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Factors in Social Computing Related to Worker Productivity

CAPSTONE REPORT

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Abstract

for

Factors in Social Computing Related to Worker Productivity

Proliferation in social computing technologies has created a need to examine the technology selection process with focus on the relationship to worker productivity. A literature review is conducted between the years of 1998 and 2007. Content analysis identifies factors in the literature addressing social computing, defined by the Social Computing Group (2005) and worker productivity, defined by Nasar (1993). The outcome is a Q&A guide for information managers to use when selecting social computing technologies.

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CHAPTER I. PURPOSE OF THE STUDY

BRIEF PURPOSE

The purpose of this study is to develop a set of factors to consider regarding the relationships between selected aspects of social computing (Social Computing Group, 2005) and worker productivity. The concept of worker productivity in this study is defined as "the amount of output per unit of input" (Nasar, 1993). Output is the successful completion of project-related tasks and input consists of the factors that are the primary subject of this study, such as "human factors" (Dryer, 1999, p. 654) and "social factors" (Dryer). Social computing, as the concept is used in this study, is defined as "digital systems that provide a social context for our activities" (Social Computing Group, 2005). Thomas (2001) further extends this definition in a way pertinent to this study as having "to do with digital systems that draw upon social information and context to enhance the activity and performance of people, organizations, and systems" (p. 872).

The larger method of study is literature review, as described by Leedy & Ormrod (2005, p. 64). Literature published from 1998 to 2007 in the fields of computer science and business is selected. Very few instances of relevant material are available from before this time period. Content analysis is performed on the selected literature to identify factors in social computing that are relevant to worker productivity. As a specific guide to the process, conceptual analysis, as defined by Palmquist et al. (2006), is used to identify pre-determined and emergent terms and concepts (called factors) in the selected literature. Information managers responsible for the development of information systems (BJA, n.d.) in support of worker productivity (Nasar, 1993)

can benefit from the identification of these terms and concepts, labeled social computing factors. These information managers include decision-makers in the areas of Information Systems, Information Technology, and Human Resources. Their decisions affect the way that organizational tasks are carried out in order to meet business objectives (the way people perform their jobs). The outcome of this study, a guide, is designed to support their need to: (1) create worker productivity efficiencies in their areas of responsibility and (2) make informed choices in information systems that are currently available to them. Willard (2006b) notes that by understanding what types of social computing applications are available and what features exist in those applications as related to worker productivity, information managers can make technology selections that better support the organizational mission.

Factors identified during content analysis are recorded as elements of five pre-determined factor categories related to social computing, examined and then regrouped into new larger categories. Categories are then reevaluated in light of the central question regarding their significance to output (worker productivity). Results are displayed in a series of tables representing the resulting new set of categories. The outcome of this study is a reference guide based on the study results containing criteria information managers can refer to when selecting social computing technologies that best support worker productivity.

FULL PURPOSE

A 2004 study on information format trends conducted by Online Computer Library Center, Inc. determined that “the major trends in the content space … are social and are profoundly changing how content is created, collected, used, shared and preserved” (OCLC, 2004, p. 3) and that “a major social change is underway as … content is … woven into the context of people’s lives” (OCLC, p. 5). The effect of this change is evident in the development of social computing technologies (Social Computing Group, 2005).

For this study, social computing is viewed as a combination of two areas of inquiry. First, it is defined as “digital systems that provide a social context for our activities” (Social Computing Group, 2005). Social computing is also defined for this study as part of social informatics, a “body of research and study that examines social aspects of computerization, the uses of information technologies in social contexts, and the ways that the social organization of information technologies is influenced by social forces and social practices” (Rob, n.d.).

Creating a competitive advantage for a company (or a division or even an individual work group) requires creating "a position in the market arena that customers perceive as unique and valuable" (Meeske, 2004a). Such a position can be created in a number of ways, including the selection of technologies that enable increased worker productivity (Nasar, 1993). Changes in one of the areas of business, organizational, or informational strategy will cause effects in the other two areas (Gammill, 2006a) (Johnson, 2000). The assumption underlying this study is that information managers responsible for selecting social computing technologies can benefit from

an understanding of the array of factors involved in social computing and their relationship to worker productivity.

