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## Editors

# Seniors and Online Social Network Use

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## Abstract

Online social networking has the potential to enrich the lives of the elderly by providing them with an easy way to stay in touch with friends and family. Seniors are the fastest growing demographic in online social networks. Marketers and advertisers are anxious to capture the attention and buying power of this demographic through this new channel. Yet very little is known about what influences seniors to use online social networks. This study uses results from a brief pilot study as well as theory and literature to build a conceptual model to examine what key factors influence seniors to use online social networks. The model that emerged describes ten key factors that influence use. Specifically the model indicates that perceptions of privacy, security along with Web experience and proclivity to give and get information are some of the key factors that influence elders to use online social networks. Finally using insights gained from the pilot and previous work in this area, a questionnaire to empirically validate the conceptual model is also presented. The model and the proposed questionnaire are a first step of an ongoing research project that also aim to provide others with a foundation to continue research in this area.

**Keywords**: Online Social Networking, Seniors, Social Networking Use, Web 2.0

## 1. INTRODUCTION

Information technology and the Internet are becoming a necessary resource for the convenience and enjoyment of individuals (Walsham, 2008). Web 2.0, the new and improved Web, has created a sophisticated user base with new online functionality and tools such as blogs, wiki's, online social networking. While earlier it was very static and mostly an information source, today the Web is more interactive and more collaborative (Anderson 2007). It gives users the opportunity to give feedback and comments.

As a result of Web 2.0, the Internet is changing from merely a place to get information or give information, to a place to access a whole set of interactive applications, online sharing, collaboration and ubiquitous commerce. In addition, the exponential growth in Internet access has created a similar growth in the number of Web users. In 2000, global Internet use was at 0.4 billion; the latest usage statistics from December 2009 indicates an increase in use to 1.8 billion users (Miniwatts Marketing Group, 2010). The growth in Internet usage in the past 9 years has thus been around 400 percent.

Social Networking is one of the many applications that emerged from Web 2.0 that has seen dramatic growth and popularity. One researcher calls it a place where you could "type yourself into existence or into being" (Macau 2009). Online social networking is described as online spaces that individuals use to present themselves and to establish or maintain connections with others (Ellison et al. 2006). Now social networking has become the 4th most

popular online activity ahead of email and it accounts for almost 10% of all Internet time. (Nielsen 2009).

As such, online social networking is currently in the midst of an explosion of popularity, as well as an explosion of questions about the costs, benefits, and future of this technology. For many users of the Internet, checking social networking sites has become part of daily computer usage, and numbers of these intensive users is rising rapidly (Smith, 2008).

While there are many social networking Web sites, the most common ones are facebook.com and myspace.com. These Web sites are often seen as relationship facilitators. Since February 2007, Facebook was the sixth most visited Web site in the United States as measured by average visits (Cain 2008). Studies cite a wide range of benefits that these users gain from social networking Web sites such as the ability to keep in touch with friends, to establishing new relationships with others, and to feeling a sense of community within the social network to which they belong. Niche groups operating in online social networks provide individuals of similar professions or interest an opportunity to pursue causes and share information that benefits group members. From a business standpoint, knowing who uses social networking sites and their motivations may facilitate marketing of products and services.

Predictably, social networks are increasingly looking for ways to profit from the sites' popularity. Businesses with a Web presence are beginning to utilize social network sites as a mechanism for targeting consumers as well as an engine for marketing and promoting their offerings. Organizations are finding that it is significantly cheaper to employ online social networking strategies than to pay for advertising. Using social networks, organizations are able to prescreen potential customers and connect with prospects on a personal level that would build trust and credibility. In 2009, organizations are expected to continue to look for ways to leverage the world's largest single marketplace in their businesses found in consumer social networks (Ogawa et al. 2006).

Yet there are many issues and challenges surrounding social networking ranging from the significance of such networking for human relationships (Pelling and White, 2009; Panzarasa et al, 2009) to persistent security-related concerns, both for younger people and for people of all ages (Tagvoryan and Briones,

2009). Some research questions its use with regard to workplace productivity (McAfee, 2009; Neumann et al, 2005). Still, increasingly, social networking is becoming a useful tool for business, education, government, and entertainment (Warr, 2008).

These social networking sites are especially popular among the 18 to 25 year old age group who are mostly composed of college students. However, the largest growth in users in the six months ending July 2009 has been from the over 55 age group with a growth of 514 percent (Owyang 2009). Consequently, research indicates that wired seniors are devoted Internet users with 69 percent of wired seniors going online on a typical day when compared to 56 percent of all Internet users (Owyang 2009).

Seniors are recognizing that they have a lot to gain from online social networking when compared to the majority users who engage in social networking. The elderly is an age group that is most prone to losing social ties and to isolation because of physical disparities and retirement from active employment (Fiori et al. 2007). They stand to gain a lot by acclimatizing themselves with social networking tools as a key means of communication. Online social networking applications would provide them with easy communication tools to increase their social interaction with their loved ones.

As businesses begin to use social networks for targeting and promotion, wired seniors can also use social network tools to investigate different products and services as well as engage in electronic commerce. As seniors are rapidly growing into a major segment in the online social networking market place, it is imperative for organizations to identify the nature and characteristics of this elderly social network user group. Wired seniors have the time as well as the discretionary income to fully utilize the tools offered through social networks to engage in and influence electronic commerce.

While there are several studies that investigate the characteristics of the majority online social network user group and what influences their use, there is no research that investigates online social networking seniors. Given that online social networking is still a growing phenomenon, academic research in this realm is still in its infancy. The practitioner literature presents anecdotal stories and conjecture of the emergence of social networking seniors as an importance target group that would influence

commerce but it lacks the rigorous research to provide details of this influence.

Given the state of the research and literature in this arena, the objective of this research study is to understand the use of social networking Web sites by seniors and to understand their attitudes towards social networking. In order to do so, this study attempts to formulate a conceptual model of what influences seniors to use social networking sites. Using results from a brief pilot study and an assessment of the relevant literature, a new conceptual model for social networking use by seniors is presented.

In so doing, this research could reveal findings that would be useful for marketers to identify how to better market to social networking seniors. Senior centers and other elder care institutions have much to gain from encouraging elders to adopt social networking websites. The findings could assist elder care facilities to increase social interaction within their facilities. Given the buzz and hype in the practitioner media about the growth in wired seniors who social network recently, this piece of research is a first step in presenting results that could both fill a gap in the existing research and provide important insights to the world of practice. In addition, it will add to the existing literature on elders and IT that would help provide insights on how to reduce the digital divide problem that has historically existed in the elderly population.

The rest of the paper is organized as follows. First, the paper discusses seniors and social networking, identifies the conceptual model used, and a description of how the model was developed. Next, the factors identified as potential influences on social networking usage are discussed, in the context of the existing literature and the pilot study. Then, the development of the questionnaire for the next phase of the study is presented. The paper concludes with final thoughts.

## 2. SENIORS AND INFORMATION TECHNOLOGY

Although considered the fastest growing population in the world (Kiel 2005), most believe that seniors have been bypassed by the Internet revolution due to insufficient literacy or familiarity with IT and the Web (Ogawa et al. 2006). While information technology innovations are rapidly changing and creating a variety of new applications and features online, relatively little attention is given to how seniors adopt and use these technologies and features. It is often assumed that the majority of seniors do not benefit from the growing Web presence in today's society.

Cognitive limitations related to memory use are cited as one of the key deterrents to seniors' Web savviness (Hendrix 2000). The healthcare industry specifically struggles in their efforts to use interactive aspects of the Web as a means of communicating, informing and gaining input from seniors (Kiel 2005). Yet, past research suggests that most seniors are interested in learning how Web tools can help them be informed and stay connected with the outside world (Temple et al. 1990). According to Gilly and Zeithaml (1985), elderly people, who are traditionally considered resistant to change, do adopt new technologies if they think they are suitable and easy enough to use. While past studies on seniors' use of social networks are meager, recent report indicates that one in five seniors in Canada visits online social networks (Larose 2008) in order to be in contact with grandchildren. Studies further suggest that training can change the elderly's attitude toward computers especially when influenced by loved ones such as grandchildren to adopt the technology (Mathur 1999).

As such, while in the past the senior population has been slower than other age groups in embracing the Internet, this trend is beginning to change. According to a Pew report (Fox et al 2001) as many baby boomers approach retirement age, seniors' use of the Internet is increasing dramatically. A technologically savvy group of seniors is beginning to utilize the convenience offered by the Web to gain access to information and engage in commerce. The Pew report further describes the characteristics of wired seniors as more likely than their offline peers to be married, highly educated, and enjoying relatively high retirement incomes. They are more devoted Internet users overall as 69 percent of wired seniors go online daily as compared to only 56 percent of all Internet users. Most seniors go online to email, to gather hobby information, news, health information, browsing "just for fun," and weather updates.

As the report also suggests, seniors represent a growing segment of Internet users that has more discretionary time and income than the average user to devote to online activities (Trocchia et al 2000). In addition, wired Web 2.0 seniors enjoy better health as they gain a greater sense of empowerment through their online interpersonal interactions. These

interactions promote their cognitive functioning and help them gain a greater sense of control and independence in their lives (Shapira et al 2007). As seniors are at risk of losing social ties due to retirement, isolation and age related health issues, they stand to gain a lot through the use of social networking sites (Fiori etal 2007).

Not only do social networks enable seniors to increase their social bonds with loved ones, they help them get acquainted with other seniors with similar interests. The senior care facilities and senior centers could also benefit from developing an online social networking presence. These institutions can use social networks to extend the communication and socializing aspect at their institutions online as well as publicize events, encourage participation and enhance seniors' lives through increased mental stimulation and social interaction.

## 3. RESEARCH METHODOLOGY

The research method for this paper has two phases. In the first phase, a pilot study was conducted where a series of semi structured interviews were conducted on three staff members of a senior center along with five seniors each lasting 30 to 45 minutes. A summary of the results of the interviews from the perspective of the seniors as well as the IT staff is presented in Appendix A.

In phase two, the results from the pilot were combined with literature and theory related to online social networking to create a conceptual research model presented in Appendix B. In the study's second phase, a survey instrument was also developed to test the overall model (See Appendix C). This paper focuses on the second phase of the study. In the phases to follow, data will be collected by seniors and the survey instrument will be validated to validate the conceptual model described in this paper.

## 4. FACTORS THAT INFLUENCE SOCIAL NETWORKING

Traditional face to face social networking behavior has been a focus of academic study for many years. In fact, traditional social networking behavior of seniors is an area of extensive research that is often motivated by the need to understand social isolation of the elderly (Gilly et al. 1985). While offline social networking behavior has been extensively studied, online social networking is a relatively recent phenomenon. Yet, recently it has been the focus of much interest by academics as well as practitioners. Online social networking behavior of seniors is still an area of growing interest that is much less understood. This paper attempts to fill this gap by investigating what factors influence seniors' social networking use. As described previously, in the second phase of the study, a model for social networking use by seniors was developed. The factors presented in the model are described next.

### Perceived Privacy, Security and Trust

Most of the early studies in online social networking focus on the importance of privacy, security and trust as they apply to revealing personal information online. One of the first studies to investigate these three factors in the context of online social networking was an ethnographic study of the first popular social networking site, Friendster (Boyd 2004). The study documents the influence of privacy, security issues on member participation and the maintenance of friendship connections. It describes members' perceived trust in creating their profile with the intention of communicating news about themselves to others. Another study of trust in virtual communities concluded that trust affected intentions to both give and get information, and that trust was raised when individuals had a higher trust disposition, and when they experienced positive relationships in the community (Ellison et al 2006). Several other studies have examined social networking sites by analyzing profile information and member surveys to understand privacy, security and information sharing practices (e.g., Acquisti and Gross, 2006; Stutzman, 2006).

A study examining how privacy, security and trust influence social interactions by comparing the two popular social networking sites, Facebook and MySpace revealed that online relationships can develop in sites where perceived trust and privacy safeguards are weak (Dwyer 2007). More recent studies of privacy and security issues have focused on the rise of legal concerns about websites such as Facebook, asking questions about who is required to protect privacy and how, especially when users have made information publicly available, and discussed Facebook's policies on privacy settings as a way of addressing such concerns (Tagvoryan and Briones, 2009; Flint, 2009). Another recent study of adolescent disclosure of personal information on web sites used survey data from middle school students to show that

students had higher levels of privacy concern when they perceived higher levels of risk, but lower levels of privacy concern when they perceived higher levels of benefit from sharing information, and that their levels of privacy concern did affect usage behaviors (Youn, 2009).

While past literature reveals many studies that look at the influence of perceived privacy, security, and trust on online social network among college students, there are hardly any that focus on seniors. However, a recent study that examined age as a major factor that influences social network use indicated that as age increases, perceptions of privacy, security and trust in the online social network decreased (Nosko et al 2010). The interviews during the pilot also further revealed that seniors feared entrapment and security concerns when interacting online. Given the support from the literature for its inclusion and confirmation from the pilot interviews, perceived privacy, security and trust were included as factors that influence online social networking.

### Gender

Demographic factors as they influence social networking are another means of investigating social networking behavior that has received much attention in the past. Much like any other innovative information and communication technology (ICT), social networks are influenced by gender. A Pew survey of teenage social network users found gender differences that indicated that boys use these sites more frequently than girls in order to engage in flirting (Thelwall 2008). The academic literature is rich with studies that look at the impact of gender on Internet use (e.g., Chen 2007, Odell 2000). According to researchers, still much concern exists that gender differences influence Web based learning and Internet usage patterns. It is widely asserted that female usage of the Internet is limited by their negative attitudes towards computers and new technology due to their less overall experience with the Internet when compared to men (Schumacher et al 2001). Investigation of gender difference in online communication suggests that females, more than males, tend to participate in online chat rooms (Louis, 2004, Verhaagen, 2005).

A recent study of profiles on MySpace suggests that elderly females have more male friends than female friends whereas elderly males have equal numbers of friends from both genders (Pfeil et al. 2009). The study certainly suggests that there may be differences between social networking behavior between elderly males and females. As such, these past findings indicate that gender can be an important determinant of online social networking use among elders.

### Web Experience

Past literature identifies user experience with the web as major factor that influences adoption of new technology, and of usage of Web-based information systems in general (e.g., Yi and Hwang, 2003; Taylor and Todd 1995). Studies have found similar results regarding the usage of social networking sites (Eastin and LaRose, 2000). For example, a study of young adults suggests that people with higher levels of web experience and autonomy of use were more likely to be users of social networking sites (Hargittai, 2007). Studies have sometimes categorized users of online social networking according to their web experience profiles. One study divided users into three categories: passive users of the network, users who invite offline friends to join, and those who participate in the evolution of the network (Kumar et al, 2006).

When considering the elderly, past research indicates that adoption and interaction with ICT's are more favorable in the presence of similar experience in the past. According to Agarwal and Prasad (1999), a positive perception and the adoption of a new technology often results from experience with past similar technologies. This past experience can be a key factor for the elderly as they are more opposed to change than the younger generations. According to Gilly & Zeithaml (1985), when seniors identify with the new innovation based on their prior familiarity with similar technologies, they are more likely to attempt new applications such as social networks.

### Computer Anxiety

A factor that has received much attention in the psychology and information systems research areas, researchers still debate as to if computer anxiety can be reduced or eliminated with training, better resources and support. Computer anxiety can be defined as generalized emotional distress or the tendency of an individual to be uneasy, apprehensive or phobic towards current or future use of computers (Igbaria & Iivari, 1995).

Much like prior experience, computer anxiety could have a critical impact on the use of social

networks by the elderly. Past literature on computer anxiety and seniors indicate that the anxiety to use computers influence the quality of life of seniors today (Karavidas et al 2005). Yet, other studies suggest that with baby boomers retiring, more computer savvy seniors are emerging online who have less computer anxiety than previous generations. During the pilot interviews, both the seniors and the senior center staff indicated that computer anxiety and computer phobia were a major barrier to computer use by the elderly. On the other hand, two other interviewed seniors who had worked with computers as part of their occupation prior to retirement indicated an openness and willingness to try out social networks as a way to better connect with society. Given the strong evidence from both literature and the pilot interviews, computer anxiety was included in the overall model for social networking use.

**Social Norms**

Social norms refer to the rules and codes of conduct and behavior within a particular community, group or culture that is accepted as normal (Kiesler et al. 1984). Many well established theories and literature in information systems highlight the importance of social norms to ICT acceptance, adoption, and use by the general population and by seniors (Mallenius et al 2007; Phang et al 2006). A recent study of adoption of new technology described 'information cascades' that can cause individuals to adopt the technology when they become aware of the adoption decisions of others (Chesney et al, 2010). As such, when perceived as the 'norm,' users tend to gravitate to adopt and use the technology to not only adhere to norms in society but also to benefit from the network effects that result. By its very nature, social network features encourage sharing, friend referral and interaction creating a new social norm for society at large. Consequently, more so than other age groups, elders may be prone to adopt social networks when referred to by friends and family to adopt this new technology.

**Enjoyment**

Motivation for use of an ICT can result from societal norms but also could be more intrinsic in nature. The perception of enjoyment from the activity might lead a user to use a specific technology more than other technology innovations. Enjoyment is defined as "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart

from any performance consequences that may be anticipated" (Venkatesh et al. 2003). The user acceptance literature in information systems identifies enjoyment as a importance factor that influences adoption. Enjoyment as an influential variable in usage is particularly important in the case of social networking sites (Yi and Hwang, 2003). These sites are comparable to online gaming in the fact that the motivation for use is highly associated with recreation and socializing. However, this may be especially true for young people (Boyd, 2007). There is some evidence that older users may be more focused on using online social networking for professional and business purposes, which may imply less emphasis on enjoyment ("Profiting from Friendship," 2010). However, retired seniors may perceive social networking as a more entertaining activity that helps them connect with loved ones. As such, enjoyment may influence them to more actively use online social networks.

**Desire to Get and Give Information**

While not greatly discussed in existing literature, the pilot study as well as the researchers own experience with online social networks led to the inclusion of the desire to get and the desire to give information as two key variables that influence social network use. While these are new variables within the social networking research arena, these variables are grounded in psychology and organizational learning (Mikami et al, 2010; Davenport and Klahr, 1998).

The organizational learning and knowledge management literature describes the desire to get information as a factor of importance to learning and knowledge creation (Grover and Davenport 2001). This study focuses on an individual's desire to get information for individual use in social interactions which may not result in knowledge creation for organizational use. Past studies in online social networking describe these sites as growing in popularity due to its ability to satisfy its user's desire for information about other users, and for information on events and activities that can be accessed from these sites (Boyd and Ellison, 2007).

Similarly the desire to give information is also a key reason for users to participate in social networking sites. Past studies indicate how users employ applications such as photo sharing and videos to share information and create unique personas online (Boyd 2007). Researchers suggest that social networking profiles are often

created to "manage impressions and write one self into existence." Given the ease with which one could create and maintain online relationships though social networks, users are encouraged to share information to create a community of friends and social interactions online. This is especially beneficial to the elderly and as noted in the introduction is cited as a primary motivation for the growth of seniors on social networks.

**Use**

Computer use is a factor that is of central importance to the information systems literature. With each new ICT that emerges with the rapid change of technology, information systems researchers attempt to understand the intention to use and the adoption of the new ICT. In the context of social networking use by seniors, use can be further investigated in terms of the intention to use, the intensity of the use as well as the patterns of use. In so doing, data collection in a future stage would enable more granular and richer analysis of the factors that influence social networking use by seniors.

Using the conceptual model described previously as the foundation, next, a questionnaire was developed. This proposed questionnaire was developed in order to validate and empirically test the conceptual model. The process used to develop this model is described next. This proposed questionnaire is presented to serve as an initial reference to other academics conducting research in this space.

## 5. SURVEY INSTRUMENT FOR SOCIAL NETWORK DEVELOPMENT

Straub et al (2004) contends that one of the challenges of positivist quantitative research is accurately capturing and measuring the social phenomena. Using existing measure when possible is encouraged in academic research; however, Swanson (1991) suggest that the context of existing research measures and questionnaires may not apply to a researcher's current project as the measures are deeply embedded in the research project that they pertain to. As such, it is best to exercise caution when adopting existing measures. Zmud et al (1991) suggests that existing measures should serve only as useful starting point in operationalizing variables of interest.

With that in mind, past literature and theory was utilized whenever possible to develop the questionnaire items. Where appropriate a deductive, iterative approach to item development was used to develop the items (Hinkin 1995). Multiple items were generated for each construct and refined through multiple iterations of review. Finally, five graduate student assistants were asked to pretest the online questionnaire. After several minor modifications were made, the resulting questionnaire contains thirteen constructs and is presented in Appendix C. Most of the questions employed a seven-point Likert scale anchored at strongly disagree (1) and strongly agree (7). This proposed questionnaire presents other researchers with some initial insights on building a research stream in this area.

## 6. CONCLUSION

This paper has described the development of a conceptual model on social networking usage by seniors as part of a larger ongoing research project. The results of the initial phase of the study is presented in this paper and describes ten factors as importance factors that influence senior social networking use. Each of these factors was identified and content validated through a pilot study along with a comprehensive literature review. While many of the factors identified are applicable to any age group, the literature and the pilot study suggests that seniors, when compared to other age groups, will vary widely on each of these dimensions. As such, this paper represents an initial phase of a proposed research project that seeks to identify and empirically validate the factors that influence social networking use by seniors. In the main phase of the study, a cross comparison field survey that examines social networking behavior of seniors and college students using the proposed model and questionnaire is expected to provide further empirical proof for the validity for the model proposed here. Currently, the main phase of the project is underway as sites are being identified for data collection.

While the vast majority of seniors do not surf online at present, this trend is likely to change as baby boomers retire. Marketers and online businesses are eager to understand and capitalize on this new growing online segment. As such, this research offers a first look at how to target this demographic. With information on what encourages the elderly to use social networks, elderly care institutions can better support seniors who use their facilities. Using these websites will in turn enhance the quality of life of the elderly as they use social networks as

a means to interact with their community and loved ones.

## 7. REFERENCES

Agarwal, R., & Prasad, J. A. (1999). Are individual differences germane to the acceptance of new information technologies? Decision Sciences, 30(2), 361–391

Acquisti, A., & Gross, R. (2006). Imagined communities: Awareness, information sharing, and privacy on the facebook. *Proccedings of the Privacy Enhancing Technologies Workshop (PET), 2006,*

Anderson, P. (2007). What is Web 2.0? Ideas, technologies and implications for Education. *TechWatch Report*. Joint Information Systems Committee.

Boyd, D. M. (2004). Friendster and publicly articulated social networks. *Proceedings of the Conference on Human Factors and Computing Systems, ACM, Vienna, 2004.,*

Boyd, D., & Ellison, N. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13*(1)

Boyd, D. (2007). Why youth love social network sites: The role of networked publics in teenage social life. *The John D.and Catherine T.MacArthur Foundation Series on Digital Media and Learning, -*, 119-142.

Boyles, S. (2008). Facebook benefits extroverts most: Introverts log more time on social networking site, but have fewer friends, study shows. *WebMD*. Retrieved from http://www.webmd.com/sex-relationships/news/20080625/friend-website-benefits-extroverts-most

Cain. J. (2008). Online social networking issues within academia and pharmacy education. *American Journal of Pharmaceutical Education, 72*(1): 10.

Chesney, T., Foster, D., & Lawson, S. (2010). Explaining technology adoption with information cascades, a study of microblogging data (april 23, 2010). *Nottingham University Business School Research Paper no. 2010-09,*

Davenport, T. H., & Klahr, P. (1998). Managing customer support knowledge. *California Management Review, 40*(3), 195-208.

Dwyer, C., Hiltz, S. R., & Passerini, K. (2007). Trust and privacy concern within social networking sites: A comparison of facebook and MySpace. *Proceedings of the Thirteenth Americas Conference on Information Systems, Keystone, Colorado August 2007,*

Dyck, J.L., & Smither, J.A. (1994). Age differences in computer anxiety: the role of computer experience, gender, and education. *Journal of Educational Computing Research*, 10(3).

Eastin, M. S., & LaRose, R. (2000). Internet self-efficacy and the psychology of the digital divide. *Journal of Computer-Mediated Communication, 6*(1)

Ellison N,. Steinfeld C, & Lampe C. (2006). *Spatially bounded online social networks and social capital: The role of Facebook.* Paper presented at the annual conference of the International Communication Association, Dresden Germany.

Fiori K., Smith, J., & Antonucci, T. (2007). Social network types among older adults: A multidimensional approach. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 62*(6), 322-330.

Flint, D. (2009). Law shaping technology: Technology shaping the law. *International Review of Law, Computers & Technology, 23*(1), 5-11. doi:10.1080/13600860902742505

Fox, S, Rainie, L., Larsen, E., Horrigan, J., Lenhart, A., & Spooner, T. (2001, September). *Wired seniors: a fervent few, inspired by family ties.* Washington, DC: The Pew Internet & American Life Project. Retrieved on January 12, 2010 from http://www.pewinternet. org/reports/pdfs/PIP_Wired_Seniors_Report. pdf.

Fox, S. (2006). Are "wired seniors" sitting ducks? Retrieved on January 12, 2010 from http://www.pew internet.org/PPF/r/180/report_display.asp

Gilly, M. C., & Zeithaml, V. A. (1985). The elderly consumer and adoption of technologies. Journal of consumer research, 12, 353–357.

Grover, V., & Davenport, T. H. (2001). General perspectives on knowledge management: Fostering a research agenda. *Journal of*

*Management Information Systems, 18*(1), 5-21.

