55452
Network Readiness Index	3603	4.469	0.772	2.7	5.85
Foreigner Percentage (Aelxa.com)	3603	0.0241	0.0398	0.005	0.473
Normalized Percentage	3603	2.1459	6.3474	0.0264	248.6188
National Population	3603	191419748	354071675	2596799	1330044605
National Internet Users	3603	42686154	64144887	500000	298000000

Correlation Analysis

Table 4.3 shows the correlation analysis results. Specifically, in the hypothesis test, in order to normalize the two variables, I used log transformation to normalize the two variable Internationalization and GDP per capita. Likewise, in the correlation analysis, the two variables are log-transformed also. The five website related features, pages viewed by per users, average time spent by per users, mother country, type (brick-and-click vs. pure clicks), and multi-language option are highly correlated with one another. The four national factors are also highly

correlated with one another. The correlations between the antecedents and the dependent variable are significant and largely consistent with the hypotheses, except for Network Readiness Index and GDP per capita. While GDP and NRI are supposed to be positively associated with internationalization, the zero order correlation analysis shows that both of the factors are negatively correlated with internationalization. However, zero order correlations are not taken as test results, because further tests are needed.

Table 4.3: Correlation Analysis

	LN I	Pages Viewed	Average Time	Host Country	Multi language	Pure Click vs. Non	English Proficiency	Cultural Distance	NRI
PV by User	-.031*								
Avg Time	-.016	.804***							
Home Country USVSNONUS	-.037*	-.144***	-.129***						
Multi-language Option	.065***	.167***	.171***	.103***					
Pure Click vs. Brick-Click	.128***	-.214***	-.167***	.218***	.163***				
English Proficiency	.361***	-.004	.011	-.026	-.067***	.006			
CD	-.189***	.007	.011	-.020	.048**	-.013	-.513***		
NRI2008	-.058***	.008	.003	-.041**	-.051***	.001	.137***	-.533***	
LNGDP	-.073***	.003	-.011	-.028*	.000	.007	-.102***	-.472***	.825***

Notes: * denotes significance at 0.05 level; ** denotes significant at 0.01 level; *** denotes significance at 0.001 level.

4.4.2 Hypotheses Testing

Main Test

To test the hypotheses, hierarchical linear regression is applied. Because the instrument of Internationalization did not follow a normal distribution, log transformation is conducted to normalize the dependent variable. Similarly, the log transformation is applied for GDP per capita. The testing results are summarized in Table 4.4.

The proposed research hypotheses are tested in *Models 1* through *4*. In *Model 1*, the national factors significantly contribute to 15.5% of explanatory power of internationalization of knowledge platforms. Hypothesis *H4.1 (*positive effect of economic advancement*), H4.2b (*positive effect of English proficiency*),* and *H4.3 (*negative effect of Culture Distance,*)* are all supported, whereas hypothesis H4.2a (positive effect of technology readiness) shows a significant opposite effect than predicted.

Table 4.4: Multiple Linear Regression on Internationalization

	Model 0	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Control Variables:					
Page Viewed per User	-0.0513	-0.0389	-0.0252	-0.0230	-0.0172
Average Time Spent per User	0.0253	0.0146	0.0029	0.0005	-0.0033
National Factors:					
LNGDP per capita of 2008 ***(H4.1)***		0.1770***	0.1629***	0.1557***	0.1554***
Network Readiness Index of 2008 ***(H4.2a)***		-0.2890***	-0.2802***	-0.2741***	-0.2707***
English Proficiency ***(H4.2b)***		0.3873***	0.3832***	0.3786***	0.4133***
Cultural Distance ***(H4.3)***		-0.0603**	-0.0676**	-0.0931***	-0.0654**
Platform Features:					
Multi-Language Options			0.0703***	-0.0271	0.1256***
Pure Click vs. Brick-and-Click ***(H4.5)***			0.1230***	0.1244***	0.1207***
Home Country (U.S. vs. Non-U.S.) ***(H4.6)***			-0.0720***	-0.0740***	-0.0714***
Interaction Effect 1 ***(H4.4a)*** Multi-Language Option X Cultural Distance				0.1187***	
Interaction Effect 2 ***(H4.4b)*** Multi-Language Option X English Proficiency					-0.1060***
Adjusted R^2 change	.001	.155***	.023***	.004***	.007***
Adjusted R^2		.155***	.177***	.181***	.184***

Notes: *--significance at 0.05 level;**--significant at 0.01 level; ***--significance at 0.001 level

In *Model 2,* platform features significantly contribute 2.3% explanatory power for the internationalization of the knowledge platforms in addition to national factors. Hypothesis *H4.4a* (positive effect of multi-language options), *H4.5* (positive effect of pure click type), and *H4.6* (negative effect of U.S. based platform) are all significantly supported.

In *Model 3,* the interaction effect of Multi Language options and Cultural Distance contributes 0.4% of explanatory power of internationalization of the knowledge platforms significantly. Hypotheses *H4.4b* (the moderating effect of Multi language options on Cultural Distance) is supported.

In *Model 4,* the interaction effect of Multi Language options and English proficiency contributes 0.7% of explanatory power of internationalization of the knowledge platforms. Hypotheses *H4.4c* (the moderating effect of Multi Language options on English proficiency) is supported. A follow up post hoc test about statistical power was conducted (Cohen, 1977). Based on the sample size (3603), effect size, and significance level (0.001 levels), all of the hypothesis tests reach statistical power of 88% or above. The limited R-square change created by platform features might result from the measurements, which are all binary variables.

Robustness Checks for Missing Data

Due to incomplete measures (cultural distance and Network Readiness Index), 257 entries from 36 countries containing missing-values are not used in the main test. These 36 countries typically have a relatively small number of internet users and a low GDP per capita, and remarkably low level of internationalization. The missing data are sharing certain patterns (e.g., low economic advancement) that are not ignorable (Little and Rubin, 1987). I, thus, conducted two robustness checks in order to check potential systematic bias. In the first

robustness test, I replaced missing data with the sample mean, and in the second robustness test, I replaced missing data with regression trend. The testing results are summarized in Table D.1, and Table D.2, shown in Appendix D. Even though the two robustness tests exhibit relatively lower R-square changes, the test results with respect to hypothesis are all consistent with the results of the main test.