A group of studies is now available that analyze varying measures of effectiveness of many social computing technologies including Thomas (2001), Churchill (2004), Johnson (2000), Davenport (2005), and Gebauer (2004). Information managers who are concerned with the effects their decisions may have on worker productivity (Nasar, 1993) now have data available to them that can aid them in their decisions when selecting information systems (BJA, n.d.).

Nasar (1993) defines a concept called "total factor productivity" (1993) in which "contribution to (overall) output" is captured and viewed in relation to various changes in input. The goal in this study is to add further definition to the notion of "input", as social computing concepts related to worker productivity are noted in the literature. Factors are identified as they are presented in the literature both explicitly and implicitly. One example of a category of explicit factors is "success factors" (Gebauer, 2004, p. 21). As reported in Gebauer (2004, p. 21), Goodhue and Thompson propose a task/technology fit that should be a requisite part of any successful technology development process. Therefore, this researcher views task/technology fit as an element in the larger category of "success factors" when applied to a social computing technology. A second example of a category of explicit factors is "social factors" (Dryer, 1999, p. 654). Dryer (1999) describes a videoconferencing system as a technology that is weak at digitizing the social context of a multi-participant meeting (p. 655). In this example, the

researcher views the ability of a social computing technology to represent a given social context as an element in the larger category of “social factors”.

The study is designed as a literature review. Leedy and Ormrod (2005) state that a literature review “describes theoretical perspectives and previous research findings regarding the problem at hand” (p. 64). This methodology is an appropriate one to use in order to address the central questions regarding relevant factors in social computing to consider in relation to worker productivity when selecting social computing technologies, as these are reported in existing published studies. Resources collected from the existing literature each address parts of the topic at the core of this study, but none addresses the whole. Through a review of the selected literature, the central topic of this study is better understood and the results of this study become more meaningful by tying together previous work (Leedy & Ormrod, 2005, p. 65).

Literature collection is focused on materials that describe social computing in relation to worker productivity (Nasar, 1993) published between 1998 and 2007 inclusive. During this time frame, social computing technologies became integrated into the modern organization (Social Computing Group, 2005). Relevancy to the specific topic at hand is also a consideration. The current increase in “work being done by ‘virtual corporations’” (Social Computing Group, 2005, p. 37) speaks to the need to examine recent findings, as factors identified more than ten years ago may be out of date.

Content analysis is selected as the approach to data analysis. Leedy and Ormrod (2005) define content analysis as "a detailed and systematic examination of the contents of a particular

body of material for the purpose of identifying patterns, themes, or biases" (p. 142). In this study, the goal of the content analysis process is to identify factors in the two key concepts of social computing and worker productivity, when they exist in relationship to each other. A specific process known as conceptual analysis (Palmquist et al., 2006), including use of a set of defined translation rules, is used to identify explicit factors and implicit factors in social computing in relationship to worker productivity, as these emerge from the reading of the literature.

A pre-defined set of five social computing factor categories and an operational definition of worker productivity are used to begin the coding process. The categories describe classes of factors found in social computing (defined by others) and include: (1) “success factors” (Gebauer, 2004, p. 21) (Clases, 2003, p. 7), (2) “social factors” (Dryer, 1999, p. 654) (Von Thaden, 2000), (3) “productivity factors” (Dryer, 1999, p. 673), (4) “human factors” (Dryer, 1999, p. 673), and (5) “social organizational factors” (Von Thaden, 2000). Worker productivity is defined by Nasar (1993) as output. The process of data analysis entails identification of instances of either an aspect of social computing or worker productivity first, and then identification of the counterpart element (i.e., the researcher finds a social computing factor and then a description of it’s relationship to worker productivity or finds a reference to worker productivity and then identifies a social computing factor associated with it).