*Gupta, G.K. (2006). Computer literacy: Essential in today's computer-centric world. ACM SIGCSE Bulletin, 38(2), 115-119.*

Hall, G. (2007). Social networking trends for 2008? Pringo takes a look. *Social Media Method.* Retrieved on January 12, 2010 from http://www.socialmediamethod.com/blog/2007/12/22/social-network ing-trends-for-2008-pringo-takes-a-look/acces-ed

Happe, R.E. (2008, May). U.S. social networking application 2008–2012 forecast: Enterprise social networking takes hold*. IDC Market Analysis.* Retrieved on January 12, 2010 from http://www. idc.com/getdoc. jsp?containerId=prUS21215808

Hargittai, E. (2007). Whose space? differences among users and non-users of social network sites. *Journal of Computer-Mediated Communication, 13*(1)

Hendrix, C.C. (2000). Computer use among elderly people. *Computers in Nursing*, 18(2), 62- 68. Retrieved on January 12, 2010 from http://www.cinplus.com/ pt/re/cin/abstract.00002771-200003000-00013

Hinkin, T. R. (1995). A review of scale development practices in the study of organizations. *Journal of Management, 21*(5), 967-988.

Igbaria, M., & Iivari, J. (1995). The effects of self-efficacy on computer usage. *Omeaga International Journal of Management Science, 23*(6), 587-605.

Karavidas, M., Lim, N.K., & Katsikas, S.L (2005, September). The effects of computers on older adult users. *Computers in Human Behavior*, 21(5), 697-71.

Kiel, J.M. (2005, March). The digital divide: Internet and e-mail use by the elderly. Informatics for Health and Social Care, 30(1), 19-23.

Kiesler, S., Siegel, J., & McGuire, T. (1984). Social psychological aspects of computer-mediated communication. American Psychologist, Vol 39(10), 1123-1134.

Kumar, R., Novak, J., & Tomkins, A. (2006). Structure and evolution of online social networks. *Proceedings of the 12th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining,* Philadelphia, PA, USA.

Larose L. (2008). Half of elderly Canadians online; nearly 1 in 5 of those social networking study. Retrieved on March 22, 2010 from http://daily gleaner.canadaeast .com /balance/article/427430.

Leavengood, L.B. (2001). Older people and internet use. *Generations*, 25(3). Retrieved on Maarch 22, 2010 from http://generations.metapress.com/content/q41l28p0u5276822/

Louis, L. (2004). Net-generation attributes and seductive properties of the internet as predictors of online activities and internet addiction. CyberPsychology and Behavior, 7, 333–349.

McAfee, A. (2009). *Enterprise 2.0: New collaborative tools for your organization's toughest challenges*. Boston, MA: Harvard Business School Publishing.

McCarthy, C. (2009). ComScore: In U.S., MySpace-Facebook race goes on. *CNET.* Retrieved on March 22 2010 from http://news.cnet.com/8301-17939 _109-10141752-2.html

Mikami, A. Y., Szwedo, D. E., Allen, J. P., Evans, M. A., & Hare, A. L. (2010). Adolescent peer relationships and behavior problems predict young adults' communication on social networking websites. *Developmental Psychology, 46*(1), 46 –56.

Miniwatts Marketing Group.Internet world stats, 2010., May 8, 2010. Retrieved from http://www.internetworldstats.com/stats.htm

Neumann, M., O'Murchu, I., Breslin, J., & Decker, S. (2005). Semantic social network portal for collaborative online communities. *Journal of European Industrial Training, 29*(6), 472.

Nosko, A., Wood, E., & Molema, S. (2010). All about me: Disclosure in online social networking profiles: The case of FACEBOOK. Computer Human Behavior. 26(3) 406-418.

Ogawa, I. (2005) "The digital divide and the elderly. *Public Health Nursing*, 23(3), 69-71

Ogawa, M., Inagaki, H., & Gondo, Y. (2006) Usage of IT and electronic devices, and its structure, for community-dwelling elderly. In

Computers Helping People with Special Needs. Springer Berlin/Heidelberg, 752-758.

Owyang, J. (April 2009). The future of the social web. *ForresterResearch.* *http://www.forrester.com/rb/Research/future _of_social_web/q/id/46970/t/2*

Panzarasa, P., Opsahl, T., & Carley, K. M. (2009). Patterns and dynamics of users' behavior and interaction: Network analysis of an online community. *Journal of the American Society for Information Science & Technology, 60*(5), 911-932.

Pelling, E. L., & White, K. M. (2009). The theory of planned behavior applied to young people's use of social networking web sites. *CyberPsychology & Behavior, 12*(6), 755-759. doi:10.1089/cpb.2009.0109

Pfeil, U., Arjan, R., & Zaphiris, P. (2009). Age differences in online social networking – A study of user profiles and the social capital divide among teenagers and older users in MySpace**.** Human Computer Behavior. 25(3) 645-658.

Prasad, U. (2008).  Social networking offers an inexpensive and effective way for SMBs to connect with their customers and prospects. Retrieved on January 10, 2010 from http://www.ciol.com/   SMB/SMB-Featured-Articles/Feature/SMBs-re-cognize-benefits-of-social-networking/41108112 254/0/

*Recruiting Trends*. (2009). Data watch: Corporate social networking trends in talent management.  Retrieved on March 22, 2010 from             http://www.recruiting trends.com/online/research_corner/1284-1.html

Shapira, N. Barak, A., & Gal, I. (2007). Promoting older adults' well-being through Internet training and use. *Aging and Mental Health,* 11(5), 477-484.

Schumacher P. & Morahan-Martin J. (2001) *Gender, Internet and computer attitudes and experiences.* Retrieved on March 22, 2010 from http://www.sciencedirect.com/science?_ob= ArticleURL&_udi=B6VDC-423HJ18-6&_user=10&_rdoc=1&_fmt=&_orig=search &_sort=d&view=c&_acct=C000050221&_ver sion=1&_urlVersion=0&_userid=10&md5=f5 5ef06bb452b593a7fa1f51d7230a66

Smith, J. (2008). *Intreguing trends in social networking growth during 1H 2008.* Retrieved

January 14, 2009, from http://www.insidefacebook.com/2008/07/27/ intriguing-trends-in-social-networking-growth-during-1h-2008/

Straub, D. W. (1989). Validating instruments in MIS research. *MIS Quarterly, 13*(2), 146-160.

Stutzman, F. (2006). An evaluation of identity-sharing behavior in social network communities. *International Digital and Media Arts Journal, 3*(1)

Swanson, E. B. (1994). Information systems innovation among organizations. *Management Science, 40*(9), 1069-1092.

Sylvers, E. (2008).  Social networking benefits from financial crisis. *International Herald Tribune.*  Retrieved on March 22, 2010 from http://www.iht.com/articles/ 2008/11/02/business /boss03.php.

Tagvoryan, A., & Briones, J. M. (2009). Facebook and the evolution of online privacy. *Venulex Legal Summaries, ,* 1-2.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research, 6*(2)

Thelwall, M. (2008) Social Networks, Gender, and Friending: An Analysis of MySpace Member Profiles, *Journal of the American Society for Information Science and Technology*, 59(8):1321–1330

Temple, L.L., & Gavillet, M. (1990). The Development of Computer Confidence in Seniors: An Assessment of Changes in Computer Anxiety and Computer Literacy. *Activities, Adaptation, and Aging*, 14(3).

Trocchia. P.J. & Swinder, J. (2000).  A phenomenological investigation of Internet usage among older individuals. *Journal of Consumer Marketing*, 17(7), 605-615.

Verhaagen, D. (2005). Parenting the millennium generation: guiding our children born between 1982 and 2000. Westport, CT: Praeger Publishers.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of

information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.

Walsham, G. (2008). ICT's and global working in a non-flat world. *Information technology in*

the service economy: Challenges and possibilities for the 21$^{st}$ century (pp. 13-25). Boston: Springer.

Warr, W. A. (2008). Social software: Fun and games, or business tools? *Journal of Information Science, 34*(4), 591-604.

Willis, S.L. (2007). Technology and learning in current and future generations of elders. *Generations,* 30(2).

Yi, M. Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: Self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *International Journal of Human-Computer Studies, 59*, 431-449.

Youn, S. (2009). Determinants of online privacy concern and its influence on privacy protection behaviors among young adolescents. *The Journal of Consumer Affairs, 43*(3), 389.

Zmud, R. W., & Boynton, A. C. (1991). Survey measures and instruments in MIS: Inventory and appraisal. In K. L. Kraemer (Ed.), *The information systems research challenge: Survey research methods* (pp. 75-105). Cambridge, MA: Harvard Business School Press.

**Appendix A: Seniors Perceptions on Online Social Networking**

| | Seniors | IT Staff |
|---|---|---|
| **Use** | Primarily photo sharing<br><br>Use of internet groups such as Yahoo Groups<br><br>Unclear what social networking is | A few of the seniors use Google chat if they have Google mail.<br><br>Photo sharing |
| **Benefits** | Could use for interest groups; links to other sites.<br><br>Center use for event posting/ announcements.<br><br>Photo sharing all in one place<br><br>Hospitality site for new members at the center.<br><br>Less threatening way of meeting. | Help them reach out to former friends in a safe, non-threatening way<br><br>Keep in touch with the grandchildren<br><br>Overall, increase the quality of life by being involved with others. |
| **Challenges** | Threaten people's privacy<br><br>Confusing to learn how to make use of it | Computer Phobia<br><br>Many have never used a computer |

**Appendix B: Conceptual Model for Factors Influencing Seniors' Social Networking Use**
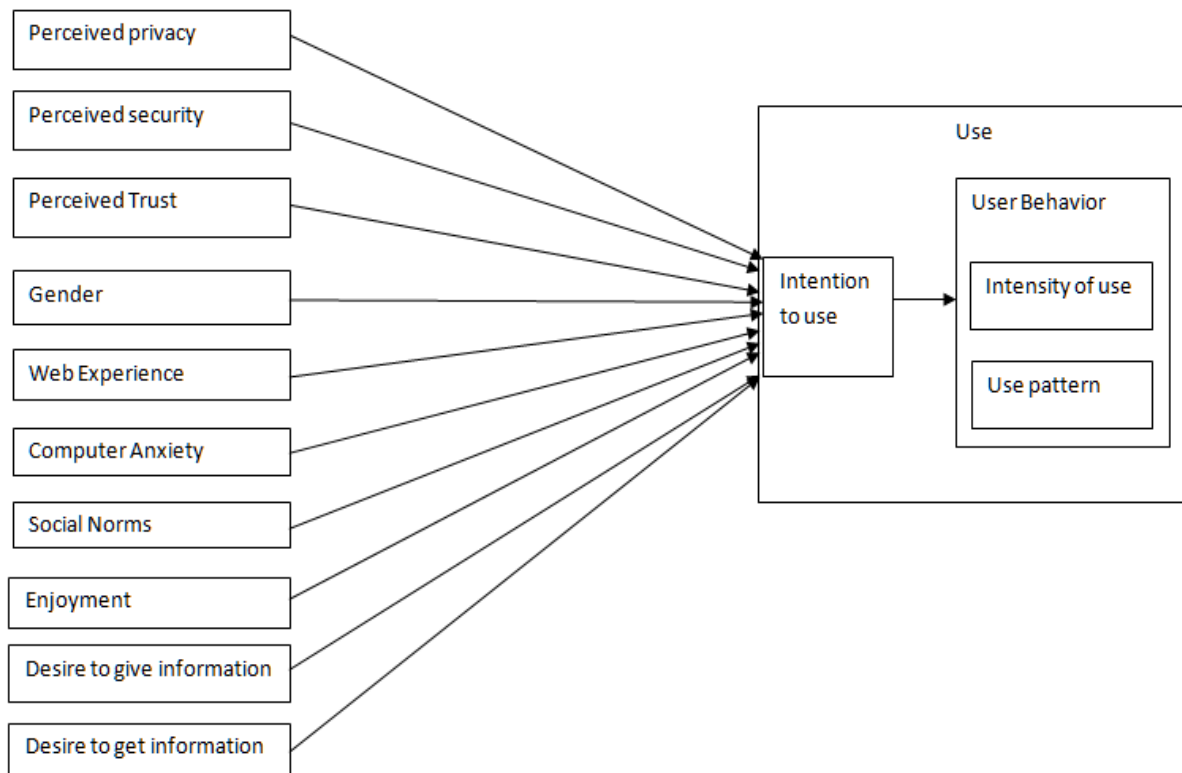
**Appendix C: Proposed Questionnaire**

**Perceived privacy**
1. The personal information that I provide on this web site is secure.
2. This web site will not use unsuitable methods to collect my personal data.
3. This web site does not ask for irrelevant personal information.
4. This web site does not apply my personal information for other purposes.
Adopted with slight modification from  - Chen, Yu-Hui, Barnes, S. (2007), Initial trust and online buyer behavior, Industrial Management & Data Systems, 107(1), pg 21-36.

**Perceived security**
1. I do not feel safe exposing my personal information when I buy goods online
2. This web site presents enough online security.
3. This web site has the ability to solve problems from hackers.
Adopted with slight modification from  - Chen, Yu-Hui, Barnes, S. (2007), Initial trust and online buyer behavior, Industrial Management & Data Systems, 107(1), pg 21-36.

**Perceived Trust**
1. The performance of this web site meets my expectations.
2. This website is trustworthy.
3. I believe the information that this website provides.
4. This website does what it says.
5. This web site has a good reputation
Adopted with slight modification from  - Wu and Liu (2007) The Effects of Trust and Enjoyment on Intention to Play Online Games Industrial Management & Data Systems, 107(1), pg 42-56; France Belanger, Janine S. Hiller1, Wanda J. Smith, Trustworthiness in electronic commerce: the role of privacy, security, and site attributes, Journal of Strategic Information Systems 11 (2002) 245–270.

**Web Experience**
On average, how much time per week do you spend on each of the following Web activities?
(Scale: None, 0–30 minutes, 30–60 minutes, 1–2 hours, 2–4 hours, 4–8 hours, 8_ hours)
1. . . . reading news on the Web?
2. . . . reading and/or posting messages?
3. . . . shopping on the Web?
4. …. All other Web activities?
Adopted with slight modification from  – McKnight, Choudhury and Kacmar (2002), Developing and Validating Trust Measures for e-Commerce; Information Systems Research, Vol. 13, No. 3, September 355

**Computer Anxiety**
1. I hesitate to use a computer for fear of making mistakes that I cannot correct.
2. I feel apprehensive about using computers.
3. Anyone can learn to use a computer if they are patient and motivated.
4. I am confident that I can learn computer skills.
Adopted with modification from  Heinssen, Jr., R., Glass, C, and Knight, L. (1987). Assessing computer anxiety: Development and validation of the Computer Anxiety Rating Scale. Computers in Human Behavior, Vol. 3 , pp. 49-59.

**Enjoyment**
1. Using this Website is exciting
2. I enjoy online social networking
3. Using this Website gives me a lot of pleasure
Wu and Liu (2007) The Effects of Trust and Enjoyment on Intention to Play Online Games Industrial Management & Data Systems, 107(1), pg 42-56

**Subjective Norms**
1. My relatives think that I should use this Website
2. My friends believe I should use this Website
3. My professors think I should use this Website
4. I believe that my classmates think 1 should use this Website

Source - Srite, M., & Karahanna, E. Role of espoused national cultural values in technology acceptance. Mis Quarterly, Sep2006, Vol. 30 Issue 3, 26p

5. People who influence my behavior think that I should use the system.
6. People who are important to me think that I should use the system.

Source - Venkatesh, Viswanath; Morris, Michael G.; Davis, Gordon B.; Davis, Fred D (2003), User acceptance of Information technology. *MIS Quarterly*, Vol. 27 Issue 3, p425-478

**Desire to get information**
1. I generally like to find out as much as possible about people I know.
2. I like to get information on potential new friends when available.
3. I enjoy staying updated on my friends, family and acquaintances.
4. I sometimes browse the Web to find professional networking opportunities.

**Desire to give information**
1. I generally share photos and information about myself online with people I know.
2. I do not hesitate to react or give my opinion online to my friends, family and acquaintances.
3. I generally like to be the first to spread the word.

**Intention to use**
1. I will use the social networking site frequently in the future.
2. I intend to use the social networking Website.

Source - Wu and Liu: The Effects of Trust and Enjoyment on Intention to Play Online Games (Wu et al 2007)
3. I expect to use the social networking site in the near future.

Source - Valerie Priscilla Goby. CyberPsychology & Behavior. Theory of Planned Behavior as the basis for internet shopping – questionnaire, August 1, 2006, 9(4): 423-431.
4. I plan to use the social networking site.

Source - Venkatesh, Viswanath; Morris, Michael G.; Davis, Gordon B.; Davis, Fred D (2003), User acceptance of Information technology. *MIS Quarterly*, Vol. 27 Issue 3, p425-478

**Intensity of Use**
1. In the past week, on average, approximately how many minutes per day have you spent on the social networking site?
   - 0 = less than 10,
   - 1 = 10–30,
   - 2 = 31–60,
   - 3 = 1–2 hours,
   - 4 = 2–3 hours,
   - 5 = more than 3 hours
2. Approximately how many times a day do you logon to social networking site?
3. The social networking site is part of my everyday activity
4. I am proud to tell people I'm on the social networking site
5. The social networking site has become part of my daily routine
6. I feel out of touch when I haven't logged onto the social networking site for a while
7. I feel I am part of the online social networking community
8. I would be sorry if the social networking site shut down

Source - Marshal, B., Cardon, P., Norris, D., Goreva, N., D'Sousa R. Social netoworking Websites in the United States and India. Issues in information systems, 9(2)87-94.

**Use Pattern**
1. Use the social networking site to connect with offline contacts
2. I have used the social networking site to check out someone I met socially
3. I use the social networking site to learn more about other people in my classes
4. I use the social networking site to learn more about other people living near me
5. I use the online social network to keep in touch with my old friends
6. I use the social networking site to meet new people

Source - Marshal, B., Cardon, P., Norris, D., Goreva, N., D'Sousa R. Social netoworking Websites in the United States and India. Issues in information systems, 9(2)87-94.

# A Study of Information Technology Integration

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## Abstract

The integration of legacy and other disparate systems from a variety of vendors or developers has been seen as a major issue for information technology. This study reviews a major survey of financial executives and examines their views on aspects of systems integration. First, it was found that integration of disparate systems was viewed as an important issue in overall IT success. This impact was generally dependent on the size of an organization. It was next found that integration success and overall IT project success were significantly correlated. With regard to integration project success itself, there was a correlation between the ability to measure projects and overall system development or integration project success. Finally, the overall approach to integration was examined. The operation and maintenance of separate systems was found to be significantly less successful than other methods. The implications, limitations, and conclusions of these findings are discussed.

**Keywords:** systems integration, information technology, success, integration

## 1. INTRODUCTION

The integration of information technology and systems is one of the most important, complicated, and costly areas for an organization. Bernstein and Haas (2004) suggest that systems integration is the "biggest and most expensive challenge" in IT. Estimates suggest that integration costs 40% of IT large shop budgets. (Bernstein and Haas, 2004). Systems integration is the combination of all the disparate technology products that an organization uses to operate its organization. This can literally require the interaction and communication between thousands of different hardware, software, communication, and process components. "Systems integration has "two faces" …. The first face concerns the internal activities of firms as they develop and integrate the inputs they need to produce new products. The second face, which has become more important in recent years, refers to the external activities of firms as they integrate components, skills, and knowledge from other organizations to produce ever more complex products and services. External organizations include suppliers, users, government agencies, regulators, production partners and, sometimes, competitors as firms work together and compete in projects." (Hobday, Davies and Prencipe, 2005, p.1) Chawathe, et al. (1994) detail the extent of IS integration to include "databases, object stores, knowledge bases, file systems, digital libraries, information retrieval systems, and electronic mail systems." They note problems with information quality, inconsistency, and access. Hasselbring (2000) discusses the various levels of heterogeneity that occur in information systems including technical (hardware, operating systems, database, and programming) and conceptual (data models, process models, programming models). Overall. integration provides a major challenge for today's organizations

## 2. REVIEW OF THE LITERATURE

Though the importance of combining disparate systems has been well documented, there has been little empirical work done on the issue of information systems and technology integration.

Zachman (1999) proposed a widely used framework to deal with integration and information systems architecture. Weber and Pliskin (1996) found a significant relationship in integration success and firm effectiveness under certain specific circumstances. Steffen (2010) examined what was different about integration versus other IT project management and found the importance of a "useful" project plan in data integration projects as well as flexibility to be particularly different. In addition, focus and data quality and data feed timing add layers of complexity when combining different systems.

Bhatt (2000) studied information systems integration and business process improvement. The study survey of the Fortune 500 and subsequent analysis found "integrated technology environment is one of the important considerations in business improvement initiatives". Chang, Fu, Li, and Lee (2009) found in a collaborative information system integration case study, "some key success factors included: support and understanding from the entire team, simple process redesign, standard process development, government support, distinctive operation collaboration model, total support from top management, and an effective and experienced team."

Mendoza, Perez, and Grimian (2006) studied critical success factors for successful systems integration. They suggested eleven general CSFs for integration project success: administrative support, tech infrastructure, project leadership, project management, user involvement, training plan, organizational change, low impact of system on org, implementation strategy, skilled team, and helpful tech support. They are organized in a four step maturity model of point-to-point, structural, process, and external. Emery (2009) attempted to develop a model for sustaining cross-functional integration. Irani, , Themistocleous, & Love (2003) saw many issues with integration and the traditional life cycle. They present a case study with over 2000 disparate systems and sort through issues in technical, financial and managerial challenges. Mangan, A., & Kelly, S. (2009) caution that a purely technical solution may not address deeper organizational issues. McCarthy, D., Mueller, K., & Wrenn, J. (2009) detail challenges associated with a case study in integrating disparate health care systems. Goodhue, Wybo, and Kirsch (1992) examined both costs and benefits of data integration in IS.

In the past there was considerable debate on the contribution of IT to economic productivity. Over the last several decades however, there has been a significant amount of work done on overall information technology productivity and return. Many of the major studies have found that at the firm level there are good returns from IT. Many studies on this productivity paradox have suggested good returns on information technology investment (Dewan and Kraemer, 1998), (Lehr and Lichtenberg, 1999), (Bharadwaj, Bharadwaj, and Knosynski, 1999). In addition, Wilconsson and Chatham (2004) suggested improvement over recent time in information technology alignment.

There have been many researchers that have explored project success and its influencing variables. Wateridge (1998) suggests that there are many factors that can influence project success and not just the traditional meeting time and cost constraints. According to users, the top two success requirements' for successful projects were meeting user requirements and "happy" users. Delone and McLean (1992) suggested the following six categories of information systems success measures: system quality, information quality, use, user satisfaction, individual impact and organizational impact. Anderson and Aydin (2009) note the importance of social and behavioral processes in health care information success.

Nah, Lau, and Kuang (2001) suggest 11 factors relating to ERP success: 1. ERP teamwork and composition, 2. change management program and culture, 3. top management support. 4. business plan and vision, 5. business process reengineering with minimum customization, 6. project management, 7. monitoring and evaluation of performance, 8. effective communication, 9. software development, testing and troubleshooting, 10. project champion and 11. appropriate business and IT legacy systems.

The importance of systems integration is clear. As noted, Bernstein and Haas (2004) suggest that systems integration is the "biggest and most expensive challenge" in IT. Estimates range that integration costs 40% of IT large shop budgets. (Bernstein and Haas, 2004).

Mendoz, Perez, and Grimian (2009) note the many advantages of systems integration including links to customers, salespeople, and suppliers and see SI as a "means of responding to global competitiveness". Hobday, Davies, and Prencipe (2005) see system integration as a

core strategic business capability not just a technical task and see great importance for the overall organization success. Lam (2007) also sees integration of systems of high importance and views it as a technical, organizational, and project management challenge. Butler (2008) notes the benefits of integration while stressing its complexity.

Onishi (1991) distinguished between two types of integration business systems and information systems and the importance of both for integration. Market size in 1998 was estimated as $4.3 billion. But despite the importance of integration, it has had a spotty record of success, with most companies unable to establish an "architecture process" (Tuft, 2001)

### 3. MOTIVATION

The preceding analyses examined overall systems integration, its importance, return on information technology investment, and IT project success. There has been little work done however on the relationships between these issues. For organizations to improve their returns on IT integration, it is important to understand the landscape of systems integration as well as to begin to explore some variables that may affect integration project success. Little work has been done on understanding the internal structural environment that can correlate with information systems integration and project success as well as the importance of integration to overall views of information systems project management success. This manuscript is an attempt to start that process by examining current views on systems integration, its relationships, and some of the influencing variables.

### 4. HYPOTHESES

As a result of reviewing the literature there are a series of research areas that merited exploration. They all focus on the areas of systems integration and project success.

Integration of disparate legacy systems is a major factor influencing IT success. H1 tests how prevalent this is in major organizations. Bernstein and Haas (2004) see systems integration as the most important IT issue. To confirm its importance, hypothesis one was developed.

**H1 Organizations will view integrating heterogeneous systems and applications in their organizations as important.**

Many researchers have tested the impact of organization size on results such as Dewar and Dutton (1986). As a result, organizational size is analyzed to determine if there is a significant difference in the importance of systems integration based on size. Due to increasing complexity, it is hypothesized that larger organizations will find systems integration as a more important issue.

**H2 Larger organizations will place a higher importance on systems integration in their organization.**

Following up on the first hypothesis, we test whether success in integration affects overall IT success.

**H3 Results in systems integration will significantly affect IT project success**

One of the most important aspects of quality is the ability to measure. The next hypothesis applies this concept to systems integration.

**H4 Ability to measure projects will significantly affect system development or integration project success**

Weber and Pliskin (1996) found a significant relationship in integration success and firm effectiveness under certain specific circumstances. In hypothesis five we study various approaches to systems integration and their effect on success.

**H5 There will be significant approaches to integration that will affect overall project success, and/or overall IT return.**

The areas included confirming the extent and importance of integration.

### 5. SURVEY SOURCE AND METHODOLOGY

In order to test these hypotheses, specific major corporate data were required. We found a rich data set that was available from Financial Executives International. Financial Executives International is "the preeminent association for CFOs and other senior finance executives." It has … CFOs, VPs of Finance, Treasurers, Controllers, Tax Executives, Academics, Audit Committee members [in] companies large and small, public and private, cross-industry. (FEI, 2006) The FEI, each year, commissions a large scale study of "technology issues for Financial Executives". The survey instructions follow.