Table 4.5 Summary of Hypotheses Testing

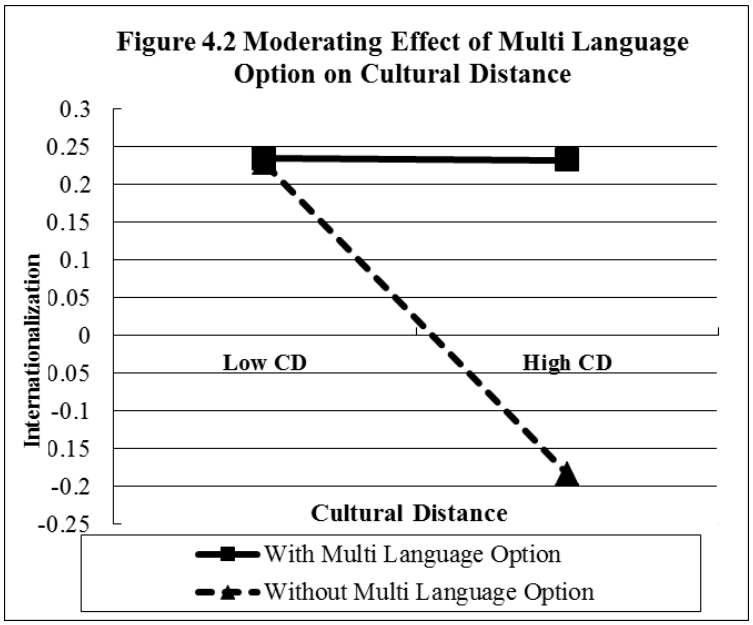
H#	Hypothesis	Result
H4.1	User country's accessibility is positively associated with the internationalization of a knowledge exchange platform.	S
H4.2a	User country's Technology Readiness is positively associated with the internationalization of a knowledge exchange platform.	NS*
H4.2b	User country's English Proficiency is positively associated with the internationalization of a knowledge-based platform.	S
H4.3	The social cultural barriers between the user country and the home country of a knowledge exchange platform are negatively associated with internationalization of the platform.	S
H4.4a	The knowledge exchange platforms with multi-language options tend to achieve higher internationalization than those without multi-language options.	S
H4.4b	The multiple language options tend to mitigate the effects of English Language Deficiency on internationalization of knowledge exchange platforms.	S
H4.4c	The multiple language options tend to mitigate the effects of Cultural Barriers on internationalization of knowledge exchange platforms.	S
H4.5	The pure player types of knowledge exchange platforms tend to gain better internationalization than mortar-and-click types of platforms.	S
H4.6	The knowledge exchange platforms centered in the countries other than United States tend to gain better internationalization than the platforms centered in United States.	S
S=supported; NS=not supported; NS*=significant in the opposite of the predicted direction		

4.4.3 Summary of Hypotheses Testing

The results of the hypotheses testing are summarized in Table 4.5. Except for H4.2b (technology readiness), all hypotheses are supported. The results indicate that national factors of

a foreign country and platform features together determine the development and expansion of a knowledge platform into other countries. The opposite effect of technology readiness is explained in following section. In Figure 4.2 and Figure 4.3, I provided a graphical representation of the moderating effects of the multi-language option on cultural and language barriers.

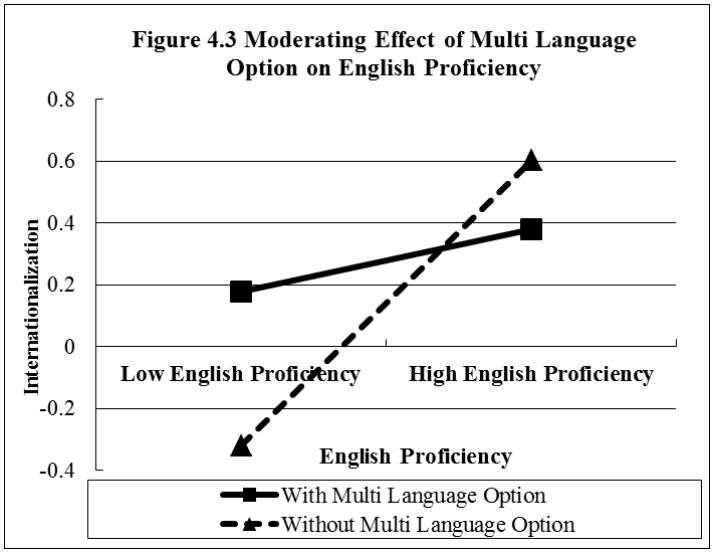
Figure 4.2 shows that without Multi language options, internationalization of knowledge platforms is seriously hindered, but with Multi language options, the effect of cultural distance is substantially mitigated. The test results in Table 4.4 show that in *Model 3*, the interaction effect of Multi language options and Cultural Distance, though significant, did not wash out the effect of cultural distance, which continues to show significant negative effects.



Similarly, Figure 4.3 shows that multi language options of knowledge platforms can mitigate the effect of language deficiency on internationalization greatly, but it still cannot completely eliminate the effects of language barriers. Test results of *Model 4* shown in Table 4.4

suggest that even though the interaction effects of Multi Language Options and English Proficiency are significant, English proficiency is still positively associated with Internationalization of knowledge platforms.

The limited effect of multi-language options in mitigating cultural and language barriers is consistent with practices of knowledge platforms. In most of English-based knowledge platforms, the sub-platforms in other languages are simply imperfect translations of the original English version. The collaborations that occur on these sub-platforms are limited to those who share the language.



4.5 Chapter Summary

4.5.1 Conclusion and Contribution

In the present chapter, an extended research model of internationalization of knowledge-based online platforms is developed building on the previous study presented in Chapter 3. Specifically, at the national level, accessibility, and capacity positively affect the internationalization of the platforms, and social-cultural barriers negatively affect the internationalization of the platforms. In terms of platform features, the platforms which are established outside the United States that contain multi-language options, or are pure players, tend to acquire higher level of internationalization than those that do not. Based on the research model, four relevant hypotheses were proposed. 200 knowledge-based online platforms were selected to examine the hypotheses. The results of the testing show that all of the hypotheses except for one are supported.