As each factor is identified in the literature during analysis, it is categorized as a member of one of the pre-defined set of coding concepts (“success factors”, “social factors” “productivity factors”, “human factors”, and “social organizational factors”), based on contextual

interpretation. After factors are identified and categorized, data analysis results are recorded (see Table 1) and then reviewed again for inherent patterns and themes reflected in the complete set of conceptual analysis results (Palmquist et al., 2006). The researcher then creates a second set of categories based on the predominant patterns and themes found in the complete result set. The goal at this stage is to re-group the identified factors in a way that enables the researcher to produce another set of tables that reveal the inherent patterns and themes (see Tables 2 – 5).

After the data analysis results are re-grouped into thematic sets, the sets are reviewed. The goal at this stage is to identify and document the thematic elements of the sets with an emphasis on the aspect of worker productivity. At the conclusion of this stage, a third set of tables is produced, documenting this emphasis and presenting a final set of organizing categories (see Tables 6 – 9).

The outcome of this study is presented in the form of a guide for information managers to use during evaluation and selection of social computing technologies. These managers are responsible for, among other things, developing social computing technologies. The assumption underlying this study is that using this guide when selecting those technologies can help them identify selections that best contribute towards desired levels of worker productivity.

The guide is developed at the conclusion of the conceptual analysis process, and begins by further reflecting on the results presented in the three sets of reporting tables. Each final organizing category is addressed by creating a Q&A item, written to present the category in light of the context of social computing, defined as "digital systems that provide a social context for

our activities" (Social Computing Group, 2005) and worker productivity, defined as “the amount of output per unit of input” (Nasar, 1993).

LIMITATIONS TO THE RESEARCH

This study examines literature published between 1998 and 2007. The timeframe of 1998 to 2007 is chosen in order to address two issues: (1) the amount of relevant material available; and (2) to provide an analysis of recent research. The limitation on publication date has a relationship to the recent "emergence … and … evolution of social Internet technology" (Maehle, 2006, p. 19).

Searches are conducted in several academic databases in the fields of computer science and business, including Academic Search Premier and Web of Science. Internet searches are also conducted, resulting in several articles related to social computing and implications for today's business environment. Several search returns lead to citations of articles or studies that are available only through inter-library loan or are otherwise not easily available as is the case with several articles in which a subscription or access fee is required. These search results are dismissed.

Worker productivity is a very large field made up of several aspects. For this study, worker productivity is viewed in terms of general outputs based on general inputs (the social computing factors), guided by Nasar's concept of "total worker productivity" (1993) in which "contribution to (overall) output" is captured and viewed in relation to various changes in input.

This study is designed to focus only on those factors that are related specifically to social computing, as defined by the Social Computing Group (n.d.) and by Thomas (2001) (see Social

Computing in Definitions) and worker productivity. Von Thaden (2000) and Tang (2000) describe social computing factors in related disciplinary contexts such as social informatics, which refers to the "body of research and study that examines social aspects of computerization" (Rob, n.d.). Von Thaden's (2000) description of the flight deck (on an airplane) as a "sociotechnical system" demonstrates the need for "explicit study of both the social context … and actual information seeking and use (behavior)" in aviation system design, but does not generalize behind the field of avionics. Tang (2000) suggests that "users' social context and relationships should be considered in the design and evaluation of (Information Retrieval) systems", but does not extend the consideration beyond information retrieval. Nasar (1993) talks about "total factor productivity" in which "contribution to (overall) output" is captured and viewed in relation to various changes in input. For this study, worker productivity is limited to the perspective offered by Nasar (worker productivity is viewed as output; can be either quantity or quality.

The focus of literature collection is on material published in peer reviewed journals and texts. In a few instances, relevant material is selected from a non peer-reviewed journal article or an industry periodical. The limitation on source is observed in order to preserve credibility and validity.