"FEI's Committee on Finance & information Technology (CFIT) and Financial Executives

Research Foundation (FERF), in partnership with Computer Sciences Corporation (CSC), are conducting the eighth annual survey of Technology Issues for Financial Executives. This initiative explores and reports on information technology from the perspective of the financial executive. Last year we set another record for survey participation with nearly 800 responses, continuing our unbroken streak of year-over-year increases since the survey's inception. As part of this year's effort, we are targeting another significant increase in response volume so that we can expand the resulting publication to include more analyses by industry and company size. ." (FEI, 2006 b)

As a part of this study, specific information was obtained from top financial executives on systems integration. These questions and responses were sufficiently detailed and pertinent to our hypotheses to serve as the bases for testing this study's hypotheses. The main advantage is the large data set and the independent collection from a private membership trade group. All data has been collected and furnished by the Financial Executives International and remains their property. Use for academic and research purposes was obtained by the author. The author wishes to sincerely thank the organizations for their cooperation.

The overall questionnaire included 44 broad questions in the noted categories but sub-questions and ranked responses raised the overall individual question responses to more than 220. From this overall report a small subsection was used to analyze the relevant hypotheses. Selected responses from the Demographics section were included as well.

The specific questions used to test the hypotheses are listed below:

**IV**

**2. How significant is the issue of integrating heterogeneous systems and applications in your organization?**
_ Extremely significant
_ Significant
_ Important
_ Moderately important
_ Not important

**4. What is your organization's preferred approach to addressing systems integration issues?**

(Mark only one.)

_ Discontinue all disparate systems and implement
a single new integrated system for core areas
_ Adopt best of breed applications and develop interfaces
_ Build new interfaces between existing systems
_ Operate and maintain separate systems

**5. What is the most important consideration when deciding whether or not to undertake a new IT initiative?**
_ Expected benefit
_ Expected cost
_ Project/business risk
_ All of the above equally
_ Other (Please specify.) _____

**6. Please rank the primary criteria used to measure the success of a systems development project.**

(Select only three with "1" being most important.)

**Ranking**

**1 2 3**
_ Delivered on time
_ Delivered within budget
_ Functionality meets user needs
_ Generated a positive return on investment
_ Improved the company's competitive position
_ Enabled the company to operate more efficiently
_ Other (Please specify.) _____

**7. Rate your relative satisfaction with your organization's ability to measure the success of IT projects.**

Very Dissatisfied 2 3 4 Very Satisfied

_ _ _ _ _

**8. What percentage of systems development or integration projects are considered successful by management?**

(Enter whole percentage.)

___% Example: 70 percent entered as 70%

**III**

**3. What overall return is your organization obtaining on its technology investments?**
(Mark only one.)

_ High
_ Medium
_ Low
_ Negative
_ Unknown

**1. What is your company's IT spending as a percentage of revenue?**

___% Example: 3.1 percent entered as 3.1%

## 6. DEMOGRAPHICS OF PARTICIPANTS

Overall, in the survey there were 708 usable responses from major corporations (depending on the question). Since responses were anonymous, an exact number of companies participating is not possible, though qualitative data review suggests little if any company duplications. The demographics of the group follow.

Table 1. Level in Organization of Respondent

|  |  | Count | % | Valid % | Cume % |
|---|---|---|---|---|---|
| Valid | Corporate | 598 | 84.5 | 86.3 | 86.3 |
|  | Group of Sector | 27 | 3.8 | 3.9 | 90.2 |
|  | Division, wholly owned subsidiary, or operating unit | 68 | 9.6 | 9.8 | 100.0 |
|  | Total | 693 | 97.9 | 100.0 |  |
| Missing | System | 15 | 2.1 |  |  |
| Total |  | 708 | 100.0 |  |  |

Table 2. Country Where Respondent is Based – All Respondents

|  |  | Count | % | Valid % | Cume% |
|---|---|---|---|---|---|
| Valid | Canada | 79 | 11.2 | 11.4 | 11.4 |
|  | Europe | 10 | 1.4 | 1.4 | 12.8 |
|  | US | 591 | 83.5 | 84.9 | 97.7 |
|  | Other | 16 | 2.3 | 2.3 | 100.0 |
|  | Total | 696 | 98.3 | 100.0 |  |
| Missing |  | 12 | 1.7 |  |  |
| Total |  | 708 | 100.0 |  |  |

Nearly 85% of the respondents were from the Corporate Level as shown in table 1. The sample reflects the strong executive position that most of the respondents held. This study thus reflects top executive views on the related technology. The remaining participants were at the Group or Division/Unit level. Table 2 reflects the location of the participants. Though Financial Executives International recently became an international organization, its international membership opened only in 2000 and the organization retains a heavy US membership. As a result, 84% of the respondents are from the US and another 10% are from Canada. There is a North American bias to the results.

Table 3 – Corporate Size in Sales – All respondents

|  |  | Count | % | Valid % | Cume% |
|---|---|---|---|---|---|
| Valid | < $100m | 289 | 40.8 | 41.4 | 41.4 |
|  | $100-400m | 199 | 28.1 | 28.5 | 69.9 |
|  | $500-999m | 66 | 9.3 | 9.5 | 79.4 |
|  | $1b-5b | 107 | 15.1 | 15.3 | 94.7 |
|  | >$5b | 37 | 5.2 | 5.3 | 100.0 |
|  | Total | 698 | 98.6 | 100.0 |  |
| Missing | System | 10 | 1.4 |  |  |
| Total |  | 708 | 100.0 |  |  |

Table 3 reflects the size distribution of the organizations. In general, the organizations are large with 69% over $100 million in sales. The largest respondents were in the $100-499 million sales category but there were still 44 respondents

Table 4. Senior Executive Status in Organization – Respondents Who Outsource

|  |  | Count | % | Valid % | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Senior | 139 | 76.8 | 77.7 | 77.7 |
|  | Not Senior | 40 | 22.1 | 22.3 | 100.0 |
|  | Total | 179 | 98.9 | 100.0 |  |
| Missing | System | 2 | 1.1 |  |  |
| Total |  | 181 | 100.0 |  |  |

The overwhelming majority of respondents were senior executives (78%). There is a strong representation at the top levels of management.

### 7. HYPOTHESES

The literature is full of cases that suggest integration of disparate legacy systems is a major impediment to IT success. H1 tests how prevalent this is in major organizations.

**H1 Organizations will view integrating heterogeneous systems and applications in their organizations as important.**

Table 5 shows the count and percentage of firms and their views on the importance of systems integration. Only 13% of respondents reported that integration is not important. H1 is supported. Most organizations view integrating heterogeneous systems and applications in their organizations as important.

Table 5 Importance of Integration

|   |   | Count | % | Valid % | Cume% |
|---|---|---|---|---|---|
| Valid | Extremely significant | 210 | 15.1 | 30.5 | 30.5 |
|   | Significant | 135 | 9.7 | 19.6 | 50.1 |
|   | Important | 205 | 14.8 | 29.8 | 79.8 |
|   | Moderately important | 51 | 3.7 | 7.4 | 87.2 |
|   | Not important | 88 | 6.3 | 12.8 | 100.0 |
|   | Total | 689 | 49.7 | 100.0 |   |
| Missing | System | 698 | 50.3 |   |   |
| Total |   | 1387 | 100.0 |   |   |

**H2 Larger organizations will place a higher importance on systems integration in their organization.**

Due to the complexity of larger organizations, it was suspected that larger organizations will view integration more importantly. Table 6 shows an increasing trend of importance (1 =extremely important) with each larger size of organization. Table 7 shows that the differences are significant at p < .001.

H2 is supported. Larger organizations generally have greater integration issues. In a separate post hoc analysis using LSD method, the only area where there was no significant difference was between $1 billion to $5 billion and over $5 billion. All other smaller groups had significantly less integration importance than larger organizations

Table 6 Importance of Integration And Size

|   | N | Mean | Std. Deviation |
|---|---|---|---|
| < $100m | 282 | 2.71 | 1.361 |
| $100-400m | 194 | 2.70 | 1.309 |
| $500-999m | 65 | 2.31 | 1.345 |
| $1b-5b | 107 | 2.10 | 1.197 |
| >$5b | 36 | 1.81 | 1.091 |
| Total | 684 | 2.53 | 1.335 |

Table 7 Importance of Integration And Size ANOVA

|   | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 56.356 | 4 | 14.089 | 8.246 | .000 |
| Within Groups | 1160.170 | 679 | 1.709 |   |   |
| Total | 1216.526 | 683 |   |   |   |

**H3 Results in systems integration will significantly affect IT project success**

Hypothesis three deals with the relationship between perceived success in systems integration and overall IT success for the firm. Tables 8 and 9 show the regression analysis. A significant and direct relationship between project success and overall IT success is supported. (The coefficient is negative only due to scale direction). Hypothesis three is supported.

Table 8 Integration and IT Success Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .159a | .025 | .024 | 1.348 |

a. Predictors: (Constant), IntegrationSuccess

Table 9 Integration and IT Success

| Model | Unstandard Coefficients B | Std. Error | Standardized Coefficients Beta | Sig. |
|---|---|---|---|---|
| 1 (Constant) | 3.411 | .170 | | .000 |
| IntSuccess | -.010 | .002 | -.159 | .000 |

**H4 Ability to measure projects will significantly affect system development or integration project success**

The ability to measure is often seen as an important component of quality control. Hypothesis four tests the ability to measure projects and overall integration success. Tables 10 and 11 show a direct and significant relationship between ability to measure and integration success. H4 is supported.

Table 10 Integration and IT Project
Measurement Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .432a | .186 | .185 | 20.247 |

a. Predictors: (Constant), E7

Table 11 Integration and IT Project
Measurement

| Model | Unstandardized Coefficients B | Std. Error | Standardized Coefficients Beta | t | Sig. |
|---|---|---|---|---|---|
| 1 (Constant | 38.250 | 2.553 | | 14.980 | .000 |
| E7 | 10.552 | .879 | .432 | 12.002 | .000 |

a. Dependent Variable: E8

**H5 There will be significant approaches to integration that will affect overall project success, and/or overall IT return.**

An ANOVA analysis shows that there is a significant difference between the four noted approaches to systems integration:

1. Discontinue all disparate systems and implement a single new integrated system for core areas
2. Adopt best of breed applications and develop interfaces

3. Build new interfaces between existing systems
4. Operate and maintain separate systems.

A post hoc analysis however reveals that the only significant difference was between operating and maintaining other systems and the other choices. There are no significant differences between new integrated systems, best of breed, or new interfaces. Hypothesis five is partially supported. Separate systems are not good compared with the other approaches.

Table 12 Post Hoc Analysis Descriptives % Systems Development or Integration Project Success versus Approach to Integration

| | | N | Mean | Std. Deviation | Std. Error |
|---|---|---|---|---|---|
| %Proj Success | 1 | 189 | 69.14 | 19.534 | 1.421 |
| | 2 | 227 | 68.31 | 22.000 | 1.460 |
| | 3 | 157 | 67.09 | 22.507 | 1.796 |
| | 4 | 51 | 54.37 | 29.787 | 4.171 |
| | Total | 624 | 67.12 | 22.446 | .899 |

Correlation between success in integration and overall IT success.

Table 13 Multiple Comparisons LSD Post Hoc Analysis % Systems Development or Integration Project Success versus Approach to Integration

| (I) E4 | (J) E4 | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval Lower Bound | Upper Bound |
|---|---|---|---|---|---|---|
| 1 | 2 | .834 | 2.182 | .702 | -3.45 | 5.12 |
| | 3 | 2.054 | 2.393 | .391 | -2.65 | 6.75 |
| | 4 | 14.770* | 3.497 | .000 | 7.90 | 21.64 |
| 2 | 1 | -.834 | 2.182 | .702 | -5.12 | 3.45 |
| | 3 | 1.219 | 2.300 | .596 | -3.30 | 5.74 |
| | 4 | 13.936* | 3.434 | .000 | 7.19 | 20.68 |
| 3 | 1 | -2.054 | 2.393 | .391 | -6.75 | 2.65 |
| | 2 | -1.219 | 2.300 | .596 | -5.74 | 3.30 |
| | 4 | 12.717* | 3.572 | .000 | 5.70 | 19.73 |
| 4 | 1 | -14.770* | 3.497 | .000 | -21.64 | -7.90 |
| | 2 | -13.936* | 3.434 | .000 | -20.68 | -7.19 |
| | 3 | -12.717* | 3.572 | .000 | -19.73 | -5.70 |

*. The mean difference is significant at the 0.05 level.

## 8. DISCUSSION AND CONCLUSION

As with any research there are limitations with this study. The main limitation is use of secondary data to uncover the relationships between systems integration and IT success. On the other hand, this is a broad-based study by an independent organization with strong executive participation. Researchers can duplicate this study with primary research perhaps with in-depth interviews to further understand the initial findings.

The study confirms the importance of systems integration to an organization, at least from the top financial executives' perspective. There have been many anecdotal reports on the importance of integration to organizations. This is the first study to empirically confirm this. Generally, top financial executives in a wide cross-section of major industries report a majority of organizations do view integrating heterogeneous systems as a significant issue. It was also found that the importance of integration was affected by the size of an organization. The implication for practitioners is that systems integration requires greater attention from larger information technology departments. Next it was found that integration success does lead to higher overall IT success. Dedicated efforts are required to solve the integration issues. Conscious efforts must be developed and maintained. One of the areas found to help with integration project success was the ability to measure projects did statistically correlate with integration success. This suggests that for organizations, one of the first steps is to have strong project management measurements in place. Properly executed this can lead to higher levels of integration achievement.

Another key area examined was the overall approach to integration and to see if various methods positively affected overall information technology returns. Four different methods were surveyed: Discontinue all disparate systems and implement, a single new integrated system for core areas, Adopt best of breed applications and develop interfaces, Build new interfaces between existing systems, Operate and maintain separate systems

None of these methods were shown to correlate with higher IT return for an organization. The only one that was significant was operate and maintain separate systems which correlated significantly with lower IT returns and was shown to be significantly different from the other three methods.

It was also determined that higher success in integration does lead to higher overall IT returns significant at $p < .001$. This reinforces and confirms the perceived importance of information systems success.

Overall, this study extends the practical study of IT success and its influencing variables. Researchers can use the results as a springboard for further analysis and study. Practitioners should be able to use these findings to improve their operations

## 9. REFERENCES

Anderson, J. G., & Aydin, C. E. (2009). Evaluating the impact of health care information systems. *International Journal of Technology Assessment in Health Care, 13*(02), 380-393.

Bernstein, P. A., & Haas, L. M. (2008). Information integration in the enterprise. *Communications of the ACM*, 51(9), 72-79.

Bharadwaj, A., Bharadwaj, S., and Knosynski, B. (1999). Information technology effects on firm performance as measured by Tobin's q. *Management Science*, 45(6), 1008-1024.

Bhatt, G. D. (2000). An empirical examination of the effects of information systems integration on business process improvement. *International Journal of Operations and Production Management*, 20(11/12), 1331-1359.

Butler, G. (2008). Putting It All Together: The Importance of Systems Integration. *Automatic Merchandise*r April 1 2008 1-4.

Chawathe, S., Garcia-Molina, H., Hammer, J., Ireland, K., Papakonstantinou, Y., Ullman, J., & Widom, J. (1994). The TSIMMIS project: Integration of heterogeneous information sources. Paper presented at the Proceedings of IPSJ Conference, 7-18.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1), 60-95.

Dewan, S. and Kraemer, K. (1998, August). International dimensions of the productivity paradox. *Communications of the ACM*, 41,8 56-62.

Dewar, R. & Dutton, J. (1986). The Adoption Of Radical And Incremental Innovations: An Empirical Analysis. *Management Science* (1986-1998), 32(11), 1422.

Emery, C.. (2009). A cause-effect-cause model for sustaining cross-functional integration. *Business Process Management Journa*l, 15(1), 93-108.

FEI (2006 b), 2006 FEI/CSC Study Technology Issues for Financial Executives, *Financial Executives International.*

FEI (2006), About FEI, Available http://www.fei.org/about/us.cfm

Fiona Fui-Hoon Nah, Janet Lee-Shang Lau, & Jinghua Kuang. (2001). Critical factors for successful implementation of enterprise systems. *Business Process Management Journal,* 7(3), 285-296.

Goodhue, D. L., Wybo, M. D., & Kirsch, L. J. (1992). The impact of data integration on the costs and benefits of information systems. *MIS Quarterly*, 16(3), 293-311.

Hasselbring, W. (2000). Information system integration. *Communications of the ACM*, 43(6), 32-38.

Hobday, M., Rush, H., & Joe, T. (2000). Innovation in complex products and systems. *Research Policy*, 29(7-8), 793-804.

Irani, Z., Themistocleous, M., & Love, P. E. D. (2003). The impact of enterprise application integration on information system lifecycles. *Information & Management*, 41(2), 177-187.

Lehr, B., and Lichtenberg, F. (1999, April). Information technology and its impact on productivity: Firm-level evidence from government and private data sources, 1977-1993. *The Canadian Journal of Economics*. 32(2), 335-362.

Mangan, A., & Kelly, S. (2009). Information systems and the allure of organisational integration: A cautionary tale from the Irish financial services sector. *European Journal of Information Systems*, 18(1), 66-78.

McCarthy, D., Mueller, K., & Wrenn, J. (2009). Geisinger health system: Achieving the potential of system integration through innovation, leadership, measurement, and incentives. New York: The Commonwealth Fund,

Mendoza, L., Pérez, L. & Grimán, A.. (2006). Critical Success Factors for Managing Systems Integration. *Information Systems Managemen*t, 23(2), 56-75.

Onishi, K, (1991) Users Needs for Systems Integration and Evaluation of Systems Integrators Capabilities. Program on Information resources policy Harvard 1-52.

Steffen, D. (2010). What is Different about Data Integration Project Management :Understand special challenges and dependencies on source systems for feed timing and data quality. *Information Management,* 20(2), 35.

Tien-Hsiang Chang, Hsin-Pin Fu, Shao-Chang Li, & Hung-Hsuan Lee. (2009). A case study for implementing a B2B collaborative information system: a textile case. *Journal of Manufacturing Technology Management*, 20(3), 330-347.

Tuft, B. (2001) The Changing Role of IT Strategy: Enterprise Architecture Strategies, *EAI Journal* 3(1)

Wateridge, J. (1998). How can IS/IT projects be measured for success? *International Journal of Project Management,* 16(1), 59.

Weber, Y., & Pliskin, N. (1996). The effects of information systems integration and organizational culture on a firm's effectiveness. *Information & Management*, 30(2), 81-90.

Willcoxson, L. and Chatham, R. (2004). Progress in the IT/business relationship: a longitudinal assessment. *Journal of Information Technology*. 19(1), 71+

Wing Lam. (2007). Information Systems Integration and Enterprise Application Integration (EAI) Adoption: A Case from Financial Services. *Journal of Information Systems Education*, 18(2), 149-157.

Zachman, J. A. (1999). A framework for information systems architecture. *IBM Systems Journal*, *38*(2/3), 454-470.

# A Methodology Tailoring Model for Practitioner Based Information Systems Development Informed by the Principles of General Systems Theory

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## Abstract

Information system development practitioners tailor system development methodologies to match the specific circumstances of their software projects.  This is not surprising as research has shown that information systems development is a highly circumstantial process and that no one system development methodology can be optimal for every context of every project.  Several formal techniques such as the contingency factors approach and situational method engineering have been introduced to facilitate the tailoring of system development methodologies to fit the needs of a project.  However, there is evidence that system development practitioners have largely neglected these techniques in favor of ad hoc methodology tailoring approaches.

This paper presents a formal methodology tailoring model geared towards the practitioner. The model is based on the principles of general systems theory and is designed to provide practitioner utility, which has been shown to be a determining factor in the employment of a technological innovation.

**Keywords**:  Information System Development Methodologies; Methodology Tailoring; Method Engineering; General Systems Theory

## 1. INTRODUCTION

An information system (IS) development methodology is defined as a recommended collection of phases, procedures, rules, techniques, tools, documentation, management, and training used to develop a system (Avison & Fitzgerald, 2003, Cockburn, 2006, Hoffer & Valacich, 2010).  Over the years numerous IS development methodologies have emerged and many are currently taught in colleges and universities around the world (Burns & Klashner, 2005).  While there has been much discussion and debate as to which of these methodologies

is best, current research shows that there may not be one optimal methodology that can be universally applied to every project. This is because, while many of the methodologies are beneficial in certain situations, system development is a circumstantial process, and no one methodology will work best for every context of every project (Cockburn, 2006, Fitzgerald, Russo, & O'Kane, 2003).

**Background**

There have been significant advances and changes to methodologies over the last 30 years. Those changes can be characterized into specific eras that include the pre-methodology era, when no methodologies existed, and the methodology era, when a plethora of new methodologies was introduced (Avison & Fitzgerald, 2003, Fowler, 2005). Some people in the IS field feel that since 2001 we have entered a post-methodology era wherein researchers and practitioners are questioning the older methodologies (Avison & Fitzgerald, 2003, Fowler, 2005). Most of the serious criticism of the methodologies from the methodology era suggests that they are bureaucratic and labor intensive or "heavy" methodologies (Fowler, 2005)

In response to this, new methodologies introduced in the post-methodology period are considered as lightweight or agile methodologies (Fowler, 2005). These agile methodologies are considered by some people in this postmodern era to be "amethodological" (i.e., a negative construct connoting not methodological) (Truex & Avison, 2003). The biggest criticism of the agile methodologies has been the lack of empirical evidence supporting the claims of their benefits and their lack of theoretical foundation (Abrahamsson, Warsta, Siponen, & Ronkainen, 2003). However, there is a growing body of literature both supporting and repudiating the claims of success of the agile methodologies (Abrahamsson et al., 2003, Conboy, Wang, & Fitzgerald, 2009).

**Problem Description**

Regardless of whether the methodology is "heavy" or "agile", current research suggests that the best methodology for a software development project may be one that has been selected, tailored, or blended (i.e. a hybrid methodology created though the blending of two or more methodologies) (McGregor, 2008) to fit the specificities of the individual system development project (Cockburn, 2006, Fitzgerald

et al., 2003). In response to this discovery, several formal "methodology tailoring" (i.e. the process of selecting, tailoring, or blending methodologies) techniques have been introduced. Two examples of formal methodology tailoring techniques are the contingent factors approach and situational method engineering. The contingency factors approach suggests that specific features of the development context should be used to select an appropriate methodology from a portfolio of methodologies. This approach requires developers to be familiar with every contingent methodology or have contingency built in as part of the methodology itself.

A suggested alternative has been a technique called "Method Engineering" (ME) (Fitzgerald et al., 2003, Brinkkemper, 1996). With this technique, a methodology is constructed from a repository of "existing discrete predefined and pre-tested method fragments" (Fitzgerald et al., 2003). Using a method-engineering tool, software developers build a meta-method that is made up of fragments from popular development methodologies. The fragments are each designed to handle a particular contingency inherent to the software project. The fragments are categorized as either product or process. Product fragments are artifacts capturing the structure in deliverables such as diagrams, tables, or models, while process fragments project strategies and detailed procedures (Brinkkemper, 1996).

Method Engineering has several shortcomings. For example, it is impossible to plan for every contingency that may arise, and therefore, critical fragments will always be missing (Rossi, Tolvanen, Ramesh, Lyytinen, & Kaipala, 2000). Also, the burden of selecting the correct fragment falls upon the analyst (Truex & Avison, 2003). Furthermore, a tool is usually required and ME tool development has been a problematic procedure (Fitzgerald et al., 2003). Thus, the evolution of software development methodologies using fragments is problematic.

Both contingency factors and ME techniques have had little success in practical industry applications (Fitzgerald et al., 2003, Rossi et al., 2000). However, ad hoc methodology tailoring (whereby practitioners use an informal process to tailor methodologies to their situation) has been an implied concept in industry (Fitzgerald, 1997). This is problematic because the lack of formality inherent to the ad hoc approach suggests that the knowledge of how to

implement the approach is tacit and therefore more difficult to acquire and transfer (Howells, 1996).

As a result, simply stated, the problem is that there is currently no formal, industry accepted, widely used, system development methodology tailoring model (Fitzgerald et al., 2003, Rossi et al., 2000, Fitzgerald, 1997).  While the ad hoc methodology tailoring approach may, to date, be the most widely used in industry, its tacit nature impedes the acquisition and transference of knowledge about the approach.  Conversely a formalized approach permits the approach to be more easily learned and explained.

The remainder of this paper is devoted to defining a model that solves this problem.  The evolution of the model is explained in terms of its utility and theoretical foundation and then a detailed definition of the model is presented.  Finally, a sample application of the model is provided so that the reader may gain a complete understanding of its practicality.

## 2.  THE MODEL

It is hypothesized that a model (i.e., an artifact used to abstract and represent phenomena) (Hevner, March, Park, & Ram, 2004, March & Smith, 1995) can be created that will provide a simple, yet formal process whereby practitioners can tailor methodologies to the context of the project.  The goal of the model is to provide practitioner utility (i.e., usefulness to system developers working in industry).

It is believed that the success of this model in industry will depend on several conditions.  Fitzgerald (1997) demonstrated that practitioners will bypass the use of methodologies simply because they do not see the utility in using them, therefore the model must have a perceived utility to practitioners.  The second condition that the model must meet is that it must be based on sound academic theory.  In order to accomplish this, a root theory must be found that can be used to explain the model and its concepts.  Finally, the model must be evaluated using an accepted methodology and the results must be reported in a statistically accepted manner.

### Practitioner Utility

The practitioner model described in this paper can be characterized as a technological innovation.  There are several theories and models that can be used to predict the degree to which an innovation will be accepted (Riemenschneider & Hardgrave, 2001).  Included in this list would be the Diffusion of Innovations Theory (Rogers, 1995), the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), the Theory of Planned Behavior (TPB) (Ajzen, 1985), the Technology Acceptance Model (TAM) (Davis, 1989), and TAM2 (Venkatesh & Davis, 2000).