Theoretically, the study contributes to the current research about the internationalization of knowledge-based platforms. First, the study proposes an enhanced research model that incorporates both national factors and platform features as antecedents of the internationalization of knowledge-based online platforms. Globally, knowledge sharing and collaborative knowledge construction have become more popular and more mature. The proposed research model could shed some new light for future research in this area. Second, the study develops a new instrument of internationalization, which can indicate a business' performance in a specific country. The internationalization of knowledge exchange platforms and web portals is a new area of international business. It has been hard to quantify the internationalization. The instrument developed in the study could promote quantitative empirical investigations in this area. The

present study achieved a reasonable level of external validity, by including 200 leading websites in its sample.

4.5.2 Limitation and Suggestions

Two reasons contribute to the negative effect of NRI on internationalization. First, during the screening process of the sample selection, some websites with a high level of internationalization are eliminated because these websites have well established localized subsidiaries foreign countries such as Yahoo.com. For the websites with foreign subsidiaries, the complicated relations between the parental websites and their subsidiaries make it difficult to measure the overall performance of the websites. Even though the localized subsidiaries cannot completely substitute international knowledge-based platforms in terms of knowledge sharing and knowledge construction, they do provide the local users with substantial digital contents and support collaborative knowledge construction within the local areas. The miss-counting of these localized subsidiaries could affect the testing result remarkably. Secondly, for countries with a high NRI, the digital resources are abundantly available. Users in these countries might tend to use the local resources and might check the international resources only if it is necessary.

Internationalization is a multifaceted construct. In the present study, only one specific facet is captured and investigated. Other facets such as entry times, number of total foreign users, and number of total foreign countries could be investigated in future research. Moreover, in the future research, the different roles of localized subsidiaries and their parental websites should be investigated.

In the present study, the web traffic statistics from Alexa.com is used as the measurement to construct the dependent variable—internationalization. Technically, the statistics of

Alexa.com contains a systematic bias. In future research, the web traffic statistics should be triangulated and verified through multiple data sources. Other web traffic statistics web sites should be considered.

Moreover, in the study, only limited web features are incorporated and measured through binary scales. In future research, more web features should be considered, and a Likert scale might be used in measuring these features. For example, the study implies that pure player knowledge platforms might display higher level of interactivity. In future study, interactivity should be measured and its effects can be tested.

Finally, in the study, multiple linear regressions were conducted in examining the hypotheses. Obviously, inter-correlation should exist within the web level variables and within national factors. In this case, hierarchical multilevel regression (HML) might be more appropriate. In future research, more sophisticated statistical investigation might be conducted.

CHAPTER 5: CONCLUSION AND DISCUSSION

5.1 Thesis Summary

In my dissertation thesis, I present three studies about knowledge sharing and global collaboration issues on online knowledge exchange platforms. In the first study, I conducted an exploratory study on a specific case of a global academic community of practice—AISNET and its communication platform ISWorld mailing list. Through content analysis based on the email messages posted on ISWorld mailing list over four years, I examined the online community of practice concerning its performance based on its major business goals, and the communication patterns with respect to its users' characteristics. I suggest that more interactive features should be added in the online community of practice in order to support better knowledge sharing and knowledge creation. The findings of the study also implied that users with different backgrounds tend to use the platforms quit differently. Digital inequality exists especially among the users with different nationality, an interesting, unexpected finding that motivated the second study.

In the second study, I reviewed the relevant literature about digital inequality at the national level, and proposed a research model about internationalization of online communities of practice. The model is tested based on six-year panel data of ISWorld mailing list. Following the second study, I conducted a more rigorous empirical study. In the third study, I proposed a research model of internationalization of global knowledge exchange platforms. In the model, national factors such as economic advancement, technology readiness, and cultural and language

barriers played important roles in explaining the internationalization of the knowledge platforms, while platform features such as focal country, type of the platforms (pure click vs. brick-and-click), and multi-language options are antecedents of internationalization of the platforms. Specifically, multi-language options are critical in mitigating the effects of cultural barriers and language deficiency. An empirical study with 200 highly internationalized knowledge platforms are carried out. The results are consistent with the hypotheses proposed, except for the role of technology readiness. An alternative explanation is offered correspondingly.

In the following two sections, the major contributions and potential implications of the three studies will be discussed before I propose suggestions for future directions.

5.2 Contributions and Implications

5.2.1 Cross-Study Contributions

The three studies presented focus on one theme—knowledge management and global collaboration. Empirically, they all employ the secondary data to indicate real participation activities of knowledge users. The potential contributions are explained as follow.

In the first study, I investigate the communication patterns of different knowledge users using archival data. Drawing on the theoretical connection between interactive communication and knowledge management activity, I examine to what extent different knowledge users are involved in various knowledge sharing and creation activities. Specifically, the knowledge users' active participation is shaped by the platform's governance policy, design features, and their personal knowledge needs. The users' communication patterns show that the interactive

knowledge resources available on knowledge platforms are used unevenly by users with different backgrounds. The existence of the digital inequality phenomenon in AISNET platform is a very typical drawback during the growth and development of these knowledge platforms.

Even though the digital inequality issue has attracted both theoretical and empirical research attention over the past few years, previous literature tends to address the issue overwhelmingly from a behavioral intention perspective at the individual level. In studies two and three, I attempted to explain the digital inequality issue on online knowledge platforms in the global context. The findings of the studies could benefit our understanding about knowledge sharing and global collaboration of knowledge exchange platforms.

Drawing on the literature in global innovation diffusion and international business, I proposed a research model of internationalization of global knowledge exchange platforms. Based on the model, the users from economic developed nations, culturally close to the home country of the platforms, and with good command of English tend to use the knowledge resources better than others. The platform feature—multi-language options, can mitigate the effect of cultural barriers and English language deficiency. Empirically, the two studies have different degrees of external validity. Study two is conducted based on the six-year communication data of AISNET, which is a dominant, if not unique, online global professional community in IS academy, centered in the United States. The findings of study two can be generalized to other knowledge exchange platforms sponsored by various similar global professional communities. With a larger sample size and more diversified platform features, study three shows a higher degree of external validity than study two.