A form of content analysis is selected as the data analysis strategy because this study is designed to collect relevant data from previously published materials in an effort to create a richer, fuller view of the selected content. The eight-step process provided by Palmquist (2006) as "Steps for Conducting Conceptual Analysis" (including translation rules) is followed. The

assumption underlying selection of this approach to data analysis is that it supports identification of a set of factors found in social computing technologies that have a relationship to worker productivity (Nasar, 1993) as these are described in the selected literature. As factors are identified, they are classified in relation to a pre-defined set of five social computing categories, including: “success factors” (Gebauer, 2004, p. 21) (Clases, 2003, p. 7), “social factors” (Dryer, 1999, p. 654) (Von Thaden, 2000), “productivity factors” (Dryer, 1999, p. 673), “human factors” (Dryer, 1999, p. 673), and “social organizational factors” (Von Thaden, 2000). These five categories are selected for two reasons: (i) they were identified by the researcher during a preliminary review of the literature as potentially useful, and (ii) they provide an initial schema for categorizing social computing factors in relation to worker productivity as the factors are identified during data analysis. While other initial categorization strategies could be employed, these five categories come from the same literature that is used for data analysis. They are, in a sense, pre-aligned with the intentions of the researcher.

Factors in social computing and worker productivity are identified during conceptual analysis regardless of the physical or virtual circumstance of the context. For example, ‘awareness of other participants’, whether in a *physical or virtual* social context, is identified as a factor related to worker productivity (Carter, 2004) (Thomas, 2001) (Erickson, n.d.) within the pre-defined “social context” category, one of five pre-defined categories.

Results of the data analysis are presented in three stages. In stage one, factors are presented in a single large table (see Table 1) individually categorized as members of five pre-defined categories. A subsequent review (stage two) re-groups the identified factors into a new

set of categories based on the predominant patterns and themes found in the complete result set. This format allows for disparate data to be seen together as a whole and allows for basic sorting (into categories) within the table structure. In stage three, a final series of tables representing the final set of thematic categories developed in stage two is presented showing the thematic elements related to social computing and worker productivity.

A reference guide of criteria for information managers to consider when selecting social computing technologies that support worker productivity is the final outcome. Criteria are presented in the form of Q&A items. Items are based on relevant factors and dominant themes selected from the final set of categories identified in the conceptual analysis. The Q&A format is often used to present information, particularly within online digital resources. It is selected as a way to provide the reference guide to information managers in a format with which they are comfortable. The Q&A format also provides a way to concisely present information. By reducing the information to the most salient points, it becomes more relevant and significant for the information manager.

The intended audience for this study is information managers who are responsible for the design, selection, and support of social computing technologies. The relevant factors are identified in relation to how each might best assist these managers in their technology decision-making duties when selecting social computing technologies that support worker productivity. This study is not intended for users of social computing systems or other ancillary groups such as audit committees.

PROBLEM AREA

The central topic of this paper is concerned with the larger fields of information design (Strong, 2005), knowledge management (ITtoolbox, 2005), and organizational management (Willard, 2006c). Social computing (Social Computing Group, 2005) is related to information design and knowledge management. The behavioral framework for the topic, worker productivity (Nasar, 1993), has to do with levels of output resulting from various elements associated with input.

Based on a study conducted at CHI 2002 and CSCW 2002, Churchill (2004, p. 44) "found that the communities we designed for reflected certain special characteristics that must be considered by any system designer". This suggests that the behavioral aspect of system design goes beyond the individual. There are communal characteristics that come into play. Churchill (2004) lists infrequent face-to-face meetings, social networking, and relationship maintenance as central factors related to communal characteristics deserving consideration. Each of these aspects could represent elements of the pre-defined “social factors” or “social organizational factors” categories, depending on the context in which they are discussed.

Corporate America is experiencing a current increase in “work being done by ‘virtual corporations’” (Social Computing Group, 2005, p. 37). Virtual non-collocated teams are becoming more prevalent. Regardless of the unique situations faced by virtual project team managers, the key to success in these teams is developing "effective ways for team members to interact" within their particular contexts (Gray 2003). A major component of this interaction is

communication. Gray (2003) lists some tips for building positive communication patterns, including the use of face-to-face time when possible, a shared status update system to keep all team members up to date, sharing digital calendars, and setting conduct expectations (p. 374).