TAM has been proven valid in numerous studies and under a multitude of conditions (Riemenschneider & Hardgrave, 2001).  TAM suggests that when users are presented with a new technology, a number of factors influence the decision about how and when they will use it.  The two primary factors are perceived usefulness (i.e., the degree to which a person believes that using a particular technology would enhance his or her job performance) and perceived ease-of-use (i.e., the degree to which a person believes that using a particular technology would be free from effort).  The TAM2 model extends the TAM model to include social factors (i.e., subjective norm, voluntariness, and image) and cognitive factors (i.e., job relevance, output quality, and results demonstrability) (Venkatesh & Davis, 2000).

Based on TAM2, in order for a practitioner to utilize a methodology tailoring model, they must perceive it to be useful, easy to use, and socially and cognitively acceptable.  Informal, ad hoc methodology tailoring meets these requirements given its widespread use in industry (Fitzgerald, 1997).  Therefore, it is hypothesized that a formal method tailoring approach that simulates the already accepted, ad hoc practitioner methodology tailoring approach would also be accepted, provided it continues to meet the conditions put forth by TAM2.

Although the literature is insufficient on the question of how practitioners informally tailor methodologies in the field, there are some things that are known.  First, practitioners generally take a shorter-term view than academics and tend to emphasize the completion of tasks and the solution of problems (Lippert & Anandarajan, 2004).  Second, the methodologies utilized by practitioners are influenced by the universality of the methodology, the methodology introduction process, the experience level of the developer, developer confidence in the methodology, and developer participation with the methodology (Hansen, Jacobsen, & Kautz, 2003).

Based on this information, in order for a formal methodology tailoring model to be utilized by

practitioners, it must aid in the completion of tasks and the solution of problems. Also, it must provide universal applicability, have management support, provide utility to both experienced and in-experienced developers, and encourage developer confidence and participation.

**Theoretical Foundation**

The theoretical foundation for the model comes from General Systems Theory. Hungarian biologist Ludwig von Bertalanffy originally proposed general systems theory in 1928 (von Bertalanffy, 1928) as a reaction against the reductionistic and mechanistic approaches to scientific study, and in an attempt to unify the fields of science. The scientific method is based on the assumptions that an entity can be broken down into its smallest components so that each component can be analyzed independently (reductionism), and that the components can be added in a linear fashion to describe the totality of the system (mechanism). Rather than reducing an entity to the properties of its parts or elements, general systems theory focuses on the arrangement of and relations between the parts that connect them into a whole (holism).

One of the goals of general systems theory was to find common ground upon which scientific study could be conducted across all disciplines. Von Bertalanffy felt that it was futile to try and find a unitary conception of the world by reducing all levels of reality to the level of physics. He felt that the answer to a unitary conception could be found by defining the commonalities among the fields through the discovery of the isomorphy of the laws of the different fields (von Bertalanffy, 1969). Von Bertalanffy thought that the systems that are present in the various fields could identify those commonalities.

Von Bertalanffy defined a system as "complexes of elements standing in interaction". He found that conventional physics dealt only with closed systems (i.e., systems which are isolated from their environment). In particular, the laws of thermodynamics expressly stated that they were intended for closed systems. The essence of the second law of thermodynamics (law of entropy) is that entropy (i.e., the degree of disorder or uncertainty in a system) (von Bertalanffy, 1969) will increase over time in a closed system.

General systems theory realizes that many systems, by their nature, are open systems that interact with their environment. Von

Bertalanffy observed that the second law of thermodynamics does not hold true in open systems. He realized that in an open system, the degree of disorder or uncertainty decreases over time or that "negative entropy" occurs (von Bertalanffy, 1969). General systems theory also realizes that open systems have a tendency to self-organize. This is a process in which the internal organization of a system increases automatically without being guided or managed by an outside source (Ashby, 1947). This happens through a process of feedback and decision-making.

An IS development methodology can be considered a "system" (von Bertalanffy, 1969), that is used to develop an information system. IS development is also a problem solving process (DeFranco-Tommarello & Deek, 2002, Highsmith, 2000). This suggests that methodologies are essentially problem solving systems with several common elements including the problems (i.e., the difference between a goal state and the current state of the system (Hevner et al., 2004), which have a hierarchical order (Ahl & Allen, 1996), problem solving processes (i.e., the tools, procedures, processes, etc. that are used to do define and understand problems, plan solutions to problems, implement solutions, and verify and present the results (Deek, Turoff, and McHugh, 1999), solutions (i.e., the answer to or disposition of a problem) (American Heritage Dictionary 2010), feedback (i.e., part of the output is monitored back, as information on the preliminary outcome of the response, into the input) (von Bertalanffy, 1969), and an environment which defines the context, contingencies, constraints, rules, laws, etc. of the organization, people, technology, etc. These systems employ incremental problem solving which involves using intermediate states as intermediate goals in solving problems (Newell & Simon, 1972).

Based on general systems theory, IS development methodologies can be characterized as collaborative, hierarchical, incremental, and problem solving systems. They are open systems that interact with their outer environment (Simon, 1996), which means that they have the propensity for negative entropy. Also, these systems all have a "system state" (Kuhn, 1974) which represents the current condition of system variables (such as the current number of open, unsolved problems in the system).

## Model Definition

The practitioner based system development model is depicted in Appendix One. Based on general systems theory, the model tailors and/or combines methodologies, not by breaking the methodologies down into fragments, but by using the concepts that are isomorphic across the methodologies (von Bertalanffy, 1969). Discovering those isomorphic concepts requires abstracting methodologies to a common level. The model suggests that the commonality among all methodologies is their inherent role as problem solving systems.

The practitioner based system development model represents a problem solving system that cyclically iterates among three phases throughout the life of the project. The first phase is the "Describe" phase. It is used to understand the current state of the project. As such, it is a knowledge producing activity (March & Smith, 1995). The goal of this phase is to gain knowledge and to identify a problem or a set of problems that must be solved in order to progress to the next step of the project. It includes analyzing the current environment, identifying circumstances that have changed since the last definition phase, analyzing feedback that was obtained from the previous iteration, analyzing and parsing the list of problems still open at the conclusion of the last cycle, and adding to the list any new problems that can be identified. The knowledge gained through this phase is depicted in Appendix One by the central circle. As the project progresses, the knowledge pool expands and contributes to the actions prescribed in the other two phases.

The second phase is the "Problem Solve" phase. During this phase, solutions are found for the problem(s) identified in the "Describe" phase. If the problem is something simple, for instance a task that needs to be completed, then it can immediately pass to the next phase where an action is prescribed. However, if the problem is complex, then a problem–solving technique must be applied in order to find a solution to the problem. The final phase is the "Prescribe" phase. This is a knowledge using activity (March & Smith, 1995). Using the knowledge gained during the previous two phases the next course of action is prescribed. The next course of action could take virtually any form. It depends on what was identified as the highest priority problem in the "Describe" phase and the solutions discovered in the "Problem Solve" phase. The prescribed action may be a methodology fragment. For instance, it may be determined that the best action at this point in time for the project would be to build a prototype or to create a UML diagram.

It must be pointed out that the principle of equifinality (von Bertalanffy, 1969) holds true in the model. Equifinality is a condition in which different initial conditions lead to similar effects or in which different courses of action lead to similar results. Application of this principle suggests that there are multiple methodologies and instantiations that would fit the model and still produce the desired result.

## A Sample Walkthrough of the Model

A sample walkthrough of the practitioner model is illustrated in Appendix Two. This walkthrough is designed to show how system developers can use the model to tailor system development methodologies to a project. The process begins with the "Describe" phase of the model. During this phase, the developers identify the highest priority problem to be the selection of a base system development methodology that will be used to implement the project. For instance, should the developers use a traditional approach such as the waterfall or spiral method or perhaps should the developers use the object-oriented approach or one of the agile methodologies?

The problem then passes to the "Problem Solve" phase where problem solving tools and techniques are used to select a base methodology with core competencies, (i.e., the set of the most strategically significant and value-creating skills in any organized system or person), that most closely match the context of the project and organization. Several key factors contribute to this selection process. For instance, the knowledge and background of the developers, the risk of change inherent to the project, and the visibility of the project development process required by the organization's management will all have to be considered when selecting a development methodology.

The project then progresses to the "Prescribe" phase where the recommended action is to select the base methodology. For this walkthrough, given the factors mentioned previously, the developers decide to implement a traditional SDLC such as the waterfall methodology. Given that this selected methodology provides a framework and not a mandate, only base fragments will be selected to

be implemented. So, for instance, only the *phases* of the waterfall approach will be selected but the activities typically inherent to those phases may be supplanted with other "actions" or activities. As an example, typically during the requirements specification phase interviews with system users are conducted. However, using the model, the developers determine that JAD sessions would be a better requirements gathering method for this project.

Once a base methodology has been selected, the model suggests that we should cycle back to the "Describe" phase. For this walkthrough, the developers identify the next problem to be the identification and extraction of the fragments from the base methodology that will serve as a skeleton methodology for the project. The "Problem Solve" and "Prescribe" phases are used to identify these fragments and determine their arrangement in a temporal fashion, with intentional gaps left in the prescribed process. This is represented by the base fragments in figure two.

We continue to cycle through the phases of the model. As we do, we describe problems and then use problem solving mechanisms to identify and prescribe activities that will extend, contribute to, and replace parts of the base methodology. "Extends" and "contributes" alters the base methodology by adding additional activities, while replaces removes a fragment of the methodology and replaces it with an activity (McGregor, 2008). The end goal is to enhance the base methodology and provide a methodology that is more of a custom fit to the project.

The walkthrough continues to follow this cycle throughout the course of the project. The base methodology fragments that were initially extracted as the skeleton methodology serve as anchor points which keep the project grounded. The prescribed actions must be collated within the fragments of the base methodology that were initially prescribed. The methodology can continue to be employed throughout the lifecycle of the project, even after the project as progressed into the maintenance phase.

### 3. DISCUSSION

The goal of the model is to provide practitioner utility (i.e., usefulness to system developers). The model attempts to reach that goal by presenting a simple process that is intuitive to the system developer and simulates the developer's typical procedure. The hope is that the model will be perceived by developers to be easy to use, and useful, and thus in accordance with the primary conditions set forth by the technology acceptance model. Furthermore, the model is based on a sound academic theory as it draws its basis from general systems theory.

Comparing the model to other known methodology tailoring techniques illustrates its advantages. The inadequacies of the contingency factors approach are apparent (Fitzgerald et al., 2003). It is just not feasible or possible for all the developers in an organization to be familiar with all of the possible methodologies that would work best for a given situation (Fitzgerald et al., 2003). Plus as the contingent factors of the project change over time, so will the optimum methodology.

If method engineering is analyzed through the lens of general systems theory, it becomes apparent that it is both a reductionistic and mechanistic solution to the problem. It is reductionistic in the sense that it attempts to solve the problem by reducing the phenomenon (the methodology) to its smallest component (method fragments) and analyzing the components. It is mechanistic because it attempts to build a whole meta-methodology from the sum of its parts, with no regard for the interrelationships of those parts.

The practitioner model, as specified in general systems theory, presents an anti-reductionistic and anti-mechanistic approach. It seeks to integrate by identifying the isomorphic characteristics of the IS development methodologies. In particular, the model capitalizes on the common inherent problem solving nature of the various methodologies.

### 4. CONCLUSION

The separation of the IS development methodology community around heavy, proprietary tool oriented approaches versus "amethodological", light, open source approaches distracts us from more basic issues. None of the IS development methodologies that have been developed to date work well in the majority of situations. They all have to be refined and tailored extensively to the actual needs of the development context (Cockburn, 2006, Fitzgerald et al., 2003). The existing accepted approaches to method tailoring (i.e., contingency and ME) have shortcomings as noted earlier.

The model presented in this research directly addresses the problems inherent with other development methodology adaptation approaches. This general systems approach facilitates an IS community effort to normalize system development methodologies. The adherence to design science guidelines lends itself to the legitimacy of the model. Practitioners who use this method will not have to learn methodologies that are not normalized. Thus, they will have a shorter learning curve to implement this technique versus the other method tailoring techniques. Our research community can work collaboratively to reduce ambiguity in methodologies by using the theoretical foundation presented here.
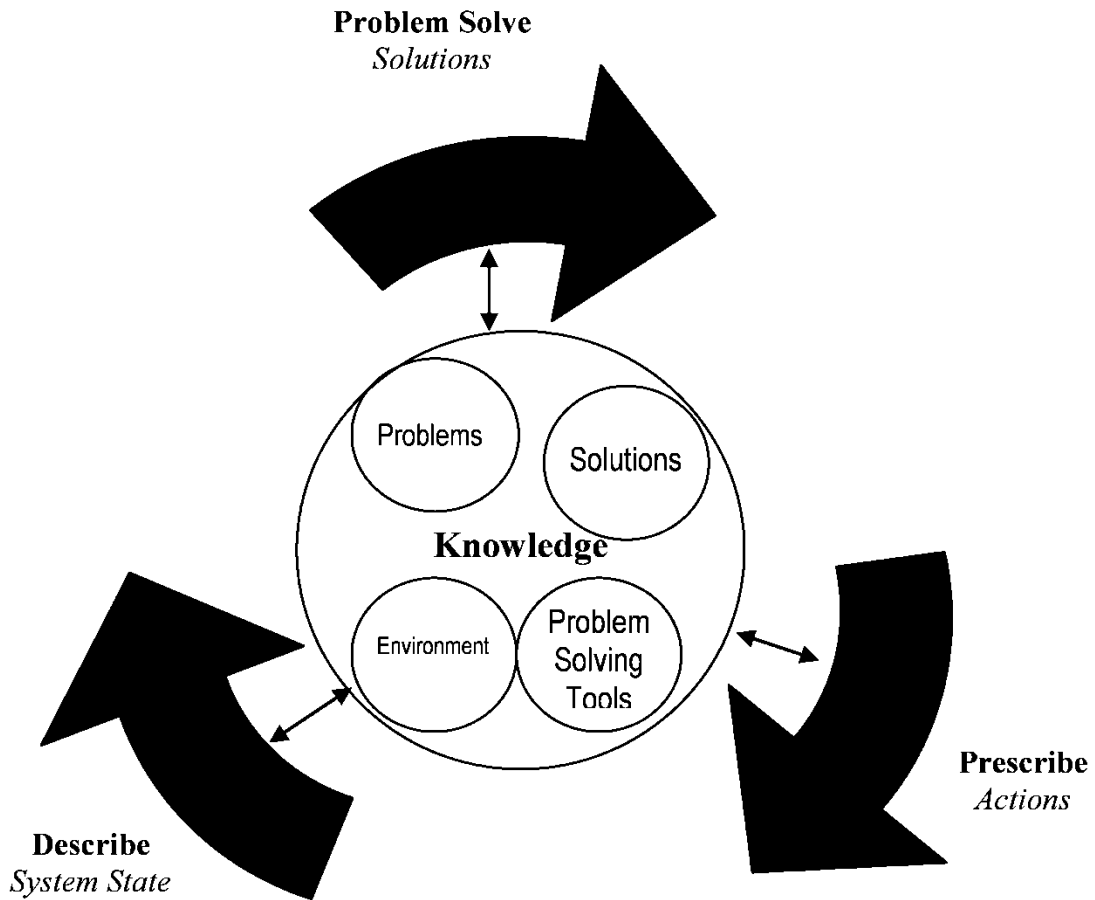
Future research is needed in several areas. First, lab experiments are needed to validate the model. Second, field experiments are needed that will test the model in a realistic setting and against other popular methodologies and approaches. Finally, specific methodologies and instantiations of the model need to be developed and evaluated accordingly.

## 5. REFERENCES

Abrahamsson, P., Warsta, J., Siponen, M., Ronkainen, J., "New Directions on Agile Methods: A Comparative Analysis", IEEE. 2003.

Ahl, V., Allen, T. F. H. "Hierarchy theory, a vision, vocabulary and epistemology", Columbia University Press. 1996.

The American Heritage Dictionary of the English Language, Fourth Edition, Houghton Mifflin Company, 2010.

Ashby, W.R., "Principles of the Self-Organizing Dynamic System", Journal of General Psychology, 1947, volume 37, pages 125—128.

Avison, D., Fitzgerald, G., "Where Now for Development Methodologies?", Communications of the ACM, 46,1 2003, 79-82.

Ajzen,I., "From intention to actions: a theory of planned behavior, in: J. Kuhl, J. Beckmann (Eds.), Action Control: From Cognition to Behavior", Springer-Verlag, New York, NY, 1985, pp. 11-39.

Brinkkemper, S., "Method Engineering: engineering of information systems development methods and tools" Elsevier Science B.V. 1996.

Burns, T., Klashner, R. "A Cross-Collegiate Analysis of Software Development Course Content", Proceedings of the 6th Conference on Information Technology Education, Newark, NJ, USA, pp. 333-337. 2005.

Cockburn, A., "Agile Software Development" 2nd edition, Addison-Wesley, 2006.

Conboy K, Wang X, Fitzgerald B. Creativity in Agile Systems Development: A Literature Review. In: Information Systems – Creativity and Innovation in Small and Medium-Sized Enterprises. Vol 301/2009. Springer; 2009. p. 122-34. (IFIP Advances in Information and Communication Technology ; vol 301/2009).

Davis, F.D., "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly 13, 1989, pp. 318-339

Deek, F.P., Turoff, M., McHugh, J., "A Common Model for Problem Solving and Program Development", Journal of the IEEE Transactions on Education, Volume 42, Number 4., pp. 331-336, November 1999.

DeFranco-Tommarello, J., Deek, F., "Collaborative Software Development: A discussion of Problem Solving Models and Groupware Technologies" Proceedings of the 35th Annual Hawaii International Conference on System Sciences. IEEE. 2002.

Fishbein, M., Ajzen, I., "Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research", Addison-Wesley, Reading, MA, 1975.

Fitzgerald, B., "The use of systems development methodologies in practice: A field study", The Information Systems J. 7, 3, 201–212 1997.

Fitzgerald, B., Russo, N., O'Kane, T., "Software Method Tailoring at Morotola", Communications of the ACM, 46, 4, 64-70 2003.

Fowler, M., "The New Methodology", WWW http://martinfowler.com/articles/newMethodology.html, Accessed May 18, 2005, 8pm.

Hansen, B., Jacobsen, D., Kautz, K. "Systems Development Methodologies in Practice", in Proceedings of the Information Systems Development Conference, Melbourne, Australia, August 25-27, 2003.
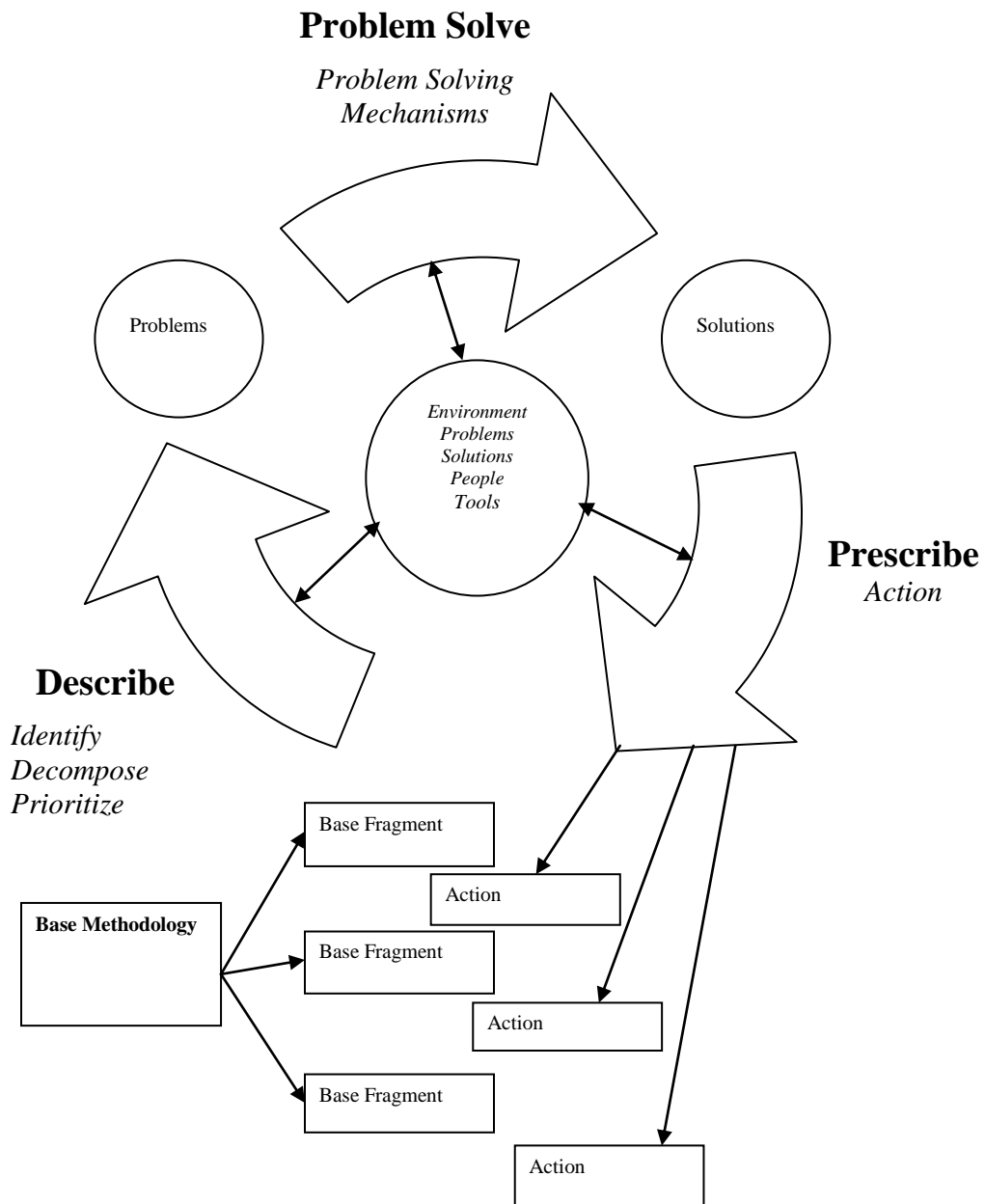
Hevner, A., March, ST, Park, J., Ram, S. "Design Science Research in Information Systems", MIS Quarterly (28:1) March 2004, pp. 75-105.

Highsmith, J., "Adaptive Software Development - A Collaborative Approach to Managing Complex Systems", Dorset House Publishing, New York, NY 2000.

Hoffer,J., George, J., Valacich,J., "Modern Systems Analysis & Design", Sixth Edition, Prentice Hall, 2010.

Howells, J., 'Tacit Knowledge, Innovation, and Technology Transfer", Technology Management and Strategic Management, Vol. 8, No. 2, 1996

Kuhn, A., "The Logic of Social Systems", San Francisco: Jossey-Bass. 1974.

Lippert, S. K., Anandarajan, M. "Academic vs. practitioner systems: Planning and analysis". Association for Computing Machinery. Communications ofthe ACM, 47(9), 91. 2004.

March, S., Smith, G, "Design and Natural Science Research on Information Technology." Decision Support Systems 15 (1995): 251 - 266. 1995.

McGregor, J., "Mix and Match", in Journal of Object Technology, vol. 7 no. 4, July-August 2008, pp 7 - 16

Newell, A., Simon, H., "Human Problem Solving", Prentice Hall 1972.

Riemenschneider, C., Hardgrave, B., "Explaining Software Development Tool Use with The Technology Acceptance Model", Journal of Computer Information Systems 41 (4), 2001, pp. 1-8.

Rogers, E., "The Diffusion of Innovations, Fourth ed., Free Press, New York, NY, 1995.

Rosnow, R. L., & Rosenthal, R. (2005). "Beginning behavioral research: A conceptual primer" (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Rossi, M., Tolvanen, J.-P., Ramesh, B., Lyytinen, K., Kaipala, J., "Method Rationale in Method Engineering", Proceedings of the 33rd Hawaii International Conference on System Sciences. 2000.

Simon, H., The Sciences of the Artificial, Third Edition. Cambridge, MA, MIT Press 1996.

Truex, D., Baskerville, R., Travis. J., "Amethodical Systems Development: The Deferred Meaning of Systems Development Methods", Journal of Accounting, Management, and Information Technologies, Tech 10. pp 53-79 2000.

Truex, D., Avison, D., "Method Engineering: Reflections on the Past and Ways Forward", Ninth Americas Conference on Information Systems, 2003.

Venkatesh, V., & Davis, F. D., "A theoretical extension of the technology acceptance model: Four longitudinal field studies", Management Science, (46:2), 186-204 2000.

von Bertalanffy, L., "Kritische theorie der Formbildung", Borntraeger. 1928.

von Bertalanffy, L. General System Theory, Braziler, New York, 1969.

**APPENDIX ONE**

**Problem Solve**
*Solutions*

Problems

Solutions

**Knowledge**

Environment

Problem
Solving
Tools

**Prescribe**
*Actions*

**Describe**
*System State*

**Figure 1** A Practitioner Based System Development Model.

**APPENDIX TWO**

## Problem Solve

*Problem Solving*
*Mechanisms*

Problems

Solutions

*Environment*
*Problems*
*Solutions*
*People*
*Tools*

## Prescribe
*Action*

## Describe

*Identify*
*Decompose*
*Prioritize*

Base Fragment

Action

**Base Methodology**

Base Fragment

Action

Base Fragment

Action

**Figure 2** A sample walkthrough of the model.

# Make or Buy: A Comparative Assessment of Organizations that Develop Software Internally Versus those that Purchase Software

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## Abstract

This study reveals insights from 221 interviews to compare the perspectives of executives in organizations who generally tend to develop or maintain software in house versus those who tend to purchase software from vendors or outsourced providers.  The key findings reveal that organizations that purchase software do not differ from those who develop software in their perspectives on the strategic importance of information technology and the role of information technology as a way to differentiate from their competitors.  The findings do reveal that organizations that purchase software also are more likely to outsource IT and to use offshore labor. In addition the study reveals that organizations that develop software are perceived as being more efficient in the collection and storage of data to support business operations.