Correspondingly, the knowledge domains of the two studies are quite different. The knowledge domain of the AISNET platform in study two focuses on professional expertise of IS academy, while the knowledge domains of the 200 platforms of the study three can more generally represent any knowledge above tertiary level education. Unlike the professional expertise on AISNET platform, the educational or research resources on university portals or various wikis lack uniqueness and consequently are more replicable. In other words, the knowledge domain of study two is more specific and less replicable than those of platforms in study three. The differences in knowledge domains partially contribute to the inconsistent roles played by technological capacity in internationalization of platforms in study two and study three. The high technological capacity of a country might lead to an abundant knowledge resource in the country. Given the abundant local resources, if the inquiries belong to certain knowledge domain that is less specific and highly replicable, the users might rather to use choose local resources than to use English based global resources.

Another important contribution of my thesis is the development of a new instrument of internationalization of knowledge platforms. In international business studies, degree of Internationalization is typically measured by foreign sales as the percentage of total sales (FSTS). The FSTS instrument is not applicable in measuring the internationalization of knowledge platforms because the performance of the knowledge platforms can hardly be indicated by the revenues. Most of knowledge exchange platforms are online non-profit organizations or online communities sponsored by professional associations. Unlike online vendors, these platforms provide services and typically do not generate revenues. Instead, the web trafficking statistics such as the number of unique visitors can indicate the performance of the web platforms more accurately.

Established DOI instruments are usually used as an aggregate indicator to show the degree of internationalization of a company across all of the foreign countries. In terms of different performance in different foreign countries, entry mode and longevity of presence are used to indicate the internationalization of a company in international business studies. However, the entry mode or the longevity of foreign subsidiaries cannot provide enough quantitative accuracy in measuring how well a company performs in specific foreign country, especially for online knowledge platforms. For knowledge platforms, the number of internet users in a foreign country or the market size of a foreign country must be considered in measuring the internationalization of the platforms. The instrument developed in my thesis is a platform-country specific indicator, showing internationalization as the percentage of foreign visitors of a platform among total visitors of the platform weighted by the market size of the foreign country. The operationalization of DOI offered in the thesis could be readily used by other scholars in future inquiries.

5.2.2 Suggested Design Features

Based on the web trafficking statistics of Alexa.com, the majority of the highly internationalized knowledge platforms are English based and hosted in the United States. The findings of my studies show that cultural difference and language deficiency are independent from each other while they are major barriers for foreign users to actively participate in knowledge sharing and online communications. To bridge the gaps between different users and mitigate the barriers, various design and managerial solutions are suggested as follows.

Multi-Language Options

The findings of the studies in my thesis suggest that multi-language options are one effective solution to mitigate the cultural and language barriers. However, the role of multi-language options on knowledge platforms is subject to detailed scrutiny, and the effect of multi-language options must not be exaggerated. Multi-language options are particularly useful for the users with English deficiency, but these options cannot bring those users into English-based global collaboration. For most of English-based global knowledge platforms, the sub-platforms of other languages are just inferior substitutes, which can hardly attract users from other cultures or nations to join in. For instance, Wikipedia contains more than a hundred foreign language sub-platforms, but these sub-platforms do not function as well as its English counterpart. Most of these sub-platforms are just incomplete translations of the English platform, and many terms generated originally in English are only translated into limited number of other languages. Even when a term is translated, during the translation process, many subtle meanings and nuances are skipped for various reasons. Therefore, on the English based platforms, multi-language options mostly benefits knowledge sharing in one direction from English to foreign languages but not much in the other way around. The role of multi-language options is quite limited in terms of leveraging global collaborations. For the knowledge platforms with multi-language options, boundary spanning activities are suggested in order to detect the information asymmetry and to improve the information quality for various foreign language sub-platforms.

Design Cultural Friendly Platforms

The findings of the third study show that the origin of the platforms plays a significant role in internationalization. The web platforms established outside United States tend to attract

more international users than U.S. based platforms. Besides the size of the local internet users, the designers' cognitive style might also contribute to these significant differences between U.S. based web platforms and non-U.S. based platforms. An empirical study by Faiola and Matei, (2006) shows that users finish information tasks faster when using the web platform created by designers from their own culture. A culturally diversified designer team might be helpful in creating a culturally friendly platform.

Previous studies also show that cultural distinctions exist in web content that is provided by either professional designers or contributed by users through collaborative work (e.g., Pfeil et al., 2006, and Zahedi et al., 2006). Following Hofstede's cultural framework, these studies identify cultural distinctions in the virtual world. Researchers have developed cultural signifiers according to Hofstede's cultural framework in order to quantify the cultural features in the design phase (e.g., Zahedi et al. 2011). In terms of collaborative authoring on knowledge platforms, cultural boundary spanning activities are suggested. Automated tools like bots might be employed to blend multi-cultural elements into the contents of web postings.

Other Suggestions for Design Features

To support global collaboration, other design features might be introduced such as personalized interface and highly interactive communication features. As I suggested in Chapter 2, high level of interactivity might lead to better knowledge sharing and knowledge creation. Improved design or governance policies of knowledge platforms might allow users to participate in highly interactive communications. Personalized design of user interface might increase users' satisfaction and intention to use the platforms persistently.

5.3 Future Direction

5.3.1 Socio-Cultural Differences Other than Hofstede's Framework

National Cultures

In my thesis, I chose cultural distance to indicate the socio-cultural differences across nations, which are derived from Hofstede's Framework of national culture. The cultural distance is widely used in various empirical studies, and has achieved high explanatory validity in international business research. Clearly, there are plenty of other options with respect to cultural differences.