Keywords: make vs. buy, outsourcing, strategic use of IT

## 1. INTRODUCTION

The past decade has ushered in a change in the way many organizations approach major software investments.  In the era of mainframe computing, most major information systems were developed in house or customized to suit the requirements set forth by the project team. With the rise of packaged enterprise systems and outsourced solutions, most organizations generally seek to purchase software rather than developing software in house.  However, there are many organizations that remain committed to their customized software and find greater value in maintaining legacy systems or developing systems to suit their specialized requirements that a packaged or outsourcing solution cannot offer.  This study compares the characteristics of organizations that tend to "make" versus those that tend to "buy" software.

The make-or-buy decision is a classic management issue. Every firm uses thousands of inputs, and for each there is a potential to either manufacture the input or acquire it on the market. In its broadest interpretation, this decision includes choices like hiring a consultant or employing internal labor to perform a given task. If a firm decides to make an input, it will transact internally with a division or another part of the firm. If it decides to buy, it will contract with another organization. In either case, it is important to

understand the decision criteria behind the transaction. The make-or-buy decision is sometimes treated as an accounting or financial decision. While it is important to perform accounting analysis and to choose the low-cost approaches, it is more important to understand the long term ramifications of these decisions (Rubin, 1990).

In this paper we address the make-or-buy decision in the deployment and utilization of a firm's Information Technology [IT] resources. We begin with a consideration of IT as a part of corporate strategy and competitive positioning. The investment and management of IT is recognized together with IT resource management. These form the lead into a discussion of the outsourcing decision. We suggest a framework depicted in Figure 1 as a basis for examining the perspectives of executives and IT professionals on IT strategic issues, IT investment and resource management as affects for make-or-buy decisions. The focus of this particular study is on the Make-Buy quadrant and its relationship with the other metrics in the framework. Note that Figure 1 represents a model for investigating the current state of organizational computing, particularly as it relates to issues of strategic importance. The focus of this research paper, examining relationships related to organizations tendencies for software development or acquisition, is one of many relationships that could be studied within this framework.

The remainder of this research paper is organized as follows. In section two, we provide a detailed background on the practices of outsourcing, make or buy decisions, and their impact on organization strategy. In section three, we detail the methodology and research questions addressed in the study. In section four, we reveal the results of the analysis and related discussion. Lastly, in section five we provide conclusions, limitations, and opportunities for future research on this subject.

Figure 1: Make-Buy Outsourcing Framework

## 2. BACKGROUND

### IT Outsourcing as a Corporate Strategy and as a Means of Competition

Outsourcing is a choice that lies in the corporate policy, not just business strategy,

area, as it modifies the firm's boundaries as a legal entity and generally involves top management decision makers. Affecting company-wide resource allocation policies and asset management practices, outsourcing decisions often involve several divisions in large, diversified companies, as in the case of IT outsourcing operations. Several factors are at work simultaneously that are likely to increase outsourcing: rapid technological change, increased risk and the search for flexibility, greater emphasis on core corporate competencies, and globalization. In this broader context, outsourcing is the result of a complex change in the cost boundaries facing firms as they choose between inside and outside production (Deavers, 1997)

According to Winkleman et al. (1993) there are two basic drivers behind the growth of outsourcing, cost reduction and a strategic shift in the way organizations are managing their businesses. Gupta and Gupta (1992) add two further drivers for outsourcing; market forces and technical considerations. Hiemstra and van Tilburg (1993) indicate four motives for outsourcing: costs, capital, knowledge and capacity. Aarts et al. (1995) added one more main motive, "less sorrows", which indicates that outsourcing is led by strategic considerations to concentrate on core business activities.

Outsourcing occurs when an organization contracts with another organization to provide services or products of a major function or activity Belcourt, 2006). Outsourcing is not just a costing exercise; it has a strategic dimension as the organization attempts to find the right size to fit new environments (Rothery and Robertson, 1995). Work that is traditionally done internally is shifted to an external provider, and the employees of the original organization are often transferred to the service provider. Outsourcing differs from alliances or partnerships or joint ventures in that the flow of resources is one-way, from the provider to the user. Typically, there is no profit sharing or mutual contribution.

Outsourcing has also helped companies ameliorate competitive pressures that squeeze profit margins and eliminate investments in fixed infrastructure. It has also allowed for improved quality and efficiency: increased access to functional expertise; potential for creating strategic business alliances, and fewer internal administrative problems. The key to

deciding what to outsource rests with those elements that differentiate the organization, especially in the areas of value and quality. While management must own those operations that define a company's core business and its core business processes, other functional areas that are non-core should be considered potential candidates for outsourcing. By outsourcing non-critical functions, a company can leverage its financial resources, share its financial risk, and allow management to concentrate more fully on core business activities.

IT outsourcing services has sometimes been the focus of best practices reporting (Rottman and Lacity, 2006). The impact of outsourcing has three interrelated dimensions: scope of outsourcing, act of outsourcing, and impact of outsourcing (see Figure 2). The first dimension of scope or 'what to outsource?' is an important issue that companies often face at the beginning of an outsourcing or make-or-buy decision. Cost savings may be offset by hidden transaction costs (Rottman and Lacity, 2006) and there may be other factors driven by outsourcer's customers' needs. There is a strategic element of choice that is involved in this issue. A company like Bank of America that sees IT as its core to offering innovative customer solutions may choose to outsource some IT functions to be at the cutting edge of technology. Being core to its business, it sees IT outsourcing as strategic (McCue, 2004). The second issue of how the outsourcing is implemented or managed is critical to its success. Poor management of the outsourcing relationship can led to a complete relationship failure (Martin, 2007). The other dimension of outsourcing relates to the overall impact of outsourcing on the business and its environment that is beyond the realm of performance in an outsourcing contract.

Figure 2: Three dimensions of Outsourcing

The decision by firms to outsource may also be driven by as well as drives (i.e., IT influenced by and facilitates) the emergence of specialist organizations in various fields and cost efficiencies. While much of the discussion relating to outsourcing IT focused on the cost of performing an activity within the boundaries of the firm versus entrusting to a third party, situations in which cost may not be the principal consideration in a firm's outsourcing decisions also merit consideration (Varadarajan, 2008).

Companies could also outsource their IT to streamline the management agenda and focus on the firm's core business (Slaughter and Ang, 1996). Senior executives often consider the IT function a commodity service best managed by a large supplier. Using a value chain analysis, this eliminates/outsources activities that do not provide primary value to the organization. If managers do not see a strategic role for IT then IT outsourcing is viewed as a means of conserving managerial effort and focusing on areas with greater strategic potential. Firms can outsource a significant portion of the IT infrastructure and still retain aspects such as critical applications development that are viewed as strategic (Weaver et al., 2000).

**IT Investment and Management**

One of the problems in explaining the continuity of large-scale IT outsourcing is that existing studies apply theoretical approaches, which offer limited explanatory power. For example, it is argued that firms externalize their IT activities because they can either save on costs/risks (the transaction cost perspective) or focus on their core competences (Lacity et al., 1994a). Little attention has been paid to wider changes in production systems. While there have been a number of contributions examining the nature and impact of IT outsourcing (Lacity and Hirschheim, 1993) and its implications for IT management (Huber, 1993), less attention has been paid to IT outsourcing in the context of broader organizational strategy and the implications for innovation and the distribution of expertise in emergent organizational forms. Companies often outsource IT to generate cash and enhance liquidity (Lacity et al., 1994 and McFarlan and Nolan, 1995). For firms considering divestitures, outsourcing can liquidate an asset that IT unlikely to be recognized in the deal (McFarlan and Nolan, 1995). On the other hand, firms considering acquisitions often see outsourcing as a means of generating capital to partially fund the acquisition (Smith et al., 1998).

A rapidly advancing technological environment often forces organizations to consider outsourcing whereby they effectively surrender control of the IT function to external suppliers. Such surrenders are usually motivated by short-term considerations where the organization providing the outsourced services does not have any incentive to become a

"partner" in the business process. This leads to the surrender of mission-critical IT functions to external parties. Furthermore, the recovery of such critical IT functions once surrendered to outside providers often proves far more difficult once the in-house expertise has left the organization (Weaver et al., 2000). This may leave firms' IT departments lacking in current technical expertise and equipment.

Whether an activity adds to an organization's competitive advantage must be measured in the marketplace. Chamberland (2003) suggests a metric to assess activities in four major categories of strategic importance, ranging from "key activities which are more apt to add the greatest strategic value to the organization, to "commodity activities," which are readily available in the marketplace and contribute no strategic value to the organization. He states that these key activities should generally be performed in-house while others become prime candidates for outsourcing. Whether an activity can be performed well internally depends on an organization's internal resources. Those resources are measured against a valuation metric that he ranks from a "weak" to a "strong" capability (as represented in the figure 3). This two-dimensional matrix helps assess whether a particular activity should be outsourced. The criteria on the matrix help decide whether an activity is both key to the organization and an important source of competitive advantage to it, and therefore worthy of being performed in-house. If it is found that an activity only provides a negligible (if any) competitive advantage to the organization, depending on the organization's ability to perform it in-house, it is more likely to be outsourced outright, or handled through some type of third-party relationship.

Figure 3: Internal Capability of Enterprise to perform an activity

**The Make-Buy Outsource Decision**

The question of what to produce internally and what to outsource is often asked (Ahern, 2009). Over the last two decades, organizations have sought to enhance efficiencies and expand their capabilities by giving larger role to their suppliers in creating and delivering value to their end customers. Moving beyond the traditional 'make' or 'buy' decisions, companies sought to view their vendors as partners that signaled a shift from

adversarial arms length relationships to deeper cooperative relationships.

Outsourcing can be considered as a continuum. At one extreme outsourcing can be seen in the form of hiring temporary labor or machines and at the other extreme, complete responsibility for the regular and continuous design, build and delivery of manufactured parts for integration within other assemblies. In the middle are various forms of consultancy and skills provision. Time is reflected across the continuum with short-term market exchanges at one end and long-term, relational exchanges at the other.

**IT Outsourcing Strategy: Make vs Bu**y

Technological developments in the macro environment can be a driver of a firm's decision to outsource an activity that was previously performed in-house. Technology can also be a driver of a firm's decision to perform in-house an activity that had been outsourced. By leveraging technology to automate, it might be possible to make redundant an outsourced activity. If contracting out parts of the operation is cheaper than doing it yourself, it is a clear case for outsourcing. This enables organizations to not only make efficiency gains but also allows them to focus more clearly on those activities that it can better perform in-house (Hendry, 1995).

Bhattachary (2003) suggests three models that can be used to understand managerial motivations for IT outsourcing. These models are (1) the antecedent firm characteristics of IT outsourcing proposed by Smith et al. (1998); (2) the Four-S Outsourcing Model (Zucchini, 1992); and (3) the Reengineering-Outsourcing Decision Matrix (Behara et al., 1995).

Smith et al. (1998) investigate outsourcing firms' financial characteristics and explicitly classifies firm-specific drivers of IT outsourcing into five categories: (1) cost reduction; (2) focus on core competence; (3) liquidity needs; (4) IT capability factors; and (5) environmental factors. Cost reduction and control are often offered as internal reasons for outsourcing IT (Smith et al., 1998). In some instances an outside vendor can provide the same level of service at a lower cost than the internal IT department (Bhattacharya et al., 2002). The vendor could have better economies of scale, tighter control over fringe benefits, better access to lower cost labor pools, and more

focused expertise in managing IT. Capability factors also motivate outsourcing (Smith et al., 1998). Environmental factors' roles in the outsourcing decision (Hu et al., 1997) include factors that are not specific to the firm, but exist in its industry or in the economy at the time of outsourcing. For instance, the decision to outsource IT may be driven by imitative behavior among firms and or by a mix of external media, vendor pressure, and internal communications at a personal level among managers. The availability of qualified vendors willing to provide the service at a reasonable price, pressure from vendors, positive stock market reaction to the phenomenon are other factors that also influence the decision.

The Four-S Outsourcing Model (Zucchini, 1992) provides a second framework to help guide a firm's outsourcing decision in a managerial context. The model (see Figure 4) is comprised of four quadrants, varied along two dimensions where one addresses the organization's objective in making the decision (Economics/Expertise) and the other indicates the utility of the decision (Functional/Dysfunctional). The resulting quadrants represent application types and are identified as Scale, Specialty, Sale, and Surrender.

Figure 4. The Four-S Outsourcing Model (Zucchini, 1992).

The scale factor comes into play when an IT outsourcer is able to provide the same service at a cost that is lower than the outsourcing company could achieve through in-house operations. Outsourcing decisions based on scale are usually viewed as a rational decision. According to this model, sound outsourcing decisions are also made when the rationale for decision making is based on taking advantage of the outsourcer's specialized technological or operational expertise (Weaver et al., 2000). While outsourcers may initially maintain personnel whose skills have been outsourced within the organization, such personnel are soon reassigned to other projects once the outsourcing engagement takes effect.

The Reengineering-Outsourcing Decision Matrix (Behara et al., 1995) provides a third framework when considering the outsourcing decision within a business process engineering environment (see Figure 5). Reengineering is broadly defined here as IT-based process redesign, and includes the myriad of issues related to the design and implementation of change along the technological, human, and organizational dimensions. The model addresses the outsourcing decision within this context by developing a framework based on the nature of IT applications and the organizational areas in which they exist. Dispersion or the organizational footprint is used to represent the organizational areas in which IT are implemented, while the extent of innovativeness of the applications is used to reflect the nature of IT applications.

Figure 5. Reengineering-Outsourcing Decision Matrix (Behara et al., 1995, pp. 46–51)

Cross-functional IT applications are becoming the norm with an increased focus on business processes at an enterprise level. Implementing such application requires a greater amount of coordination and cooperation between participating groups within the firm. When dealing with innovative IT applications, there is an added challenge related to the emerging and dynamic nature of the application itself. This compounds the need for effective integration of the various business processes and IT parties involved. Under these circumstances, it may be appropriate to in-source or keep the IT application in-house. This is exemplified by the implementation of Enterprise Systems solutions in organizations. However, when dealing with established IT applications, outsourcing may be an appropriate option due to the reduced uncertainty that IT experienced when dealing with a known application. The tentative approach by some companies to outsource Enterprise Systems through Application Service Providers (ASPs) is an example. When IT applications are limited to specific business functions, outsourcing-established applications is most suitable as it represent the most sustainable approach. However, the ability of the outsourcers to deliver innovative solutions in narrow functional areas should be carefully evaluated before the outsourcing decision is made.

In many situations outsourcing describes corporations' search for cheap labor and reflects a belief about the motives and consequences of economic restructuring, not careful analysis.

## 3. RESEARCH QUESTIONS AND METHODOLOGY

To investigate the ramifications of make-buy decisions on organizational effectiveness, we offer the following research questions:

**Research Question 1**: Does an organization's preference for buying software vs. developing in-house have a relationship with their decisions regarding **outsourcing of IT functions or future plans to offshore labor to reduce costs**?

**Research Question 2**: Does an organization's preference for buying software vs. developing in-house have a relationship with their **perceptions on the strategic importance of IT and the role of IT as a basis for differentiation with competition**?

**Research Question 3**: Does an organization's preference for buying software vs. developing in-house have a relationship with their **perceptions on the success of IT investments, the management of IT projects, and the mechanisms that effectively measure and justify IT expenditures**?

**Research Question 4**: Does an organization's preference for buying software vs. developing in-house have a relationship with **perceptions on the effectiveness in the collection, storage, and dissemination of data to support business operations and the use of technological resources to help decision makers gain strategic insights**.

To investigate these research questions, personal interviews were conducted with 228 senior level executives. The interviews were conducted primarily in face-to-face settings. The subjects were offered confidentiality so their names and affiliations are not revealed in the data set. Most of the interviews were conducted with executives in a relatively large city in the Midwestern United States. Thus, the findings in this research paper may be limited if there are regional differences in perspectives. Consistent with other academic empirical research, the subject pool was not limited to one respondent per organization, thus the results should be interpreted with the potential that large companies may have multiple entries.

The executives were asked to comment on a series of questions about IT strategy and provide a rating on Likert scale (5=strongly

agree, 3=neutral, 1=strongly disagree). The questions included the following which are relevant to this study:

- In examining major software investments, we typically seek to purchase solutions rather than develop them in-house.

- We are looking increasingly at outsourcing many of our IT functions.

- We are looking increasingly to reduce costs by using offshore IT outsourcing.

- Information Technology is very important to the strategic success of our organization.

- Our use of IT helps differentiate us from our competitors.

- Most of our investments in IT have been successful.

- We have implemented mechanisms that effectively measure and justify IT expenditures.

- We manage IT projects effectively.

- We are efficient in the collection, storage, and dissemination of data to support business operations.

- We are able to use our technological resources to help decision makers gain strategic insights.

## 4. ANALYSIS AND FINDINGS

Two basic statistical tests, a Pearson Correlation and a t-test for equality of means, were conducted to examine the research questions. The t-test for equality of means was formed by dividing the sample into two groups. Those who responded that they "agreed" or "strongly agreed" with question 1 (that typically seek to purchase solutions rather than develop them in-house) were placed in one group while the remaining subjects were placed in another. The sample included 120 executives who fell into the "Buy" group while 101 fell into the "Make" group.

The Pearson Correlation is a measure of linear dependence between two variables. Since the data used in the study is Likert-scaled, with end points of "strongly agree" to "strongly disagree", it is common in academic literature to perform statistical tests that test linear, continuous relationships among the variables. The t-test of equality allows for comparisons of

sub-groups of data be tested for differences in mean that are useful in illustrating the results. For example, if one were to examine the relationship between age and income, a Pearson Correlation might show a positive significant correlation between those variables while a t-test of equality could be used to illustrate that groups age 40 or older (for example) earn an average of X, while those under age 40 earn an average of Y.

### Research Question 1

The practice of outsourcing IT, particularly when it includes offshore labor has received a great deal of attention in recent years. Research Question 1 examines the relationship between the make-buy decision and the practices of outsourcing and offshoring of IT. As shown in Table 1, there is statistically significant positive correlation between organizations that buy software and their practices of outsourcing and offshoring. As shown in Table 2, the Buy group had higher mean ratings for both outsourcing and offshoring of IT. However, the statistical significance was stronger for outsourcing than for offshoring. It is possible that relationship between offshoring of IT labor and the practice of buying off-the-shelf software is not as clear cut. In general, the mean rating on the use of offshore labor reflects the finding that the practice is not perceived as being widespread by interview respondents. The relatively weak significance of the t-test may also be attributed to the inability of offshore labor to assist organizations in the in the implementation of major software projects (e. g., ERP implementations) while conversely, offshore computer programmers could be utilized in software development projects or maintenance of existing systems. In general, however, the results suggest that buying packaged software is consistent with an overall philosophy of seeking to outsource IT resources.

### Research Question 2

The question as to whether IT is a strategically important resource has generated a great deal of controversy in recent years, primarily due to the publication of the article "IT Doesn't Matter" in Harvard Business Review (Carr, 2003). Table 1 reveals that there is no statistically significant correlation between organizations that buy software and perceptions on the strategic importance of IT and the use of IT to differentiate from competitors. Table 2 shows that there is strong agreement that IT is, in fact, regarded as strategically important and that most organizations agree that IT is used as basis for competition. The importance of IT appears strong regardless of whether organizations buy or develop software. While the mean for both items was slightly greater among the group that develops software, the lack of significance is a potential important finding.

Those who subscribe to the arguments set forth in" IT Doesn't Matter" may view the common practice of buying software from vendors as evidence that that IT is declining in strategic importance due to the equal availability of IT resources among competing firms. The results of this study would not support this view due to the lack of a statistical relationship between buying software and decreased perceived importance of IT as a basis for competition. Of course, the overall high mean results for strategic importance of IT and IT as basis for differentiation also serve to refute some of the conclusions of "IT Doesn't Matter" and related literature.

### Research Question 3

Major software projects have historically been scrutinized for failing to successfully meet the intended goals and for failing to be completed within the original cost estimates of the projects. In recent years, there has been greater focus on the accountability of IT expenditures and, in turn, an increased effort to measure and track metrics of IT projects in a consistent manner. Table 1 reveals that there is no statistically significant correlation between organizations that buy software and perceptions regarding the success of IT investments, the effectiveness of IT project management, and the use of mechanisms that effectively measure and justify IT expenditures. The mean values depicted in Table 2 also reveal little differences between the two groups on these bases. This lack of difference and the relatively high overall mean values are surprising given the general perception that (historically) internal software development projects do not have a positive reputation for meeting goals and being completed within projected time and cost estimates. Of course, there is also a wealth of literature documenting that it is difficult and costly to implement major packaged software solutions (e. g., ERP implementations).

Given the deliberate steps and financial considerations that most organizations

undertake in the course of selecting vendors for major software investments, it is somewhat surprising that there is not a greater difference among the groups for the item related to measurement and justification of IT expenditures. An important extension to this study would be to further investigate the different success factors between buyers and developers on these bases, including comparative best practices for system life cycle approaches, project management success factors, and appropriate metrics and system review techniques for different styles of software acquisition.

## Research Question 4

Among the most important trends in the use of IT resources in recent years has been the widespread popularity of business intelligence (BI) systems that enhance the ability of organizations to produce interactive reports and to conduct analysis of business data to improve tactical and strategic decision making. BI systems can only be successful if data is collected and stored effectively as a basis for organizational decision making and if the decision makers are given the tools and training to use BI effectively.  Table 1 reveals that there is a statistically significant, negative correlation between the the practice of buying software and perceptions regarding the efficiency of collection, storage, and dissemination of data to support business operations.  The finding is also reflected in Table 2 which reveals a statistically significant difference in means between software developers and software buyers.  These results indicate that organizations that develop software internally are viewed as being more efficient in the collection, storage, and dissemination of data to support business operations.

When an organization develops software internally, they are able to customize the processes and data structures to match the business requirements of the system. Conversely, there is a limited ability to select, configure, and customize a packaged off-the-shelf software solution to closely match an organization's business requirements. Customizing packaged software can be complex and problematic due to the cost of the customization, the difficulties in upgrading to new releases of the packaged application, and the potential impact on vendor support or warranty issues.  As a result, the practice of

buying off-the-shelf software often requires that an organization adjust its business processes rather than customizing the software.  Thus, the inability of packaged applications to meet specific functional requirements of system users could serve as an explanation for this finding.  However, the result is still somewhat surprising since packaged software is purported to improve the integration of business data while in-house systems are often viewed as being outdated and inadequate.

While Table 1 reveals that the correlation between the practice of buying software and perceptions regarding the use of technological resources to help decision makers gain strategic insights is also negative, the correlation is not statistically significant. Table 2 also confirms that there is a not a statistically significant difference in mean values between the groups.  The overall mean values near 4.0 for both groups show that executives generally agree that they are using technology to gain strategic insights.  The lack of correlation and difference in means is somewhat surprising given the potential synergies between packaged software and BI. Major software vendors such as SAP and Oracle market both business software and BI solutions.  It also would seem likely that organizations that tend to buy software would be more likely to implement and use BI solutions than organizations that develop software internally.

Table 1

Table 2

## 5. CONCLUSIONS

The landscape of IT continues to evolve away from the historical practice of in-house developed software towards packaged and outsourced software solutions. As we continue this evolution, it is important for researchers and practitioners to understand the ramifications of making versus buying software and the potential impact these decisions can have on the success of an organization. This research provides insights into the potential differences and commonalities among organizations that tend to buy software and those that develop software internally.

The key findings of this study can be summarized as follows:

- Organizations that buy packaged software are more like to outsource IT functions and are more likely (but to a lesser extend) to utilize offshore IT resources as compared to organizations that develop software internally.

- Organizations that buy packaged software do not differ from those who develop software internally in their perceptions on the strategic importance of IT and the ability of IT to differentiate from competitors.

- Organizations that buy packaged software do not differ from those who develop software internally in their perceptions on the success of IT investments, the management of IT projects, and the mechanisms that effectively measure and justify IT expenditures.

- Organizations that buy packaged software are perceived as being less efficient than those who develop software internally in the collection, storage, and dissemination of data to support business operations but do not differ in perceptions on the use of technological resources to help decision makers gain strategic insights.

There are a few potential limitations to this study. The packaged software market is continually evolving, thus the findings of this study could be valid for only a short period of time. As best practices for packaged software implementations and new methods of integrating outsourced solutions (e.g., software as a service) continue to emerge, perceptions on the success or failure of these solutions may adjust accordingly. Interviews for this study were conducted primarily in one metropolitan city in the mid-western part of the United States. The perceptions of the respondents may not reflect the national or worldwide view of the subject matter. While interview subjects were granted assurances that results were confidential, there may be inherent bias in the results if respondents were reluctant to express criticism of their software systems or the role of IT in their organization.

Despite these limitations, these findings provide an important foundation for future research on the role of packaged software compared with internally developed software.

While this study attempted to assess organizational software development into discreet make vs. buy organizations, in reality, organizations rarely fit neatly into either category. Future research could focus on the best practices, success factors, or ramifications of make vs. buy software decisions at the individual project level rather than as an overarching organizational philosophy. The methodology of this study, given the relatively short list of questions, did not lend itself to multivariate statistical analysis. Future studies could expand on this research to develop models, and analyze in a more complex and rigorous nature, the issues raised in this exploratory study.

## 6. REFERENCES

Aarts, A.A.G., Navest, L.M. and Schoenmakers, A.M.D.C. (1995), Trends in uitbesteding: onderzoek naar de praktijk van uitbesteding in Nederland, Moret, Ernst & Young, Rotterdam.

Ahern, M. Kothandaraman, P. (2009) Impact of outsourcing on business-to-business marketing: An agenda for inquiry. Industrial Marketing Management, 8(4), May, 376-378
Impact of Outsourcing on Business-to-Business Marketing

Behara, R.S., Gundersen, D.E. and Capozzoli, E.A., (1995). Trends in information outsourcing. Int. J. Purch. Mater. Manage. 31 2,. 46–51.

Bhattacharya, S., Behar., R. and Gundersen, D.(2003) Business risk perspectives on information systems outsourcing. International Journal of Accounting Information Systems 4 (1), March, 75-93

Carr, N.G. (2003). IT doesn't matter. Harvard Business Review, 81(5), 41-49.

Chamberland, D. (2003) Is it core or strategic? Outsourcing as a strategic management tool. Ivey Business Journal. July/August

Deavers, K. (1997) Journal of Labor Research. 18 (4)

Gupta, U.G. and Gupta, A. (1992), Outsourcing the IS function: is it necessary for your

organisation?, Information Systems Management, Summer, pp. 44-50.

Hendry (1995), Outsourcing: culture, community and networks: the hidden cost of outsourcing, European Management Journal, 13 (2), 193-200.

Hiemstra, G. and van Tilburg, J.J. (1993), Inzicht in uitbesteding: ondernemingsstrategie en besturing, Van Gorcum, Assen.

Hu, Q., Saunders, C. and Gebelt, M., (1997). Research report: diffusion of information systems outsourcing: a reevaluation of influence sources. Inf. Syst. Res. 8 3, pp. 288–301 [September]

Huber, R.L., (1993). How continental bank outsourced its "crown jewels". Harvard Bus. Rev. 71 1, 121–129 [January–February].

Lacity, M.C. and Hirschheim, R., (1993). The information systems outsourcing bandwagon. Sloan Manage. Rev. 35 1, 73–86 [Fall].

Lacity, M.C., Hirschheim, R. and Willcocks, L.P., (1994). Realizing outsourcing expectations. Inf. Syst. Manage. 4, 7–18.

Lacity, M.C., Willcocks, L.P. and Feeny, D.F. (1995), "IT outsourcing: maximize flexibility and control", Harvard Business Review, May/ June, pp. 84-93.

Martin, D. (2007) 10 notable outsourcing failures, Finance Week (http://www.financeweek.co.uk/item/5137), May 16, 2007.

McCue, A. (2004) For Dell, Indian call center failure a lesson, cnet News (http://news.cnet.com/2100-1001_3-5182611.html), March 11, 2004.

McFarlan, F.W. and Nolan, R.L., (1995). How to manage an IT outsourcing alliance. Sloan Manage. Rev. 36 2, 9–23 [Winter] .

Rothery, B. and Robertson, 1. (1995), The Truth About Outsourcing, Gower Publishing, Aldershot.

Rottman, J. and Lacity, M. (2006), Proven practices for effectively offshoring IT work, MIT Sloan Management Review, Spring

Rubin, P.H. (1990), Managing Business Transactions: Controlling the Cost of Coordinating, Communicating and Decision Making, The Free Press, New York, NY.

Slaughter, S. and Ang, S., (1996). Employment outsourcing in information systems. Commun. ACM 39 7, 47–54 [July].

Smith, M.A., Mitra, S. and Narasimhan, S., (1998). Information systems outsourcing: a study of pre-event firm characteristics. J. Manage. Inf. Syst. 15 2, 61–93.

Varadarjian, R. (2009) Outsourcing: Think more expansively. Journal of Business Research , 62( 11) November, 1165-1172

Weaver, M., Bhattacharya, S. and Galup, S.D., (2000). Effective software management: its time has come in internal auditing. Intern. Audit. 13 3, 3–13 [May–June] .

Winkleman, M., Dole D., Pinkard, L., Molloy, J. et al. (1993), The outsourcing source book, Journal of Business Strategy, 14 (3), May/June, 52-6.

Zucchini, M., (1992). The Four-S Outsourcing Model. In: Applegate, L.M., Editor,. Eastman Kodak Co.: Managing Information Systems Through Strategic Alliances, Harvard Business School Case Teaching Note 5-193-037, 9 October 1995, Fleet/Nostar Financial Group, Providence, RI

**APPENDIX**
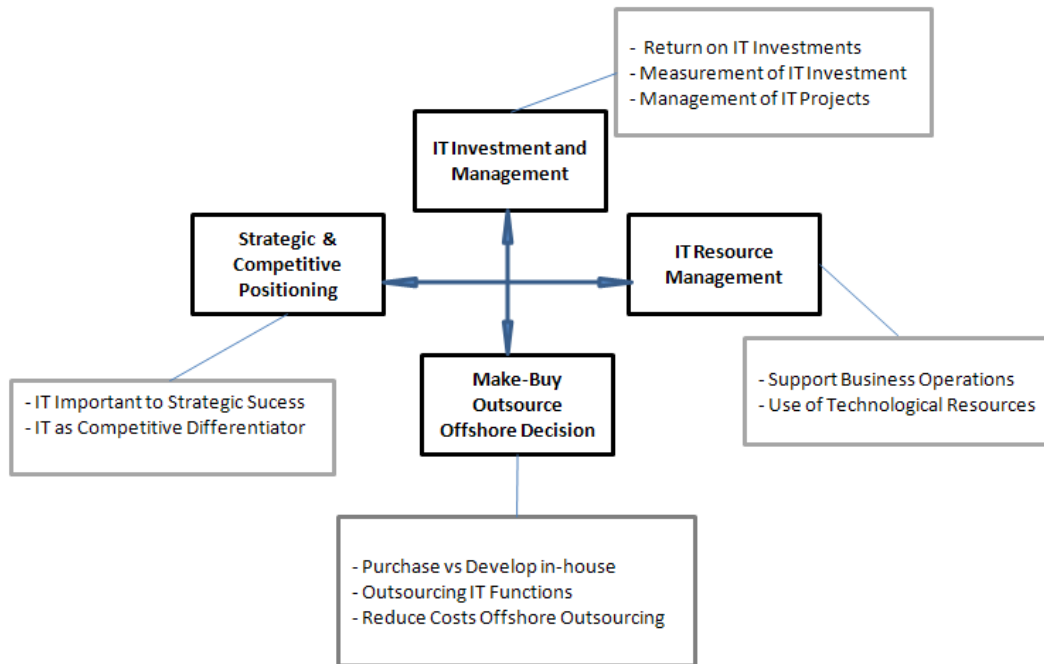
Figure 1: Make-Buy Outsourcing Framework



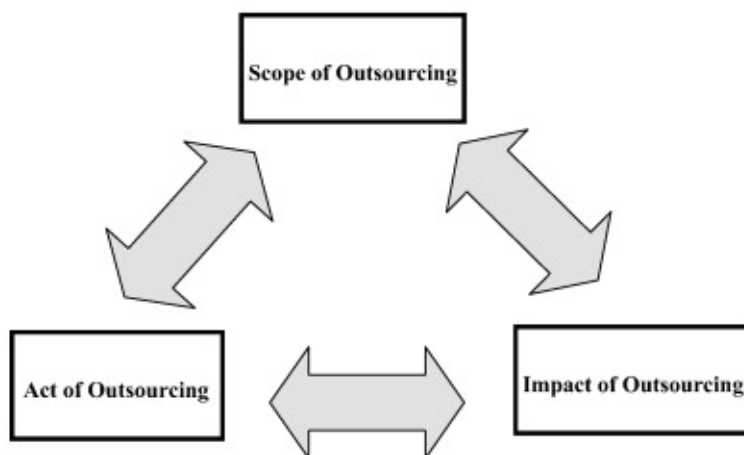Figure 2: Three dimensions of Outsourcing

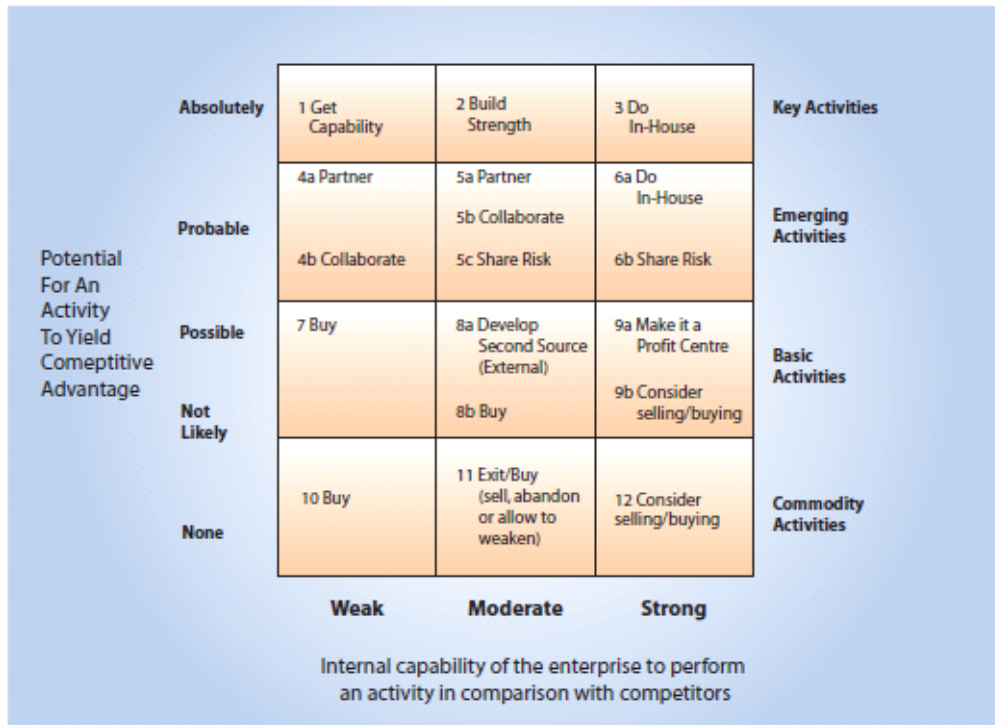Figure 3: Internal Capability of Enterprise to perform an activity



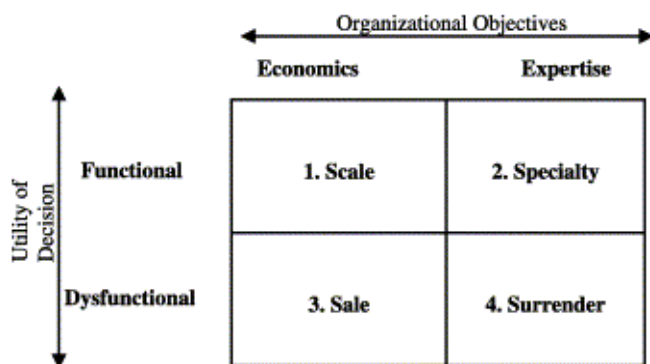Figure 4: The Four-S Outsourcing Model (Zucchini, 1992).

Figure 5: Reengineering-Outsourcing Decision Matrix (Behara et al., 1995, pp. 46–51)
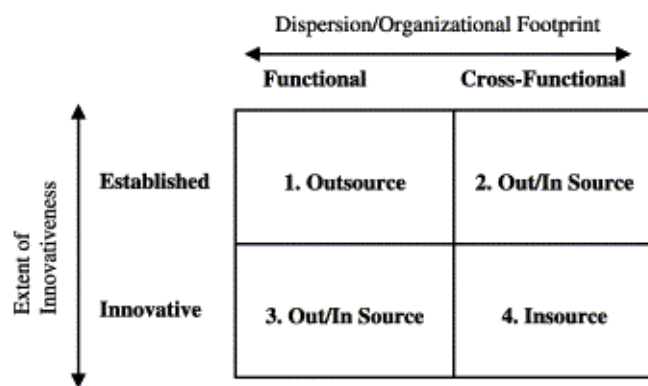


Table 1: Correlation Between Organizations that Buy Software and Strategic IT Perspectives

| Item | Correlation with "buying" software |
|------|-----------------------------------|
| We are looking increasingly at outsourcing many of our IT functions | R=.228 (p=.001) |
| We are looking increasingly to reduce costs by using offshore IT outsourcing | R=.197 (p=.005) |
| Information Technology is very important to the strategic success of our organization | R=-.107 (p=.112) |
| Our use of IT helps differentiate us from our competitors | R=-.088 (p=.196) |
| Most of our investments in IT have been successful | R=.000 (p=1.00) |
| We have implemented mechanisms that effectively measure and justify IT expenditures | R=.082 (p=.227) |
| We manage IT projects effectively | R=.018 (p=.797) |
| We are efficient in the collection, storage, and dissemination of data to support business operations | R=-.147 (p=.031) |
| We are able to use our technological resources to help decision makers gain strategic insights | R=-.067 (p=.330) |

Table 2 Test of Means: Organizations That Buy Software vs. Those That Develop Software

| Item | Mean (Buy) | Mean (Make) | T-test of Difference |
|---|---|---|---|
| We are looking increasingly at outsourcing many of our IT functions | 3.04 | 2.6 | T=2.47 (p=.014) |
| We are looking increasingly to reduce costs by using offshore IT outsourcing | 2.68 | 2.31 | T=1.72 (p=.081) |
| Information Technology is very important to the strategic success of our organization | 4.7 | 4.81 | T=-1.56 (p=.120) |
| Our use of IT helps differentiate us from our competitors | 3.83 | 3.97 | T=-1.03 (p=.306) |
| Most of our investments in IT have been successful | 3.78 | 3.83 | T=-.495 (p=.621) |
| We have implemented mechanisms that effectively measure and justify IT expenditures | 3.57 | 3.49 | T=.572 (p=.568) |
| We manage IT projects effectively | 3.69 | 3.72 | T=-.193 (p=.847) |
| We are efficient in the collection, storage, and dissemination of data to support business operations | 3.59 | 3.92 | T=-2.39 (p=.018) |
| We are able to use our technological resources to help decision makers gain strategic insights | 3.95 | 4.09 | T=-1.14 (p=.256) |

* 5 point Likert Scale (1 = strongly disagree... 5=strongly agree)

# Password Security Risk versus Effort:
# An Exploratory Study on User-Perceived Risk and the Intention to Use Online Applications

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## Abstract

We present the results of a study that explored the relationship between user-perceived security risk of online applications and the efforts associated with password use. Based on data that were collected from undergraduate students and analyzed using the Partial Least Square (PLS) method, we found that the reactions of users to efforts related with password strength differed from the reactions to efforts related with frequency of required password change. In general, long and complicated passwords appear to be more acceptable than passwords that need to be changed very often, in particular for applications that users perceive to be of high risk. The results of our study should be of interest to practitioners who need to balance organizational needs with individual user behavior when developing effective security strategies, and to researchers who are interested in the conceptualization of fit-variables.

**Keywords:** online applications, user-perceptions, security, risk, password strategy, fit, empirical study, PLS-analysis

## 1. INTRODUCTION

It is generally recognized that there are trade-offs involved with implementing information systems, such as between usability and security (DeWitt & Kuljis 2006). Common security measures attempt to increase security through

dictating user behavior, such as password policies. A policy that requires, for instance, very long passwords has been shown to decrease the likelihood of the password being cracked by technical means (Lockdown 2008; Neosmart 2006; Salem, Hossain, & Kamala 2008), but it

may also be considered inconvenient, since the user must remember a lengthy string of characters that takes considerable time to type (Kuo, Romanosky, & Cranor 2006; Zhao, Wang, Wu, & Ma 2005). In addition, the policy may even be thought of as less secure to the extent that users write their passwords down and place them in close proximity to their machines, thus increasing the likelihood to be obtained by non-technical means (Gehringer 2008).

Insights about the tradeoff between usability and technical security requirements are commonly included in password policies as system administrators and business managers attempt to balance the various factors (Forget, Chiasson, Van Oorschot, & Biddle 2008; Garrison 2006). In general, it is possible to assess the consequences of inadequate password strength from an objective technical perspective, be it related to the possibility of unauthorized access to data as a result of particularly weak security, or related to performance losses and the need for additional system resources as a result of particularly strong security measures.

Less is known, though, about the differing impacts on user-behavior that result from situations of minimal versus very high levels of security, as perceived by a user (Florêncio & Herley 2007). Kline, He, & Yaylacicegi (forthcoming) found that users had an awareness of security technologies but did not always use them, and considered reputation and peer opinion more important than technological factors when judging the risk associated with a web site. Wier, Douglas, Carruthers, & Jack (2009) found that most users chose e-banking one-time passwords that were least secure, in their opinion, for convenience. Jones, Anton, & Earp (2007) found that user perceptions of authentication technologies were different in a banking setting than in a retail setting.

While users who perceive a system to exhibit an insufficient level of security may refrain from using it because of the fear of unauthorized access to sensitive information (risk), an excessive level of security may deter users because of limited usability and inconvenience (Hart 2008). System administrators are, thus, left with the challenge of developing security policies that are not only optimal from technical and organizational standpoints, but also sensitive to the consequences that the policies have for user behavior. The challenge is particularly difficult yet nonetheless critical in an open environment with a great number of users, such as a university setting. At the same time, a university setting provides the opportunity for education, whereby practical guidelines are needed to ensure effective results.

In the current study, we set out to improve our understanding of the extent to which very low levels of password security have similar or different consequences for user behavior than comparatively high levels of security. In other words, we seek to understand better the association between security as an independent variable, and a user's intention to use online information systems as the dependent variable, whereby our focus is on password policies. In particular, we address the following two research questions:

1. What is the functional relationship between password-related security requirements and the intention to use online applications?

2. What are the risk-perceptions of various types of online applications and what are the implications of user-perceived risk on user-behavior?

Our research promises insights for system and business administrators who need to provide effective information systems. The goal is to help improve security management with practices that are successful because of their comprehensiveness, as they take into consideration user preferences and behavior, in addition to the more common technical and organizational perspectives. More specifically, we hope to learn more about the practical implications of the presumed trade-off between the need for security and password-related efforts associated with the use of online applications, all from the perspective of the user. From an IS research perspective, we hope to contribute to a growing body of literature that seeks to develop a better understanding of various functional forms of fit, such as between task and technology (Gebauer 2009; Goodhue & Thompson 1995) and the respective dependent variables. The focus of the current study is on the fit between user-perceived application risk and password-related effort, and the implications for user behavior.

## 2. RESEARCH MODEL

The current research model (Figure 1) was developed to understand the impacts of user-perceived password-related efforts and application-related risks on the intention to use

an online application. In essence, we are interested in the interaction between the two elements of user-perceived risk (i.e., presumed need for security) and password-related effort (inconvenience). As for control factors, we use demographic aspects (age, gender, and computer knowledge) (Florêncio & Herley 2007), and type of application.
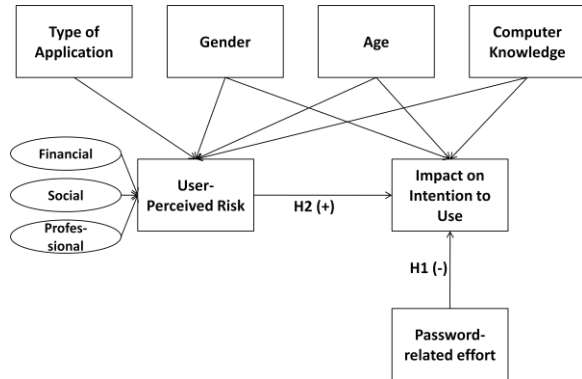


**Figure 1: Research Model**

Users are commonly required to enter a secret password in order to gain access to and use an online application. Password requirements are set by system administrators and vary in length, types of characters to be included, and frequency with which a password has to be changed. From the perspective of the user, password management can be seen as inconvenient because it requires extra effort, such as the effort associated with selecting a valid code and remembering or storing it. In addition, the subsequent use of a password requires a repeated extra effort before the user can access the online application. We suggest that from a user perspective, password-related efforts can be regarded as some form of costs (albeit intangible) that are associated with the use of an online application. Consequently, and all other things equal, the need to maintain and use a secret password should reduce the overall value of an online application, and may in fact deter marginal users for whom the extra efforts does not outweigh the benefit associated with using the application. We hypothesize:

*H1: Password-related efforts are associated negatively with the intention to use an online application.*

In other words, we expect to find that minimal required password-related efforts correspond with high values of intention to use. In contrast, higher required password-related efforts should correspond with lower values of intention to use.

However, the use of online applications comes of course with risks as a result of the open computer network structure that underlies the Internet and that can expose sensitive data to unauthorized access. Weir et al. (2007) found that context can change user perceptions of security. In the current study, we include three types of risk in the analysis: *Financial risk* relates to the negative financial implications that a user may incur when unauthorized access to account and credit card information leads to fraud or identity theft. *Social risk* relates to the negative implications that a user may incur in their personal life when information about activities or preferences is exposed to third parties without user consent. Similarly, *professional risk* relates to the negative implications that a user may incur in their professional life when sensitive information about personal preferences, activities, or health conditions are exposed to a current or future employer or school administration without user consent.

All other things equal, the risks that are associated with the use of an online application can reduce its overall value from a user's perspective, in addition to negative consequences from the perspectives of system administration and organization management. To the extent that passwords limit the risks that users associate with online applications, they can help maintain the intended benefits associated with the applications, and thus offset at least partially the hypothesized negative effects of password-related efforts. We hypothesize:

*H2: User-perceived risk of an online application is associated positively with the impact of password-related efforts on intention to use an online application.*

Put differently, for low levels of user-perceived risk, we expect limited or even negative effects of password-related efforts on the intention to use an online application; a user who is generally willing to comply with certain password requirements may be less inclined to do so for applications that are perceived to be of low risk. For high levels of user-perceived risk, however, we expect positive effects of password-related efforts on the intention to use an online application; a user who is generally willing to comply with certain password requirements may be even more accepting of the need for such efforts for applications that are considered to be of high risk. As the two hypothesized effects on

intention to use counteract each other, we are interested in their relative strength and interaction.

## 3. RESEARCH METHODOLOGY

### Data Collection

Data were collected among undergraduate business students at a public university who were enrolled in an introductory course on information systems. Surveys were distributed online at two different times, January 2009 (n=200) and December 2009 (n=159). Participating students received course credit at the discretion of their respective instructor. Table 1 depicts the basic demographic data of the respondents who filled out the survey completely (n=339), including gender, age groups, and self-reported computer knowledge. For the later variable, we used a five-point Likert-scale ranging from "well below average" to "well above average". A summary of the questionnaire is provided in the Appendix.

**Table 1: Demographic Data (n=339)**

| Variable | Value | Percentage |
|---|---|---|
| Gender | Male | 58.1 |
| | Female | 41.9 |
| Age | 17-18 | 2.9 |
| | 19-20 | 67.4 |
| | 21-22 | 17.9 |
| | 23-24 | 5.6 |
| | 25-26 | 1.5 |
| | 27-30 | 2.1 |
| | 31-35 | 1.8 |
| | 35-40 | 0.6 |
| | 41-50 | 0.3 |
| Computer Knowledge | Well below average | 0.6 |
| | Below average | 4.5 |
| | Average | 55.2 |
| | Above average | 34.5 |
| | Well above average | 5.3 |

T-tests to assess the independence of the two data samples (January versus December) showed no significant difference for any of the three demographic variables gender (t(339)=-0.149, p=0.881), age (t(339)=1.599, p=0.111) and computer knowledge (t(339)=0.289, p=0.773). We consequently combined the data from the two surveys for the remainder of the analyses.

### Measurement Scales

All model constructs were operationalized with single item indicators, except for risk, which was measured with a three-item reflective construct (Figure 1).

We coded password-related efforts with two different indicators, namely (1) required password strength pertaining to length and special characters, and (2) frequency of password change. *Password strength* was coded with a seven-level ordinal scale that included zero length/no special characters, and 4 characters, 8 characters, and 12 characters, each with and without required non-letter characters. *Frequency of password change* was coded with a four-level ordinal scale that included no required change, and required changes every year, every three months, and every week.

The main dependent variable (*intention to use*) was operationalized as the impact of password-related efforts on intention to use and measured with a five-point Likert-scale that ranged from very negative to very positive. We performed separate analyses for both types of password-related efforts (strength and frequency of change).

*User-perceived risk* of online applications was operationalized with a three-item reflective construct that included financial, social, and professional risk. Each type of risk was measured on a five-point Likert-scale ranging from not risky to very risky. Four control variables were included in the model, namely type of application, gender, age, and user-perceived computer knowledge.

We coded for five types of applications, namely online banking, gaming, retail, social networking, and student records (see appendix for details about the application scenarios). The applications were selected because of their presumed association with different types of risks. More specifically, we suggest that online banking and retail are associated in particular with financial risk because of the financial data that are an integral part of the applications. Online gaming and social networking are presumably associated foremost with social and professional risk because of the sensitive personal information that is part of these applications. In contrast, we expect student networking to be associated foremost with professional risk because of data that are closely related with a user's career (in addition to

financial data and risk). The appendix provides descriptive statistics of the measurements and inter-item correlations.

## 4. DATA ANALYSIS AND RESULTS

The data from the survey were analyzed using the structural equation modeling (SEM) approach with Warp3 PLS software that applies the partial least squares (PLS) technique (http://www.scriptwarp.com/warppls). SEM is a second generation statistical method that, in contrast to regression, allows for the simultaneous assessment of multiple independent and dependent constructs, including multi-step paths (Gefen, Straub, & Boudreau 2000). PLS was considered an appropriate method to test the research model because there is a broad agreement among scholars that PLS is well suited for exploratory research and theory development (in contrast to theory testing), which is the case in the current research study. As described above, we conducted two separate analyses, one for each operationalization of password-related efforts (password strength and frequency of change). In both analyses demographic data and risk-perception data were identical, whereas the indicators for password-related effort (strength and frequency) and the associated impacts on intention to use differed.

We tested the research models in two steps (Anderson & Gerbing 1988). In the first step, the quality of the measurement model was assessed by determining its overall fit and testing its factorial validity in the form of convergent and discriminant validity (Gefen & Straub 2005). In the second step, path effects and significance levels in the hypothesized structural model were examined to test the hypotheses. Results from each step are presented next.

**Measurement Model**

To assess the model fit with the data, it is recommended that the p-values for both the average path coefficient (APC) and the average r-squared (ARS) be both lower than 0.05. In addition, it is recommended that the average variance inflation factor (AVIF) be lower than 5 (Kock 2009). In reference to the results that are presented in Table 2, all of the three criteria are met in both models, and we have reason to assume that the models have acceptable predictive and explanatory quality.

Since our research models have only one construct that contains more than one item

(risk) the test of the measurement model is straightforward. To assess the factorial validity of a reflective construct, it is recommended to test for convergent and discriminant validity.