The two comparative national culture measurements are Schwartz's National Culture Dimensions (Schwartz 1994; Schwartz, 1999) and the Global Leadership and Organizational Behavior Effectiveness (GLOBE) study (House et al., 2004). Schwartz's national culture values, shown in Figure 5.1, contain seven major cultural dimensions—mastery, hierarchy, conservatism, harmony, egalitarian commitment, intellectual autonomy, and affective autonomy. Among the seven dimensions, conservatism and mastery have been employed frequently in international business studies (Chui et al., 2002). In the GLOBE project, the researchers identify 18 items to indicate leadership characteristics across national cultures (House et al. 2004). Compared with Hofstede's cultural framework and Schwartz's seven cultural dimensions, GLOBE indices are still subject to theoretical and empirical validation (Hofstede, 2010). To indicate national cultural differences, the three cultural measures, Hofstede's cultural framework, Schwartz's cultural values, and GLOBE indicators, are used in robustness checks for one another, and to show similar explanation power (Chui and Kwok 2008; and Shao et al., 2010). Future research might apply the alternative cultural index to indicate the national cultural differences.

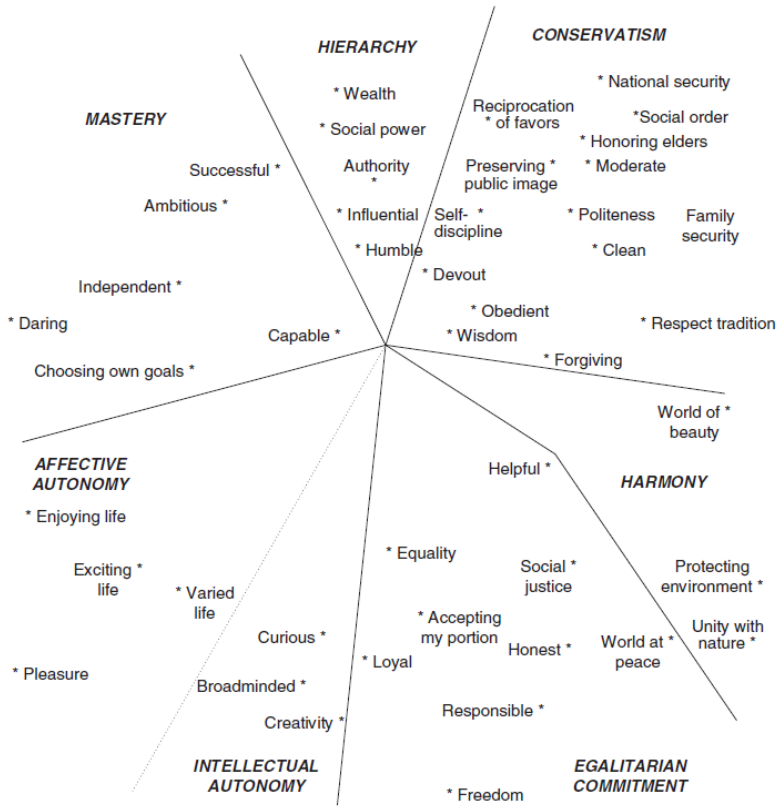


Figure 5.1 Schwartz's Culture-Level Value Structure (adapted from Schwartz, 1994).

Cultural Cognitive Orientation

Besides the cultural behavioral differences indicated through Hofstede's framework or Schwartz's dimension, people from different cultural backgrounds tend to show different cognitive styles. Cognitive styles are the particular styles in mind, with respect to planning, strategizing and problem-solving based on patterns of organizing information and environmental conditioning (Goldstein and Blackman, 1978). Researchers describe the dichotomy of Western and East Asian cognitive styles as "holistist" and "serialist" styles (Chiu 1972; and Pask, 1988). Because cognitive styles determine the information producing and information searching behaviors, cognitive styles with different cultural backgrounds will shape the way of online

communication and global collaboration. Future research can investigate the effects of cultural cognitive styles on global collaboration and knowledge construction on knowledge platforms.

Social Norms and Values

Besides national cultures, social norms and values can also indicate the socio-cultural differences across nations (Knack, 1999). At the national level, generic trust, and trust of foreigners based on the World Values Survey (World Values Study Group, 1994) can also effectively indicate the socio-cultural differences; these are all theoretically relevant to the research in global collaboration in knowledge platforms.

5.3.2 Platform Features, Task Orientation and Group Composition

In future research, more platform features should be examined. Interactivity of online platforms is associated with knowledge creation and knowledge sharing. In future research, the interaction effects between interactivity and internationalization of knowledge platforms should be thoroughly examined. Other socio-cultural related design features should be identified and investigated. Among others, cultural signifiers could be applied to measure the formation and development of the platforms' culture, shaped by global users.

The knowledge construction processes in different knowledge domains are quite different from one another. In a multi-cultural context, the interaction effects between platform features and task orientation of different knowledge construction activities should be examined both theoretically and empirically. In collaborative knowledge construction processes, group history and group composition are also important antecedents of group performance and the quality of

knowledge products (Webb et al., 1998). In future research, the effects of multi-cultural backgrounds of group members on the group performance deserve more research endeavors.

5.3.3 Research Methods

The thesis contains both qualitative and quantitative research studies in examining the knowledge sharing and global collaboration issues in online platforms. In future research, other methods based on archival documents, interviews, participant observations, and questionnaire surveys should be applied as well in order to investigate knowledge sharing and creations and collaboration on knowledge exchange platforms more thoroughly.

In terms of measurements and statistical analysis, more rigorous research methods can be applied in future research. Even though Alexa provides very reliable web trafficking statistics, and is cited by various commercial reports, for scientific research purpose, the measures based on Alexa could be verified or triangulated through other web trafficking tools in future research. In strategic management studies, multiple linear regressions are widely used in examining hypotheses. Hierarchical Multi-level Analysis and PLS might be applied in future research in order to show the multi-level effects and the path model respectively.

APPENDIX A: ISWORLD MISSION STATEMENT AND LIST POLICY

The ISWorld Mailing List

This page contains information about the ISWorld Mailing List, a mailing list designed to serve the needs of the Information Systems academic community. The list is supported and funded by the Association for Information Systems, with resources provided by University College Dublin and the Information Systems Research Center at the University of Houston.

The ISWorld List was founded in November 1994 by John Mooney at University College Dublin. The initial subscription was drawn from an amalgamation of the ICIS-L list, then maintained by Rick Watson at the University of Georgia, and the CIS-L list, then maintained by Al Bento at the University of Baltimore. In December 1994, ISWorld had 1,384 subscribers across 32 countries.