**Table 2: Model Fit Indices and P-Values**

|  | Strength-model | Change-Model |
|---|---|---|
| **Average path coefficient (APC)** | 0.099 p<0.001 | 0.026 p<0.001 |
| **Average R-Squared (ARS)** | 0.139 p<0.001 | 0.065 p<0.001 |
| **Average Variance Inflation factor (AVIF)** | 1.005 (good if <5) | 1.007 (good if <5) |

Convergent validity is the extent to which items are thought to reflect one particular construct (Straub, Boudreau, & Gefen 2004). We assess convergent validity by examining the loadings of the measurement items on the reflective construct and found acceptable results: the loadings of financial risk, social risk and professional risk on the risk-construct were all above the recommended threshold of 0.5 with 0.715, 0.899, and 0.908, respectively, and significance-levels of p<0.001 (Hair, Anderson, & Tatham 1987). In contrast, the loadings on all other factors (i.e., cross-loadings) were much lower (<0.2). Both composite reliability and Cronbach's alpha of the risk construct were above the recommended conservative threshold of 0.7 with 0.881 and 0.794, respectively (Fornell & Larcker 1981). Based on these results, we conclude that the three risk-related items exhibit acceptable convergence toward the latent variable of user-perceived risk.

Discriminant validity is the extent to which items reflect their suggested construct differently from the relation with all other items in the measurement model (Straub et al. 2004). Upon examining the correlations among the latent variables we expect to find the square root of the average variance extracted (AVE) to be much larger than any correlation among any pair of latent constructs. Again, we focus on the risk construct where we recorded an AVE of 0.845, and substantially lower correlations (<=0.104) with any other item. Based on these test results, we suggest that the three risk-related measurement items indeed reflect the latent variable of user-perceived risk that differs from all other measurement items in the model.
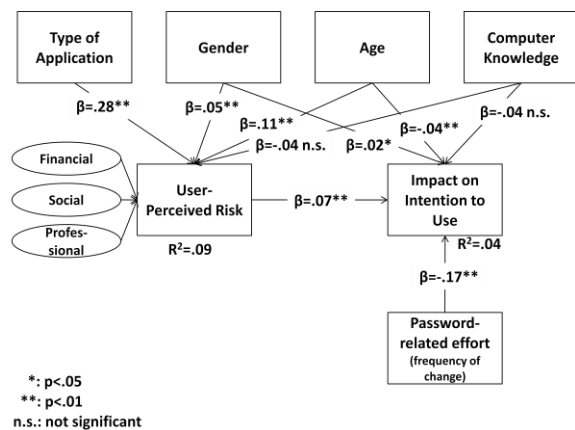
**Structural Model**

The next step of data analysis involved examining the structural models in order to test

our hypotheses. The results are presented in Figures 2 and 3, and summarized in Table 3.
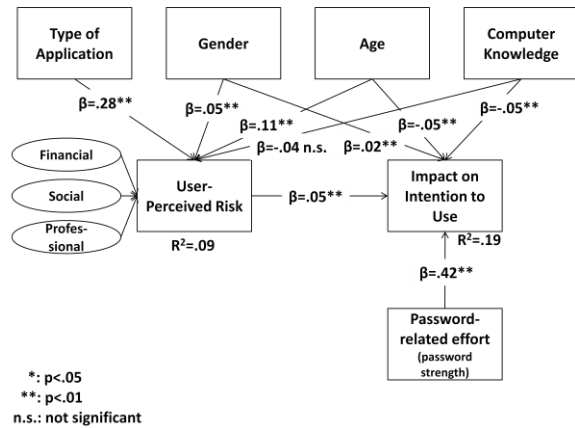


**Figure 2: Structural Model for Password Strength**



**Figure 3: Structural Model for Frequency of Password Change**

**Table 3: Model Results**

| Hypotheses | Support for Password Strength | Support for Frequency of Change |
|---|---|---|
| H1: Password-related efforts are associated negatively with the intention to use an online application. | No (link is significant, but opposite sign) | Yes |
| H2: User-perceived risk of an online application is associated positively with the impact of password-related efforts on intention to use an online application. | Yes | Yes |

We found links that were significant at the p<.01 level for both hypotheses in the strength- and

change-models. In the strength model, however, the expected sign of the relationship between password strength and impact on intention to use (H1) showed a positive instead of the expected negative direction. A look at the estimated functional relationship between password strength and impact on intention to use exhibits an inverted U-shape with a prominent and unexpected upward sloping part (Figure 4).
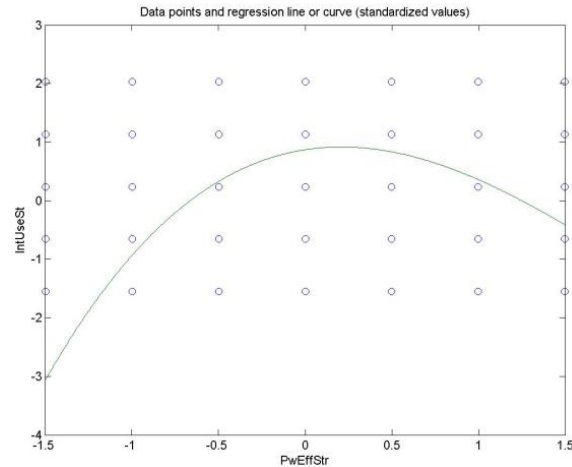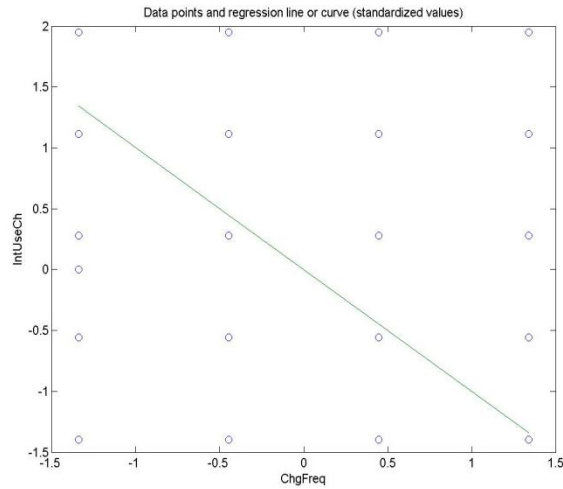


**Figure 4: Functional Form between Password Strength (Effort) and Impact on Intention to Use (H1)**

In comparison, Figure 5 shows the functional form between frequency of password change and intention to use, which shows the expected linear downward slope.

In contrast, H2 is supported in the correct (upward-sloping) direction for both the strength- and change-models. Still, the coefficients are rather small with 0.05 and 0.07, for password strength and frequency of password change, respectively.

The path coefficients for the remaining control variables are mostly significant (Figures 2 and 3). We note that the type of application exhibits a strong and significant effect on user-perceived risk. The descriptive statistics show that on average financial risk is considered highest for banking and retail, whereas social and professional risk are perceived to be particularly high for social networking applications. The risk associated with online gaming is comparatively lower (Figure 6).

**Figure 5: Functional Form between Frequency of Password Change (Effort) and Impact on Intention to Use (H1)**
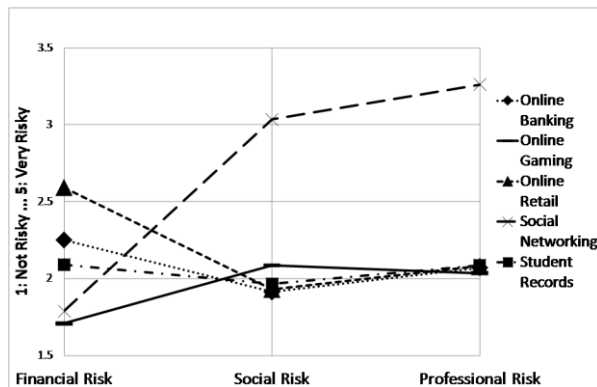


**Figure 6: Mean User-Perceived Risk by Type of Application**

Gender is significant insofar as female participants indicated both higher user-perceived risk and a higher impact on the intention to use online applications than male participants. Age played a mixed role as both models showed a significantly positive association between age and user-perceived risk and a significantly negative association between age and intention to use. Computer knowledge had only comparatively small (even insignificant) associations with risk and intention to use in both models.

Even though both models have highly acceptable values of fit with the data as reported above, the R-square values are small, in particular for the change model.

## 5. DISCUSSION

Our data analysis has yielded some interesting results. For efforts related with frequency requirements of password change, the data showed the hypothesized *negative* association between effort and impact on intention to use and the hypothesized *positive* association between perceived risk and impact on intention to use. We interpret the results such that from a user-perspective the inconvenience (=effort) associated with frequent password changes has a negative effect on the intention to use online applications. In contrast, user-perceived risk has a counterbalancing effect, in particular for high-risk applications. This latter insight was obtained by splitting the data sample into high-risk and low-risk groups based on overall perceived risk. While the high-risk group exhibited a strong and significant positive relation with intention to use, the association was non-significant for the low-risk group.

The results differ for password strength, our second measure of password-related efforts. Here, we find a curvilinear relationship between password strength and impact on intention to use that resembles the form of an inverted U, with a prominent *positive* upward slope. The relationship between user-perceived risk and intention to use is *positive* as expected. The results for low- and high-risk groups are very similar, even though the low-risk group again shows a non-significant relationship between risk and intention to use. We interpret the results such that for password strength, the inconvenience factor appears to play less of a (negative) role for intention to use than what we found for the efforts related with frequent password changes. Users appear to be more accepting of the requirements associated with setting up and using passwords that are of medium length and strength, despite the associated effort. Incidentally, with a ratio of explained to unexplained variance ($R^2$) of 0.19, the strength of the model that uses password strength as its dependent variable is higher than the strength of the model that uses frequency of password change ($R^2=0.04$).

We also note that our results show no clear symmetry in the reactions of users to password related efforts and application-related risk. Moreover, the relation between effort and user-perceived risk on the one hand and user-reaction on the other hand appears to depend on the operationalization of effort (password strength versus frequency of required change).

## 6. CONCLUSIONS

The results of our study have implications for practitioners as well as for researchers. Practitioners may be interested in the differences that we found in user reactions regarding the requirements of password strength versus frequency of change. We suggest that in order to be effective, system administrators need to rely more on the inherent strength of password length and character-types, than frequency of password change. In addition we found that the extent to which users are aware of the risks associated with the use of online applications appears to add to the willingness to accept long and complicated passwords, but not necessarily passwords that have to be changed very often.

Our research shows a continued need to increase awareness of the various risks associated with the use of online applications. Users appear to be willing to make security-related efforts in particular to the extent that they help avoid negative implications for their own well-being. We suggest that system administrators need to be careful to combine the need for security from organizational and technical perspectives with the perceptions of the individual user. The results of our study complement established security practices, as they emphasize the need to include individual security perceptions and behavior as part of comprehensive security strategies.

The results of our study also have implications for research, in particular research that applies fit variables (e.g., Goodhue & Thompson 1995). We attempted to identify a clear trade-off between security-related efforts in the form of password requirements and benefits (risk mitigation) that could help us devise guidelines to achieve optimal fit between the two factors. We found, however, that the relationship between both factors can vary for different measures (password length vs. frequency of change), and that the reactions of users to situations of low risk/high security-related efforts (under-fit) were not necessarily the same as the reactions of users to situations of high risk/low security-related efforts (over-fit). The results in the current study support earlier calls to apply an asymmetric approach when studying fit-measures in organizational settings (Gebauer 2009).

One limitation of the study lies in the group of survey participants (undergraduate students) that may not adequately represent the general population, in particular staff employed in a typical business setting. A generalization of our results should therefore be conducted with caution. We suggest a replication of our approach in a more professional setting to confirm and extend our insights. In addition, the current study was exploratory and therefore used rather crude measures to assess password-related efforts. Future studies should apply more granular measurements in order to obtain more refined results regarding the user-perceived tradeoff between efforts and benefits (risk-mitigation). Experimental research designs may be in order to achieve the latter research goal.

In conclusion, our research can help shed light on the interplay between the need to maintain security and the efforts associated with achieving a certain level of security, from a user-perspective. In order to be effective, system administrators and managers need to develop comprehensive strategies to security that balance the needs of the organization with the needs and preferences of the individual user. We think that the insights presented in the current study can help achieve that goal.

## 7. Acknowledgments

## 8. REFERENCES

Anderson, J., & Gerbing, D. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. *Psychological Bulletin*, 103(3), 411-423.

DeWitt, A., & Kuljis, J. (2006). Is Usable Security an Oxymoron? *Interactions*, (May), 41-44.

Florêncio, D., and Herley, C. (2007). A Large-Scale Study of Web Password Habits. *Proceedings of International World Wide Web Conference*, Banff, Alberta, Canada.

Forget, A., Chiasson, S., van Oorschot, P.C., & Biddle, R. (2008). Improving Text Passwords Through Persuasion. *Symposium on Usable Privacy and Security (SOUPS)*, Pittsburgh.

Fornell, C., & Larcker, D. (1981). Evaluating Structural Equation Models with

Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(1), 39-50.

Garrison, C. (2006). Encouraging Good Passwords", *InfoSec CD Conference '06*, Kennesaw, ACM.

Gebauer, J. (2009). Functional Forms of Fit: An Asymmetric Perspective. *Proceedings of the Americas Conference on Information Systems*, San Francisco, CA. http://aisel.aisnet.org/amcis2009/311/ (accessed April 9, 2011)

Gefen, D., & Straub, D. (2005). A Practical Guide to Factorial Validity Using PLS-Graph: Tutorial and Annotated Example. *Communications of the Association for Information Systems*, 16, 91-109.

Gefen, D., Straub, D., & Boudreau, M.-C. (2000). Structural Equation Modeling and Regression: Guidelines for Research Practice. *Communications of the Association for Information Systems*, 4(article7).

Gehringer, E. (2008). Choosing Passwords: Security and Human Factors. Working Paper.

Goodhue, D., & Thompson, R. (1995). Task-Technology Fit and Individual Performance. *MIS Quarterly*, 19(2), 213-236.

Hair, J., Anderson, R., & Tatham, R. (1987). *Multivariate Data Analysis*. New York, NY: Macmillan.

Hart, D. (2008). Attitudes and Practices of Students Towards Password Security. *Consortium for Computing Sciences in Colleges*.

Jones, L., Anton, A., & Earp, J. (2007). Towards Understanding User Perceptions of Authentication Technologies. *Proceedings of the 2007 ACM workshop on Privacy in Electronic Society*, Alexandria, VA, 91-98.

Kline, D., He, L., & Yaylacicegi, U. (forthcoming) User Perceptions of Security Technologies.

*International Journal of Information Security and Privacy*.

Kock, N. (2009). WarpPLS 1.0 User Manual. ScriptWarp Systems, Laredo Texas. Retrieved online June 7, 2010 from http://www.scriptwarp.com/warppls/UserManual.pdf.

Kuo, C., Romanosky, S., & Cranor L. (2006). Human Selection of Mnemonic Phrase-Based Passwords. *Symposium on Usable Privacy and Security (SOUPS)*, Pittsburgh.

Lockdown.co.uk (2009). Password Recovery Speeds: How Long Will Your Password Stand up? Retrieved June 7, 2010 from http://www.lockdown.co.uk/?pg=combi.

Neosmart Technologies (2006). *The Advent of Uncrackable Passwords*, 3rd edition. Retrieved online June 7, 2010 from http://neosmart.net/downloads/research/Uncrackable_Passwords.pdf.

Salem, O., Hossain, A., & Kamala, M. (2008). Intelligent Systems to Measure the Strength of Authentication, IEEE Explore working paper.

Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation Guidelines for IS Positivist Research. *Communications of the Association for Information Systems*, 13, 380-427.

Weir, Catherine S., Douglas, G., Carruthers, M., & Jack, M. (2009) User Perceptions of Security, Convenience and Usability for ebanking authentication tokens. *Computers & Security*, 28(1-2), 47-62.

Zhao, D.-M., Wang, J.-H., Wu, J., & Ma, J.-F. (2005). Using Fuzzy Logic and Entropy Theory to Risk Assessment of the Information Security. *Proceedings of the Fourth International Conference on Machine Learning and Cybernetics*, Guangzhou, IEEE.

**Editor's Note:**

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# Appendices and Annexures

**Questionnaire**

**Background**
1. Gender (male, female)
2. Age (under 17, 17-18, 19-20, 21-22, 23-24, 25-26, 27-30, 31-35. 36-40, 41-50, over 50)
3. What is your level of general computer knowledge compared to the majority of people your age? (Well Below Average, Below Average, Average, Above Average, Well Above Average)

**Online Banking:** The next few questions relate to online banking. You are considering an online banking web site. The website allows you to check account balances, transfer funds, pay bills, and interact with customer service representatives.

4. How risky do you perceive the Online Banking scenario to be? (Not Risky, A Little Risky, Moderately Risky, Risky, Very Risky, each with respect to Financial Riskiness, Social Riskiness, Professional Riskiness)
5. Please rate how each of the password change policies would affect your likelihood of using this online banking site. (very negative, negative, indifferent, positive, very positive, each with respect to password must be changed every week, password must be changed every 3 months, password must be changed every year, password never needs to be changed)
6. Please rate how each of the password policies would affect your likelihood of using this online banking website. (very negative, negative, indifferent, positive, very positive, each with respect to no minimum, password can be blank, minimum 4 character password, minimum 8 character password, minimum 12 character password, minimum 4 character, non-letters required, i.e., password must contain characters other than letters, such as (*,$,1-9,!), minimum 8 character, non-letters required, minimum 12 character, non-letters required)

**Online Gaming:** The next few questions relate to on line gaming web site. You are considering an online gaming web site. The site offers single person games such as solitaire and crossword puzzles. The site allows you to store and manage your personal scores. The site is free.
Questions 7-9 correspond with questions 4-6.

**Online Retail:** The next few questions relate to on line retail. You are considering an online retail web site. The site allows you to shop for electronic products in the range of $10-$500. You can place orders, pay by credit card, store items you wish to buy in the future, and track your orders.
Questions 10-12 correspond with questions 4-6.

**Social Networking Site:** The next few questions relate to a social networking site. You are considering an online social networking web site. The website allows you to share pictures, display information about yourself, join groups with common interests, and meet people through shared contacts.
Questions 13-15 correspond with questions 4-6.

**Student Records System:** The next few questions relate to an online student records system. You are considering using an online student records system. The system allows you to check past grades, check your GPA, change majors, see outstanding account balances, and view your transcripts.
Questions 16-18 correspond with questions 4-6.

**Descriptive Statistics and Correlations**

| | Min | Max | Mean | Std-Dev | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8a/b |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Gender** | 1 | 2 | 1.418 | .493 | | | | | | | | |
| **2. Age** | 2 | 10 | 3.529 | 1.184 | -.023** | | | | | | | |
| **3. Computer Knowledge** | 1 | 5 | 3.404 | .689 | -.109*** | -.022* | | | | | | |
| **4. Application** | 1 | 5 | n/a | n/a | n/a | n/a | n/a | | | | | |
| **5. Financial Risk** | 1 | 5 | 2.091 | 1.074 | .062*** | .091*** | -.020* | -.038*** | | | | |
| **6. Social Risk** | 1 | 5 | 2.189 | 1.134 | .042*** | .046*** | .004 | .127*** | .427*** | | | |
| **7. Professional Risk** | 1 | 5 | 2.309 | 1.191 | .035*** | .057*** | -.013 | .148*** | .458*** | .802*** | | |
| **8.a Password-related Effort (Password Strength)** | 1 | 7 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | |
| **8.b Password-related Effort (Frequency of Change)** | 1 | 4 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | |
| **9a. Intention to Use (impact of password strength)** | 1 | 5 | 2.733 | 1.117 | .031*** | -.034*** | .019* | .011 | .049*** | .043*** | .033*** | .259*** |
| **9b. Intention to Use (impact of frequency of password change)** | 1 | 5 | 2.669 | 1.196 | .034** | -.026* | -.012 | -.007 | .075*** | .056*** | .050*** | -.173*** |

\*: <=0.05

\*\*: <=.01

\*\*\*: <=.001

# A Model for Understanding Social Commerce

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## Abstract

When it comes to purchasing products and services, customers usually display different decision making behaviors although most agree that decisions can be influenced by other people. Since the social web provides a discussion platform for customers, it can be leveraged by companies to lean the discussion to their advantage and influence customers' purchase decisions. Recently, an effort to study social commerce was started, with a focus on extracting value from the social web for both businesses and customers. In this paper we aim to contribute to that effort by evaluating the effects of the social web on various stages of purchase decision making and we propose a model for understanding social commerce.

**Keywords:** Social Commerce, e-Commerce, Social Web, Web 2.0

## 1. INTRODUCTION

Advances in web technologies, security, and payment systems increased the role of the Internet as a commercial tool and a marketing channel. Thus, businesses augmented their web presence and activities in order to benefit from a lower cost business channel and attract more customers. Meanwhile, the emergence of Web 2.0 technologies and the introduction blogs, wikis, and social networks, are dramatically changing the web collaboration structure, as well as empowering and sophisticating traditional customers. These technologies have altered the concept of web content contribution, provided new means for users to generate content, and made the web more social and interconnected. The ability of customers to interact and generate content is extremely important for web marketers since it usually facilitates crowd-sourcing - i.e., businesses leveraging user content and ideas (Howe, 2006).

Social networks consist of large numbers of individuals who are potential content generators and a massive source of information. Crowd-sourcing utilizes the potential of networked web users to generate new ideas, advertise, and create added value for a little (or no) cost while increasing effectiveness by understanding customer needs, identifying potential customers, and building loyalty. Recently, to leverage the power of crowd-sourcing, Volkswagen launched "the fun theory", an ad campaign using web media (particularly YouTube) focusing on environmental issues. The campaign

encourages users to develop environmental solutions (with an emphasis on the "fun" element) and share them on the web. VW uses these ideas and embeds its own ad, and delivers it to customers by customers. The ad has been watched and shared more than seven million times at no cost to the company. Similarly, user generated videos on YouTube about the reaction of Mentos to Coca-Cola increased Mentos's sales without costing the company. Mentos even went as far as providing free stock of its products to people in order to generate more videos.

Comparing Amazon and eBay with MySpace shows a decline in the daily reach of the two e-commerce pioneers while social networks are gaining more attention. Indeed, social networks saw a healthy 500% increase in traffic between 2007 and 2008 (Leitner & Grechenig, 2009; Palmer, 2008). It is therefore important for next generation web-based businesses to understand the value of online communities in attracting new customers (Lorenzo, Constantinides, Geurts, & Gómez, 2007; Wu, Ye, S. Yang, & Wang, 2009).

Although there is little doubt that Web 2.0 can generate value for businesses, the question of how, why and when remains under investigation. The answer revolves around the impact of Web 2.0 and user generated content on customers' decision making process (Kim & Srivastava, 2007). In the offline world, a customer's decision to buy a product or service is mainly influenced by friends, family, and colleagues. The same relationships exist in the online world, so individuals with online social ties can promote word-of-mouth and create niche groups of customers with similar shopping behaviors.

In addressing online businesses, we define e-commerce as a three stage process: (1) *before* (attracting customers to the website through online marketing); (2) *during* (offering online means for executing the transaction); and (3) *after* (offering online means for after-the-service interactions). A purchase involving one or all stages qualifies as an e-commerce transaction. Hence, a customer who discovers a product on the web, purchases it online, and goes to the physical store for service is engaging in e-commerce. Leveraging social communities in e-commerce provides multiple advantages for both customers and businesses as online shoppers have access to large amounts of information provided by their

trusted parties (Leitner & Grechenig, 2008), while businesses employ Customer Relationship Management (CRM) to better predict market trends and maintain better relationships with their customers (Wu et al., 2009). Using CRM in the context of Web 2.0 and social networks is called "Social CRM".

However, the impact of the social web on e-commerce is not always positive. For instance, the "keeping up with the Joneses" behavior may translate into higher sales, increasing revenue by 5%, whereas seeking distinctiveness may decrease sales by 14% (Iyengar, Han, & Gupta, 2009). Social networks do not always influence to buy; they sometimes influence not to buy. The "minimalism" trend present on the social web (i.e., communities aiming to minimize purchases) has attracted many people during the last years, and more recently due to the economic breakdown.

The increased interest in Web 2.0 technologies and their e-commerce applications has led to a new shopping trend where customers leverage social networks to make more efficient and effective purchases. This is referred to as "collaborative shopping" or "social shopping" (Stephen & Toubia, 2009). In contrast, "social commerce" refers to businesses getting together to form networks of sellers (e.g. www.zlio.com). We use the term social commerce to refer to both "networks of sellers" and "networks of buyers" as we believe that social commerce should encapsulate both customers and sellers. We see social commerce as the evolution of "e-commerce 1.0", which is based on one-to-one interactions, into a more social and interactive form of e-commerce (Appendix 1).

While there is an agreement on social networks' impact on customer decisions, a systematic analysis of that impact is lacking. Our objective is to identify and discuss the various social factors influencing the different steps of a customer's decision making process, while presenting a model for understanding social commerce.

We continue the paper by surveying related work in Section 2. In Section 3 we present and discuss our model for understanding social commerce and support it with real life examples. Section 4 concludes the paper.

## 2. RELATED WORK

Analyzing the behavior of customers with regard to their purchase of products and services has been an interesting research issue, both in the context of traditional and online marketplaces. Customer buying behavior has been investigated from different aspects by psychology, social science, marketing, and recently information systems scholars. The most rigorous research regarding this issue provided models that capture customer shopping behavior including the Nicosia model (Nicosia, 1966), the Howard-Sheth model (Howard & Sheth, 1969), the Engel-Blackwell model (Engel & Blackwell, 1982), the Bettman model (Bettman, 1979), and the Andersen model (Anderson & Vincze, 2000).

The Nicosia model was first to shift focus from the act of purchase to a more complex consumer decision making process. As a communication model, it begins with advertising and ends with consumer feedback. Later, the Howard-Sheth model addressed customer behavior in the presence of multiple product choices, and the Engel-Blackwell model detailed the consumer's step-by-step decision making process. Based on these models and those of Bettman and Anderson, we identified the six basic stages of our proposed model for understanding social commerce presented in Section 3.