Policy and Intended Usage

1. The ISWorld List is primarily for use by Information Systems faculty, doctoral students, and researchers.

2. The purpose of the ISWorld List is to be a broadcast medium for IS-related information of interest to, and relevant for, members of the IS academic community.

3. AIS does not publish messages on the ISWorld List; AIS and the ISWorld List service providers provide facilities that enable ISWorld subscribers who originate content to publish that content on the ISWorld List.

4. Only ISWorld subscribers may distribute messages over ISWorld.

5. The ISWorld List should not be used as a forum for discussion unless that discussion is directly IS-related and is of significant importance to a large majority of ISWorld subscribers.

6. The ISWorld List should not be used to advertise events, items, or services that are marketed to generate profit without advance written permission of the AIS President.

7. The ISWorld List should **not** be used for personal communication (e.g., change of contact details) or self-promotion.

8. The ISWorld List should **not** be used to distribute file attachments. Instead, a message containing a URL to the file may be distributed.

9. The ISWorld List should **not** be used for student exercises.

10. The ISWorld List should **not** be used for repeated distribution of the same information.

11. Organizers of non-AIS conferences that are of interest to the IS community are permitted to distribute **one** call for papers (CFP) for their conference plus **one** submission deadline reminder AND **one** message relating to registration/program information plus **one** reminder. This policy specifically denies CFP postings by individual tracks within a conference. Multi-track

conferences should coordinate a single ISWorld posting containing URLs to further detailed information.

12. In order to minimize the level of superfluous postings while maintaining the dynamics of an unmoderated list, replies to messages posted on the list are by default sent only to the Sender of the original posting.

13. AIS reserves the right to edit or amend ISWorld List policy.

If you have any doubt regarding the appropriateness of your posting, feel free to contact the Vice President of Communications of the Association for Information Systems.

The ISWorld List is part of the ISWorld Net initiative designed to provide a single entry point to intellectual resources related to information systems technology and to promote the development of an international information infrastructure for creating, disseminating, and applying knowledge.

ISWorld List Rules

ISWorld subscribers must agree to the following Conditions of Use to confirm the distribution of a message to the ISWorld List.

Senders must confirm that they accept the List Usage Policy and Conditions:

1. The Sender acknowledges that he or she is the publisher of the message to be distributed on the ISWorld List. AIS and the ISWorld List service providers take no responsibility for the content of any message unless it is directly disseminated by AIS.

2. The Sender acknowledges that (i) the ISWorld List is **not** moderated, (ii) all messages will be automatically distributed in unedited form to all ISWorld subscribers, (iii) the content of the messages is limited to information systems matters, and (iv) the message has a subject line that clearly reflects the content of the message.

3. The Sender warrants that the content of the message is not (i) confidential, (ii) in violation of any copyright law, (iii) defamatory, or (iv) in violation of any other law.

4. The Sender warrants that the message is not inflammatory, offensive, or political in content, tone, or implication to any member of the diverse, global, and multi-cultural ISWorld community.

5. The Sender warrants that the content distributed is in the public domain or that the Sender owns copyright in the material or has a license to publish the material.

6. The Sender warrants that information contained within the posting has not been previously distributed over ISWorld. Individuals who are uncertain whether their posting has been successfully distributed should check the online archive to verify this, rather than distributing the message a second time.

7. Individuals using ISWorld to solicit information from the ISWorld community agree to provide the community with a summary of the responses obtained, either by distributing the summary through ISWorld or by distributing a URL for the summary.

8. The Sender indemnifies AIS and the ISWorld List service providers against any liabilities that may incur as a result of any message sent by the Sender.

9. At the discretion of the President of AIS or the ISWorld List manager, AIS reserves the right to unsubscribe temporarily or permanently any ISWorld subscriber who fails to abide by these conditions and also to remove any postings from archives of the ISWorld List with or without cause.