As web technologies matured and web applications became mainstream, the focus quickly shifted towards incorporating new business models in e-commerce (Guttman, Moukas, & Maes, 1998; Maes, Guttman, & Moukas, 1999). Older business models dealt with one-to-one interactions resulting in the development of customer-seller relationships (Dwyer, Schurr, & Oh, 1987). But social networks transformed customer-seller interactions from being one-to-one to community-based (Stephen & Toubia, 2009). Hence, the newer business models had to rely on community-based communications (Godes & Mayzlin, 2004; Jansen, Zhang, Sobel, & Chowdury, 2009; W. Yang, Dia, Cheng, & Lin, 2006) (Appendix 1).

Yet most research on community-based e-commerce revolves around increasing business revenue using word-of-mouth distribution and advertisement techniques as well as recommender systems. Little effort has been directed to researching the complete decision

making process and ways of improving it. Although some frameworks have been proposed to explain the role of social networks in customers' decision making process (Kim & Srivastava, 2007; Leitner & Grechenig, 2008, 2009), most lack a systematic approach, and nearly all evaluate few stages of the process, giving way to an incomplete view of a community's role in the decision making process of its members (as customers).

Finally, with the aim of bringing "social features" to e-commerce, some researchers focused on the elements required for designing smart social shopping spaces (Leitner & Grechenig, 2009). They analyzed the effect of social networks on e-commerce by looking at e-commerce websites, their structural elements, and applications that facilitate the creation of social environments. But since social networks that are built on top of e-commerce websites have not received enough attention, more research is necessary.

## 3. UNDERSTANDING SOCIAL COMMERCE

The concept of consumer buying behavior is not new. It refers to the decision making process which evolves in multiple steps including the act of buying and using products and services. Studying consumer buying behavior helps in understanding the influential factors on purchase decisions, and answers the question of why customers buy what they buy. It also enables firms to comprehend the reaction of customers to their marketing strategies. Understanding why, where, what, and how customers buy improves marketing campaigns and gives a better prediction of customers' response.

Although the research reviewed in Section 2 analyzed customer buying behavior in different contexts, it more or less pointed to six prevalent stages pertaining to customer behavior, namely Need Recognition, Product Brokerage, Merchant Brokerage, Purchase Decision, Purchase, and Evaluation. As the basis of our proposed model, we will detail these stages in the next sections. Note that although each stage represents a decision making step in the purchase process, not all customers follow them in the specified order. For instance, in traditional marketplaces most low cost purchases are made without previous intention or research as customers see products on the shelf and make the decision to buy or not to buy. Even for more expensive

products, the order of the stages can change. For instance, to buy a laptop, a customer might be determined to buy a Mac, so he immediately starts browsing through Apple products, placing the Merchant Brokerage stage before Product Brokerage. Nevertheless, in most cases customers follow the stages sequentially.

The adoption of social networks introduced a new set of components to the e-commerce environment. Fisher (Fisher, 2010) divides these components into six categories: Social Shopping, Rating and Reviews, Recommendation and Referrals, Forums and Communities, Social Media, and Social Advertising. Each component has brought new challenges and advantages to the online shopping experience, urging for the analysis of consumer buying behavior in the context of social networks. In our proposed model, we evaluate the effects of the abovementioned components on social shopping behavior from the viewpoints of consumers and businesses. Including businesses in the model should improve the analysis since businesses are usually part of consumer networks and they affect consumer decisions. In the following subsections we detail the stages of our model (Appendix 2).

**Need Recognition**

The first stage in a customer's purchase decision making process is identifying the need for a specific product or service. Although this is considered the first stage in the process, the role played by businesses in creating brand and product awareness begins long before customers become aware of a need.

Need recognition is associated with many issues that must be addressed for a clear understanding of the entire social shopping process. One of these issues has to do with customer needs and wants. Campbell (Campbell, 1998) defines need as the requirement, necessity, or the feeling of deficiency; and associates want with phrases such as 'desire', 'fancy', 'love', 'attracted to', and 'fond of'. The contrast between need and want rests on the difference between deprivation and desire. Need refers to a state of deprivation, and it occurs when there is a lack of necessary items to maintain an existing condition, whereas want refers to a motivational disposition to experience the pleasure of owning a product or service.

Customer needs and wants can be motivated by social networks. For instance, two kinds of social influence correlated to the generation and recognition of customer wants and needs are observed (Bearden, Calcich, Netemeyer, & Teel, 1986). Normative social influence (aka subjective norm) creates a social and psychological pressure (i.e., want) on people to purchase a product (or service) - regardless of an individual's interest in the product - since not adopting that product may paint them as old fashioned in their society or network of friends. Therefore, some purchases have a positive correlation with prestige and competition. However, informational social influence is a learning process achieved through observing early adopters' experiences with a special product (or service) aiming to understand the motives for acquiring it. The product can then be modified to address those needs more effectively, and the product profile should address the issue of attracting customers with similar needs. For instance, if your friend brags about his new phone that checks emails, then the need for checking emails on the go may be awakened in you.

Businesses, on the other hand, are interested in awakening the need or generating the want in customers. The key to make their products known to potential customers is effective advertisement. Note that CRM systems can assist businesses in predicting their potential customers and their potential needs.

How can the social web improve the need recognition process? Within social networks, nodes are the individual actors and links are the relationships between these actors. A social network is simply a map of relevant links between nodes. Links usually represent common interests or needs between actors on which they establish their relationships (Schwartz & Wood, 1993; Wellman, 1999), and thus they often form a subgroup. We believe that social networks can improve the need recognition process using the following three methodologies.

**Mutual Impact**

A customer's decision to buy a product or service is often influenced by family, friends, colleagues, business partners, etc. Due to mutual influences, it is more likely to observe similar purchase behaviors among customers with strong ties in a social network. Adopting a product by a network of people connected to an individual may awaken the need for the

product in that individual or create a desire (want) for acquiring that product or in some cases a similar product.

Back in 1996, Hotmail employed the effect of mutual impact to increase its user base. Hotmail increased its users from 0.5 million to 12 million by adding a simple message to the end of each sent email.

## Viral Advertisement

 While popular social networks base their business model on advertising (Trusov, Bodapati, & Bucklin, 2009), identifying the effective target for advertisement has always been challenging (Green, 2008). Indeed, only 40% of customers are source of positive social influence, while 12% create negative influence. Almost half of social network users have no social influence at all (Iyengar et al., 2009). A positively influential customer offers the opportunity for targeting an effective, but maybe small, portion of customers, resulting in a decrease in advertisement cost. Observing similar purchasing behavior helps identify subgroups of customers with strong ties and likely common interests. Businesses can create profiles of their products within an online community to increase their interaction within that community. For instance, Kiva (www.kiva.org), a charity loan website, created a profile on Facebook so people can become friends with Kiva and promote its service. This resulted in the formation of support groups among Facebook members, some even launching campaigns and competing to show support for various causes.

A different methodology consists of advertising a product to an online community member who has strong ties to other members or is positioned between sub-communities. The community member may, then, intentionally or unintentionally mention the product in his/her posts which creates a special form of viral advertising called "blogvertising" (i.e., advertising a product indirectly by talking about it in blog posts). Seth Godin, a renowned business author, provided an electronic version of his new book for free to his blog readers, who are also bloggers and social network users, and asked them to post it on their blogs, twitter, etc. if they found it interesting. Also, several e-commerce websites provide the functionality of posting purchases on Facebook immediately

after the purchase, so more people become aware of the purchased product.

## Recommender Systems

Recommender systems use various techniques to make accurate recommendations (Terveen & Hill, 2001), social recommendations being among those techniques. After detecting the sub-communities and analyzing the behavior of individuals and their community-wide connections, recommender systems can be employed to better predict the current and future needs of the community. "Customers who purchased this also purchased …" uses community behavior to identify similarities in the interests of people in products. The accuracy of recommendations increases by incorporating the different facts about users such as social ties and demographics (Terveen & Hill, 2001).

## Product Brokerage

Product Brokerage (aka Information Search) is the stage where consumers determine what to buy after a need or want has been recognized. This is achieved through a comprehensive search on products, followed by a critical evaluation of candidate products' information. The search procedure is normally conducted through "Internal" or "External" search or both. Internal search focuses on personal knowledge and past experiences, whereas external search utilizes marketers dominated sources, comparison shopping, public sources, and friends and relatives who can affect the decision through word-of-mouth. Social networks have the potential of improving the product brokering process by providing a resourceful environment of individuals with different experiences and specialties who spread the word-of-mouth and potentially lower the cost of search for different products (Guttman et al., 1998). Social networks can assist in achieving this lower cost search medium by providing the following:

## Trusted Reviews and Power of Friends Network

Trusted reviews may appear in two forms, formal and informal. When customers visit a merchant's website, they provide formal reviews on the products there and then. In contrast, informal reviews are provided whenever customers informally share some opinions on products among their social network of friends. Informal reviews can have

more credibility since they originate from members of the same online community who supposedly share the same values.

A friend who uses Twitter to comment on his recent purchase and describes the product with passion or disappointment affects his friends more than a formal review. Plus, friends may re-tweet (i.e., repost) the comment if they trust the original author. The re-tweet may be re-tweeted again to reach larger communities. In open social networks such as Twitter, users can search for products and reach thousands of informal, and sometimes formal, reviews about these products.

### Impact of Social Identity

Purchases and memberships can signal customers' social identity (Belk, 1988; Berger & Heath, 2007); therefore a customer's social identity may hinder the purchase of specific products. People may converge or diverge in their choice of products based on how much their choice will signal their social identity. A color, cloth, or hairstyle is socially accepted to represent a group, but if other people start to adopt the same style, then the meaning of adopting that specific style may become diffuse. For instance, Berger and Heath (Berger & Heath, 2007) discuss the example of Harley motorcycles which are a symbol of toughness, so many buy a Harley to signal their tough social identity, and the social identity that is associated with Harley motorcycles may stop many people from buying them. However, if different groups, e.g., accountants, start to adopt Harleys, their tough social identity may disappear over time.

### Synchronous Shopping

Social networks give users in different locations the opportunity to shop together simultaneously. With Web 2.0, web pages can be embedded into chat tools, and a group of people is able to browse the web together while they communicate regarding product profiles (Fisher, 2010). This synchronous shopping method preserves the fun of shopping together while benefiting from each other's ideas. Actually, this method mirrors the offline shopping experience where a group of shoppers visit a mall and help the potential buyer by discussing products and brands. Mattel, producer of Barbie dolls, provides synchronous shopping on its website, so kids in different locations can play together and design their own Barbie doll.

### Merchant Brokerage

The Merchant Brokerage stage compares merchant alternatives. The result of the comparison may lead to the next stage of the social commerce process or a return back to the previous stage to conduct more searches (Appendix 2). In this stage, the buyer establishes criteria for evaluating merchant related product specifications, along with promotions and accessories that a merchant provides. Plus, the merchant-customer relationship plays a role in the buyer's decision to select a merchant. Scanzoni (Scanzoni, 1979) identified five phases in the development of merchant-customer relationships in a conventional marketplace, namely awareness, exploration, expansion, commitment, and dissolution. We believe the same phases apply to an online marketplace, the first two having a direct impact on merchant brokerage.

### Awareness

Awareness refers to one party recognizing another party as a feasible exchange partner. That means customers will understand that a merchant provides their needed product or service in the desired condition. The presence of the merchant in social networks, whether formally or informally, amplifies the customers' awareness of the merchant. Amazon developed a method to amplify its recognition by providing affiliated links to its users, so whenever users talk about a book on their blog they can use the affiliated link to direct others to the book description hosted on Amazon. In this win-win situation, book descriptions are readily available to customers, while Amazon benefits from recognition and increased sales.

### Exploration

Customers evaluate the benefits, burdens, commitments, and conditions of the deal associated with the seller. Trial purchases are suggested as an enabler for the evaluation of benefits and drawbacks while increasing trust (Dwyer et al., 1987). But social networks help in skipping the trial purchase step and going straight to the exploration phase. The quality of the reviews and ratings associated with the merchant, especially those coming from trusted parties, speed up this stage. Customers usually rely on other people's recommendations. For instance, a Twitter account named "AskAroundOttawa" gives the opportunity to Ottawa residents to get fast

feedback regarding Ottawa related issues. One user may receive hundreds of feedbacks for inquiring about a restaurant serving a specific cuisine. Moreover, merchants can provide promotions and discounts on their social profile which updates users more frequently than a website.

Techniques and applications discussed during the product brokerage stage are also useful for merchant brokerage if they are focused on merchants. For instance, if a merchant provides a synchronous shopping functionality on its website, users will be attracted and the fact that they are using the service means that they have already chosen the merchant to do their purchase.

## Purchase Decision

This stage (aka negotiation) is where the price and other terms of the transaction are determined. Similar to the previous two, this stage does not always lead to the next stage. There is a possibility that the customer returns to the previous stages to do more analysis (Appendix 2). As social networks rely on members and communities, two types of purchases exist: individual purchases and group purchases (aka group buying). The value of social networks is more apparent in group purchases.

Once a customer decides on the merchant and proceeds to the purchase stage, the merchant will try to extract maximum benefit from the purchase, for instance using recommender systems to suggest accessories or related products. Recommender systems leverage customers' activities within social networks to identify their interests and habits then recommend the right product to them. Bundled products which usually translate into better prices for the customer may start a new social shopping trend. If there is a choice in the suggested accessories, customers may go back to the product and merchant brokerage stages to revisit the decision on the choice of accessories.

The purchase process can involve multiple customers, especially when the merchandise is a subscription to a digital product (e.g., Safari Books). Although wholesale and group prices were always available for different products, most products are sold one at a time because customers usually need one item. However, social communities have the potential to change that. Communities within a social

network can be formed to adopt a product, so sales increase and price decreases. CommunityShopper (www.communityshopper.com) has recently launched a service that enables customers to purchase products in groups. Customers can join the service and form groups by showing interest in different products, leading to a group purchase. CommunityShopper also leverages the power of other social networks, so any purchase or show of interest can be posted on the user's Twitter account.

In general, social networks potentially empower customers and merchants in the following ways: (1) Product Bundling: recommender systems recommend accessories or related products to customers based on their social relations. (2) Group Purchase: enabling customers to use their collective buying power to obtain lower prices.

## Purchase

Although purchase is an important stage in social commerce, social networks do not affect it dramatically if the purchase is done offline. Based on what we described previously, the purchase can be done individually or in a group. In case of an individual purchase through a social network, the customer can leverage feedback from his network. For instance, the status of a member of Movie Fans (www.community.netflix.com) is updated when he purchases a movie ticket. If friends view his status and dislike his choice of theatre, they may suggest better venues. He may then consider their suggestion for his next movie outing. In case of a group purchase, merchants, customers and their social network benefit from the purchase. Customers acquire the product for a lower cost, while social networks multiply sales for the merchants. Moreover, merchants can promote the product by enabling customers to post their purchases on their social profiles (perhaps to gain social acceptance). Also, the merchant may ask the customer to recommend a product to friends or recommend people who are interested in a product to the merchant.

Nevertheless, in some types of purchases where the purchase has "a duration" associated with it, the effect of social networks on this stage may increase. For instance, when a customer orders food in a restaurant, he is committed to pay even though the payment will be completed in the near future. The purchase action begins when the order is

received. If the user posts his location and his intention to dine on a social networking site such as Foursquare (www.foursquare.com), friends (i.e., members of his social network) can join him. Foursquare encourages users to be frequent buyers and to post their status on the website, rewarding them with social recognition and promotions.

### Evaluation

The post-purchase stage is the final and probably the most influential stage in the social commerce model. It affects all previous stages, involves customer service, and more importantly the evaluation of the satisfaction with the buying experience. It acts as a transition stage for customers to go from being influenced to becoming potential influencers. The rationality of the decision made by the customer is evaluated, leading to satisfaction or cognitive dissonance. Online reviews are important if we accept that online customer review systems are one of the most powerful channels to generate online word-of-mouth (Foster & Rosenzweig, 1995; Godes & Mayzlin, 2004). However, not all researchers agree on the impact of online reviews on sales. The disagreement results from the fact that some researchers focus on the persuasive aspect of online reviews and on assessing the quality of products in the reviews, while others focus on user awareness and spreading the word without paying attention to the quality of the products (Duan, Gu, & Whinston, 2008). Nevertheless reviews have a positive relationship with the quality of the shopping experience. If a product sells well, then the number of reviews will grow and will eventually cause more recognition (Eliashberg & Shugan, 1997). The number of positive reviews during a certain amount of time is also indicative of more future sales, so merchants can predict sales and assign resources for more production.

Reviews can be divided into three categories: Customer Reviews, Expert Reviews, and Sponsored Reviews. Although it is expected that expert reviews have the most effect on customer decision making, in reality, informal and user generated reviews affect customers the most (Eliashberg & Shugan, 1997). Businesses should therefore focus on encouraging customer generated reviews.

In social networks, customers are encouraged to leave reviews for several reasons. An important one is that social network members seek recognition and try to show that they are always first in line, which is more verifiable in social networks where members know each other, hence they expect social satisfaction. Foursquare, for example, provides badges to grant social recognition to its users when they post reviews. Another incentive for leaving reviews is to help friends with decision making by providing personal experiences and history of products or services. While the number and quality of reviews change based on products, more attention is directed towards the comments of a critic (Eliashberg & Shugan, 1997). Trusting a critic's reviews in a network of friends is easier since the users are aware of the background of the critic (Kim et al., 2008).

In light of the above, social networks are better for review generation than merchants' websites.

## 4. CONCLUSIONS

Web 2.0 generated a new e-commerce stream named social commerce, enabling customers to harness the power of the social web to make more accurate decisions. Although social networks have an impact on customers' purchase decisions, few studies have focused on such influences because until recently data about the effects of social interaction on sales has not been adequately captured. With more customers using the social web, businesses developed tools to reach more of them to create product and brand awareness.

This paper reviewed and leveraged existing frameworks to present the influence of the social web on e-commerce decision making in a comprehensive model. The model guides all actors involved in the social commerce (businesses, developers, and customers) in leveraging the power of social networks. This includes enabling businesses to improve their marketing campaigns and increase sales. On the other end, customers are empowered through more informed purchases. All of this is possible when the developers build more focused tools to target the communities.

By using the right tools in the right way, e-commerce companies can ultimately increase sales while lowering marketing cost. We believe that e-commerce companies can benefit from the analysis of customer behavior in the social shopping experience. They should also recognize and apply the right strategies at the right purchase decision making stage. The

model guides business through the process of selecting the right strategies for different products and different target groups, as the model provides a comprehensive overview of possible techniques for employing social networks in business and their positive and negative effects. The result makes the social web an additional tool to be used by businesses in influencing customer purchases.

The model explores various social commerce tools with their advantages and projected deficiencies. Developers of social commerce systems can use the model improve current technologies.

Customers who may not have complete information about a product or service are eager to learn from other customers. Furthermore, human psychology suggests that people are interested to own what their friends have, whether they need it or not. Viewing products or hearing about them may awaken needs in customers. High quality reviews and functionalities on e-commerce websites that connect merchants to customer networks may encourage or discourage purchases of specific products from specific merchants. Customers are the ultimate beneficiaries from the model since it improves the services provided to them by business and developers.

In conclusion, our findings show that the main driver for social commerce is user interaction and involvement. Companies should encourage users to engage more in providing product and merchant related comments on their social networks and a comprehensive understanding of social commerce strategies is required for managers.

## 5. REFERENCES

Anderson, C. H., & Vincze, J. W. (2000). Strategic marketing management. Houghton Mifflin.

Bearden, W. O., Calcich, S. E., Netemeyer, R., & Teel, J. E. (1986). An Exploratory Investigation Of Consumer Innovativeness And Interpersonal Influences. Advances in Consumer Research, 13(1), 77-82.

Belk, R. W. (1988). Possessions and the Extended Self. Journal of Consumer Research, 15(2), 139. doi:10.1086/209154

Bettman, J. R. (1979). An information processing theory of consumer choice. Addison-Wesley Pub. Co.

Campbell, C. (1998). Consumption and the Rhetorics of Need and Want. J Design Hist, 11(3), 235-246. doi:10.1093/jdh/11.3.235

Duan, W., Gu, B., & Whinston, A. B. (2008). Do online reviews matter? - An empirical investigation of panel data. Decis. Support Syst., 45(4), 1007-1016.

Dwyer, F. R., Schurr, P. H., & Oh, S. (1987). Developing Buyer-Seller Relationships. The Journal of Marketing, 51(2), 11-27.

Eliashberg, J., & Shugan, S. M. (1997). Film Critics: Influencers or Predictors? The Journal of Marketing, 61(2), 68-78.

Engel, J. F., & Blackwell, R. D. (1982). Consumer behavior. Dryden Press.

Fisher, S. (2010, February). Social Commerce Camp - Killer Social Commerce Experience. Retrieved from http://www.slideshare.net/stevenfisher/social-commerce-camp-killer-social-commerce-experience

Foster, A. D., & Rosenzweig, M. R. (1995). Learning by Doing and Learning from Others: Human Capital and Technical Change in Agriculture. The Journal of Political Economy, 103(6), 1176-1209.

Godes, D., & Mayzlin, D. (2004). Using Online Conversations to Study Word-of-Mouth Communication. Marketing Science, 23(4), 545-560.

Green, H. (2008, September 25). Making Social Networks Profitable. BusinessWeek. Retrieved March 11, 2010, from http://www.businessweek.com/magazine/content/08_40/b4102050681705.htm

Guttman, R. H., Moukas, A. G., & Maes, P. (1998). Agent-mediated electronic commerce: a survey. Knowl. Eng. Rev., 13(2), 147-159.

Howard, J. A., & Sheth, J. N. (1969). The Theory of Buyer Behavior. New York, NY: Wiley.

Howe, J. (2006, June). The Rise of Crowdsourcing. WIRED. Magazine, Retrieved February 2, 2010, from http://www.wired.com/wired/archive/14.06/crowds.html

Iyengar, R., Han, S., & Gupta, S. (2009). Do Friends Influence Purchases in a Social Network? SSRN eLibrary. Retrieved from

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1392172

Jansen, B. J., Zhang, M., Sobel, K., & Chowdury, A. (2009). Micro-blogging as online word of mouth branding. In Proceedings of the 27th international conference extended abstracts on Human factors in computing systems (pp. 3859-3864). Boston, MA, USA: ACM. doi:10.1145/1520340.1520584

Jonah Berger, & Chip Heath. (2007). Where Consumers Diverge from Others: Identity Signaling and Product Domains. Journal of Consumer Research: An Interdisciplinary Quarterly, 34(2), 121-134.

Kim, Y. A., Le, M., Lauw, H. W., Lim, E., Liu, H., & Srivastava, J. (2008). Building a web of trust without explicit trust ratings. In ICDE 2008. Presented at the Workshop on Data Engineering for Blogs, Social Medial and Web 2.0, Mexico.

Kim, Y. A., & Srivastava, J. (2007). Impact of social influence in e-commerce decision making. In Proceedings of the ninth international conference on Electronic commerce (pp. 293-302). Minneapolis, MN, USA: ACM. doi:10.1145/1282100.1282157

Leitner, P., & Grechenig, T. (2008). Collaborative Shopping Networks: Sharing the Wisdom of Crowds in E-Commerce Environments. In BLED 2008 (Vol. 21, p. 321).

Leitner, P., & Grechenig, T. (2009). smart shopping spaces: connecting merchants and consumers by innovative online marketplaces. Presented at the IADIS International Conference e-Commerce 2009.

Lorenzo, C., Constantinides, E., Geurts, P., & Gómez, M. (2007). Impact of Web Experience on e-Consumer Responses. In E-Commerce and Web Technologies (pp. 191-200). Retrieved from http://dx.doi.org/10.1007/978-3-540-74563-1_19

Maes, P., Guttman, R. H., & Moukas, A. G. (1999). Agents that buy and sell. Commun. ACM, 42(3), 81-ff. doi:10.1145/295685.295716

Nicosia, F. M. (1966). Consumer decision processes : marketing and advertising implications. Englewood Cliffs, N.J. :: Prentice-Hall,

Palmer, M. (2008, January 21). Social shoppers find goods well recommended. Financial Times. Retrieved March 5, 2010, from http://www.ft.com/cms/s/0/349ca1ba-c7c3-11dc-a0b4-0000779fd2ac.html?nclick_check=1

Scanzoni, J. (1979). Social Exchange and Behavioral Interdependence. In Social exchange in developing relationships. Academic Press.

Schwartz, M. F., & Wood, D. C. M. (1993). Discovering shared interests using graph analysis. Commun. ACM, 36(8), 78-89. doi:10.1145/163381.163402

Stephen, A. T., & Toubia, O. (2009). Deriving Value from Social Commerce Networks. SSRN eLibrary. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1150995

Trusov, M., Bodapati, A. V., & Bucklin, R. E. (2009). Determining Influential Users in Internet Social Networks. SSRN eLibrary. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1479689

Wellman, B. (1999). Networks in the global village. Westview Press.

Wu, B., Ye, Q., Yang, S., & Wang, B. (2009). Group CRM: a new telecom CRM framework from social network perspective. In Proceeding of the 1st ACM international workshop on Complex networks meet information & knowledge management (pp. 3-10). Hong Kong, China: ACM. doi:10.1145/1651274.1651277

Yang, W., Dia, J., Cheng, H., & Lin, H. (2006). Mining Social Networks for Targeted Advertising. In Proceedings of the 39th Annual Hawaii International Conference on System Sciences - Volume 06 (p. 137.1). IEEE Computer Society. Retrieved from http://portal.acm.org/citation.cfm?id=1109714.1109905

# Appendices

## Appendix 1. From e-commerce 1.0 to social commerce
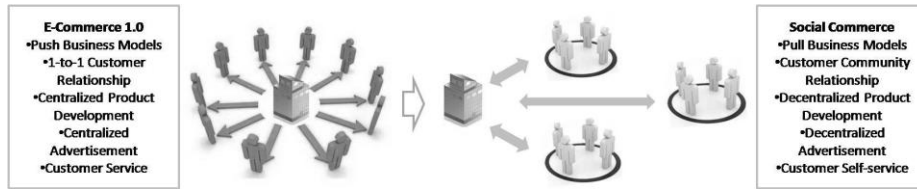


## Appendix 2. Model for understanding social commerce