APPENDIX B: ADDITIONAL FIGURES FOR CHAPTER 2

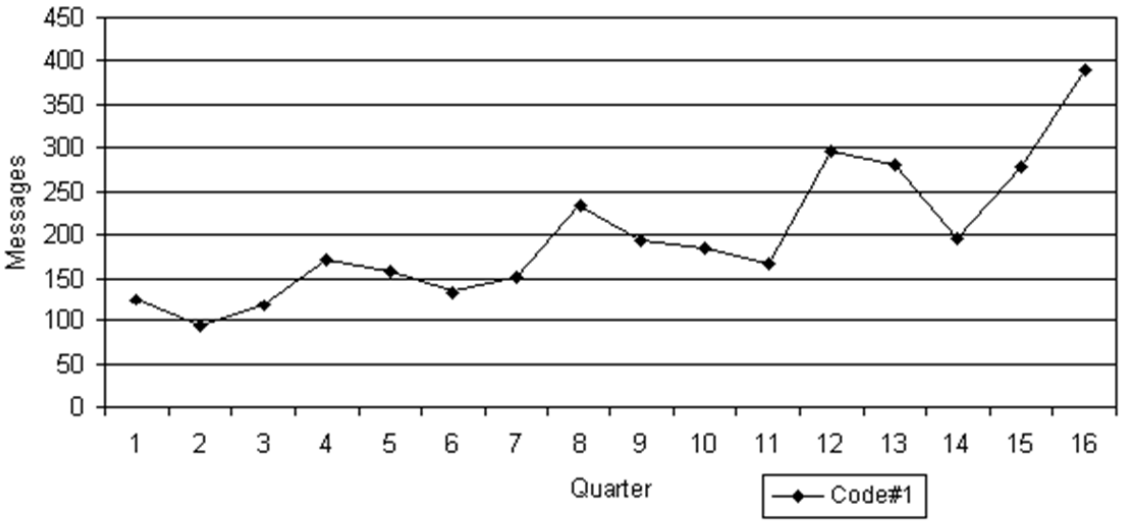


Figure B1: Conference Announcement Quarterly

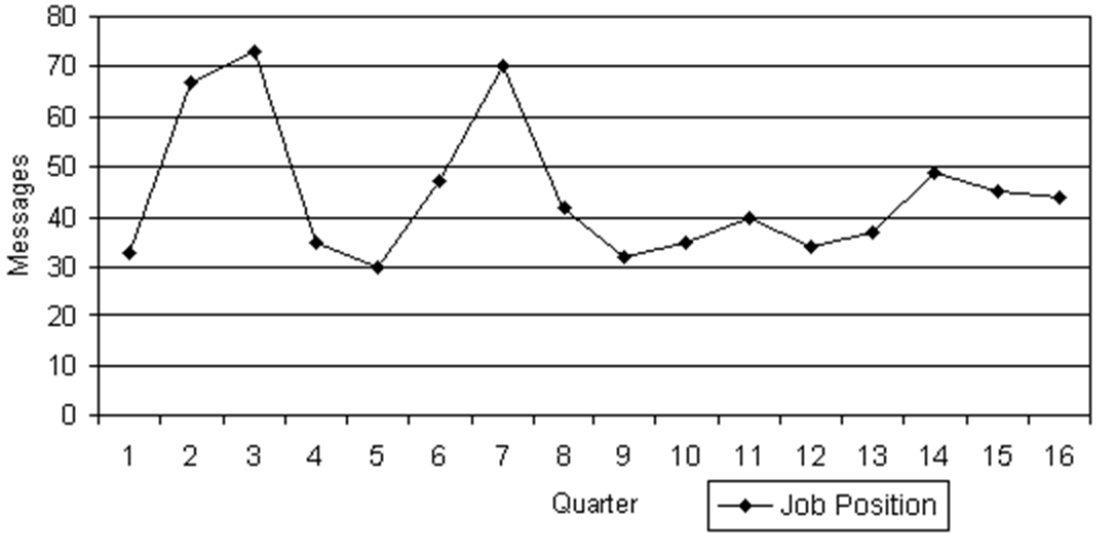


Figure B2: Job Position Announcement Quarterly

APPENDIX C: SAMPLE OF GLOBAL KNOWLEDGE PLATFORMS

Table C.1: Sample - Brick-and-Click Platforms

No.	Websites	Mother Country	# Foreign Countries	No.	Websites	Mother Country	# Foreign Countries
1	Austmus.gov.au	AU	9	51	Osu.edu	US	15
2	Amonline.net.au	AU	10	52	Amnh.org	US	15
3	Vic.gov.au	AU	13	53	Pdx.edu	US	16
4	Powerhousemuseum.com	AU	15	54	Cornell.edu	US	16
5	Usyd.edu.au	AU	18	55	Duke.edu	US	16
6	Monash.edu.au	AU	19	56	Usf.edu	US	16
7	Nla.gov.au	AU	22	57	Healthfinder.gov	US	16
8	Nature.ca	CA	10	58	Uiuc.edu	US	17
9	Gc.ca	CA	12	59	Ncsu.edu	US	17
10	Sfu.ca	CA	19	60	Dtic.mil	US	17
11	Ualberta.ca	CA	22	61	Isbndb.com	US	17
12	Utoronto.ca	CA	24	62	Exploratorium.edu	US	17
13	Ifla.org	CA	30	63	Usu.edu	US	18
14	Iisg.nl	NL	16	64	Purdue.edu	US	18
15	Nmm.ac.uk	UK	13	65	Loc.gov	US	18
16	Npg.org.uk	UK	13	66	Childrenslibrary.org	US	18
17	Nhm.ac.uk	UK	14	67	Nsf.gov	US	18
18	Nationalgallery.org.uk	UK	14	68	Upenn.edu	US	19
19	Sciencemuseum.org.uk	UK	16	69	Tamu.edu	US	19
20	Designmuseum.org	UK	17	70	Moma.org	US	19
21	Bham.ac.uk	UK	19	71	Davidrumsey.com	US	19
22	Vam.ac.uk	UK	19	72	Si.edu	US	19
23	Bl.uk	UK	20	73	Berkeley.edu	US	20
24	Britishmuseum.org	UK	20	74	Columbia.edu	US	20
25	Tate.org.uk	UK	22	75	Colorado.edu	US	20
26	Nottingham.ac.uk	UK	24	76	Nga.gov	US	20
27	Ucl.ac.uk	UK	24	77	Uiowa.edu	US	21
28	Leeds.ac.uk	UK	25	78	Stanford.edu	US	21
29	Warwick.ac.uk	UK	25	79	Umd.edu	US	21
30	Ox.ac.uk	UK	27	80	Yale.edu	US	21
31	Saatchi-gallery.co.uk	UK	28	81	Unc.edu	US	21
32	Ed.ac.uk	UK	31	82	Msu.edu	US	21
33	Archives.gov	US	10	83	Bu.edu	US	21
34	Brooklynmuseum.org	US	11	84	Metmuseum.org	US	21
35	Museum.tv	US	11	85	Noah-health.org	US	21
36	Walkerart.org	US	11	86	Umn.edu	US	22
37	Nypl.org	US	12	87	Umich.edu	US	22
38	Ala.org	US	12	88	Ucla.edu	US	22
39	Ohiolink.edu	US	12	89	Uchicago.edu	US	22
40	Nsdl.org	US	12	90	Ucsb.edu	US	22
41	Thetech.org	US	12	91	Indiana.edu	US	23
42	Guggenheim.org	US	13	92	Virginia.edu	US	25
43	Asu.edu	US	14	93	Cmu.edu	US	25
44	Byu.edu	US	14	94	Harvard.edu	US	26
45	Usda.gov	US	14	95	Wisc.edu	US	26
46	Getty.edu	US	14	96	Princeton.edu	US	26
47	Fi.edu	US	14	97	Mit.edu	US	28
48	Rockhall.com	US	14	98	Caltech.edu	US	28
49	Usc.edu	US	15	99	Ushmm.org	US	29
50	Ucsd.edu	US	15	100	Nih.gov	US	31

Table C.2: Sample - Pure Click Platforms								
No.	Websites	Mother Country	# Foreign Countries		No.	Websites	Mother Country	# Foreign Countries
1	Classicreader.com	CA	12		51	Lii.org	US	18
2	Infopackets.com	CA	14		52	Highbeam.com	US	18
3	Stumbleupon.com	CA	19		53	Myownbusiness.org	US	18
4	Bibsonomy.org	DE	17		54	Photosig.com	US	18
5	Ceeol.com	DE	22		55	Scienceblogs.com	US	18
6	Historyofwar.org	UK	9		56	Groupsrv.com	US	18
7	Sportsvl.com	UK	11		57	Able2know.org	US	19
8	Literature.org	UK	12		58	Tech-forums.net	US	19
9	Theanswerbank.co.uk	UK	12		59	Encyclopedia.com	US	20
10	Bubl.ac.uk	UK	15		60	Virtualdr.com	US	20
11	Badscience.net	UK	15		61	Designcommunity.com	US	20
12	Netdoctor.co.uk	UK	16		62	Inhabitat.com	US	20
13	Bibliomania.com	UK	18		63	Idealist.org	US	20
14	Businessballs.com	UK	18		64	Quomon.com	US	21
15	Citeulike.org	UK	23		65	Eliteskills.com	US	21
16	Bit-tech.net	UK	27		66	Linguistlist.org	US	21
17	Listal.com	UK	28		67	Jiskha.com	US	22
18	Askowen.info	US	10		68	Techguy.org	US	22
19	Peakware.com	US	11		69	Bleepingcomputer.com	US	22
20	Plos.org	US	11		70	Computerforum.com	US	22
21	Philosophypages.com	US	12		71	Cdlib.org	US	23
22	Blurtit.com	US	12		72	Cpdl.org	US	23
23	Yedda.com	US	12		73	Experts-exchange.com	US	23
24	Techsoup.org	US	12		74	Techsupportforum.com	US	23
25	Infoplease.com	US	13		75	Tek-tips.com	US	23
26	Allexperts.com	US	13		76	Computing.net	US	23
27	Whitepapersource.com	US	13		77	Britannica.com	US	24
28	1911encyclopedia.org	US	14		78	Webopedia.com	US	24
29	Ccel.org	US	14		79	Knowledgerush.com	US	24
30	Askmehelpdesk.com	US	14		80	Softwaretipsandtricks.com	US	25
31	Mathforum.org	US	14		81	Fas.org	US	25
32	Physlink.com	US	14		82	Ibiblio.org	US	26
33	Doctorslounge.com	US	14		83	Aerospaceweb.org	US	26
34	Emedicinehealth.com	US	14		84	Stackoverflow.com	US	27
35	Jrank.org	US	15		85	Molecularstation.com	US	27
36	Allreaders.com	US	15		86	Codeproject.com	US	27
37	Pantheon.org	US	16		87	Ittoolbox.com	US	27
38	Webexhibits.org	US	16		88	Worldcat.org	US	28
39	Ipl.org	US	16		89	Archive.org	US	28
40	Fullbooks.com	US	16		90	Howtogeek.com	US	28
41	Artlex.com	US	16		91	Useit.com	US	29
42	Liveperson.com	US	16		92	Sharpened.net	US	29
43	Howstuffworks.com	US	17		93	Sourceforge.net	US	30
44	Dublincore.org	US	17		94	Opensource.org	US	30
45	Scienceray.com	US	17		95	Gutenberg.org	US	31
46	Eserver.org	US	17		96	Wikia.com	US	32
47	Craftster.org	US	17		97	Wikipedia.org	US	33
48	Oculture.com	US	17		98	Wikibooks.org	US	34
49	Bartleby.com	US	18		99	Wikiversity.org	US	35
50	Online-literature.com	US	18		100	Wikisource.org	US	41

APPENDIX D: ROBUSTNESS TESTS

Table D.1: Robustness Test 1 (Replace Missing Value by Series Mean)
Multiple Linear Regression on Internationalization

	Model 0	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Control Variables:					
Page Viewed per User	-.013	-.002	.006	.008	.013
Average Time Spent per User	-.007	-.016	-.028	-.030	-.033
National Factors:					
LNGDP per capita of 2008 ***(H4.1)***		.099***	.081**	.075**	.074**
Network Readiness Index of 2008 ***(H4.2a)***		-.305***	-.289***	-.284***	-.280***
English Proficiency ***(H4.2b)***		.290***	.287***	.283***	.316***
Cultural Distance ***(H4.3)***		-.144***	-.150***	-.173***	-.147***
Multi-Language Options			.096***	.006	.145***
Pure Click vs. Brick-and-Click ***(H4.5)***			.111***	.113***	.109***
Home Country (U.S. vs. Non-U.S.) ***(H4.6)***			-.079***	-.081***	-.078***
Interaction Effect 1 ***(H4.4a)*** Multi-Language Option X Cultural Distance				.108***	
Interaction Effect 2 ***(H4.4b)*** Multi-Language Option X English Proficiency					-.099***
Adjusted R^2 change	.000	.135***	.026***	.002***	.006***
Adjusted R^2		.135***	.161***	.163***	.167***

Notes: *--significance at 0.05 level;**--significant at 0.01 level; ***--significance at 0.001 level

Table D.2: Robustness Test 2 (Replace Missing Values by Linear Trend)
Multiple Linear Regression on Internationalization

	Model 0	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Control Variables:					
Page Viewed per User	-.013	-.002	.005	.007	.012
Average Time Spent per User	-.007	-.015	-.027	-.029	-.032
National Factors:					
LNGDP per capita of 2008 ***(H4.1)***		.087**	.068*	.063*	.061*
Network Readiness Index of 2008 ***(H4.2a)***		-.299***	-.283***	-.278***	-.273***
English Proficiency ***(H4.2b)***		.280***	.277***	.273***	.306***
Cultural Distance ***(H4.3)***		-.160***	-.166***	-.187***	-.163***
Platform Features:					
Multi-Language Options			.095***	.012	.145***
Pure Click vs. Brick-and-Click ***(H4.5)***			.111***	.113***	.109***
Home Country (U.S. vs. Non-U.S.) ***(H4.6)***			-.079***	-.081***	-.078***
Interaction Effect 1 ***(H4.4a)*** Multi-Language Option X Cultural Distance				.101***	
Interaction Effect 2 ***(H4.4b)*** Multi-Language Option X English Proficiency					-.099***
Adjusted R^2 change	.000	.137***	.025***	.002***	.006***
Adjusted R^2		.137***	.162***	.164***	.168***

Notes: *--significance at 0.05 level;**--significant at 0.01 level; ***--significance at 0.001 level

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