Whether the result of sociological change or technological boost (Webster 2002), the recent proliferation in social computing technologies (Maehle, 2006, p. 19) has created an increased need for understanding and scrutiny of the selection and development process concerning social computing technologies and the impact on worker productivity. As new objectives are established and processes are redesigned, social computing can function as an enabler, helping an organization meet its objectives. The development of social computing technologies, therefore, needs to be aligned with informational strategy as closely as possible so that a minimal effect is experienced in business and organizational strategies (Gammill, 2006a). And, as stated by Strong (2005), while developing social computing applications and technologies, organizations need to maintain an eye on how information is presented to the users of the system. If poorly designed, the costs to the organization can include user dissatisfaction, lower levels of productivity, higher support costs, and loss of credibility.

SIGNIFICANCE OF THE STUDY

The work of previous researchers speaks to the need for this study. Gebauer and Shaw (2004, p. 38) recommend "that user characteristics should be included" when performing an analysis related to the impact of a new technology. Dryer (1999) supports this same idea in a discussion regarding the importance of social computing applications to “support human social lives” if they are going to be successful (p. 674). Dryer (1999) backs up this idea with suggestions of “targeting the needs of a specific community (by) … providing systems that help individuals collaborate” (p. 674) and maintains that (successful) designers “will understand the mechanisms behind … collaborative productivity” (p. 674).

The concept of a fuller, richer set of factors to consider is present in the work of Thomas (2001), who views "attention to human and social factors" (as part of social research) as a "missing piece (of the) dominant picture of knowledge management" (p. 864). According to Thomas (2001), information managers benefit from the more complete representation of social computing factors that can affect worker productivity. He provides the example of a study of IBM management training done using scenario simulators in which it was found that the learner “is very much influenced by social context” referring to the social context of the scenario (p. 866).

CHAPTER II. REVIEW OF REFERENCES

This review is an annotated bibliography of key references used to support this study. Selected key references are presented alphabetically, followed by a separate section of references based on work performed by the IBM Research Division. Individual entries describe the use of the reference in the study, the pertinent information selected from the reference, as well as the criteria used to establish credibility of the reference.

Churchill, E., Girgensohn, A., Nelson, L., & Lee, A. (2004). Blending Digital And Physical Spaces For Ubiquitous Community Participation, *Communications Of The ACM, 47*, 39-44.

At two emerging technology conferences, Churchill et al describe the deployment of online community spaces "using large-screen, interactive displays that mix online community information with content generated at the conference(s)". Their purpose is to create "awareness of online social activities in physical community spaces". This type of work is contributing to several fields of study including computer human interaction, ergonomics, sociology, and psychology. Findings from their deployments are used in this study to develop the Problem Area and the Full Purpose.

At publication, Churchill, Girgensohn, and Nelson were all working as senior research scientists at FX Palo Alto Laboratory and Lee was an IBM researcher. The Association for Computing Machinery (the ACM) has published *Communications* for the past 50 years. Contributors are recognized technology columnists, often writing about emerging technologies. Published materials are peer reviewed.

Gebauer, J. & Shaw, M.J. (2004). Success Factors And Impacts Of Mobile Business Applications: Results From A Mobile E-Procurement Study. *International Journal of Electronic Commerce, 8(3),* 19-41.

In this reference, Gebauer & Shaw discuss the efficiency of mobile workers and factors involved in mobile applications that are characterized as "success factors". Mobile computing is presented as a subset of social computing due to utilization of interpersonal as well as computer-human communications. The concept of success factors is referenced several times throughout the study, including in the Purpose and Problem Statement. This reference is also used as one item in the data set for coding during data analysis.

The International Journal of Electronic Commerce is a peer-reviewed journal. Gebauer is a University of Illinois assistant professor. Shaw is associated with the management of several information systems and technology programs including that of the University of Illinois.

Information World Review (2006, May). Genie In A Bottle. *Information World Review, May 2006*, 19-21.

This reference focuses on benefits available to businesses that choose to adopt social computing technologies and includes several references to concepts associated with those benefits. This reference is selected as part of the data set used for coding during Data Analysis.

Information World Review is a monthly technology publication. While some of the content found in the publication may be viewed as biased (information is not peer reviewed and the publication is supported by commercial advertising), the information presented in this particular reference is presented in a format that includes both positive and negative commentary associated with adopting social computing technologies.

Johnson, E.H. (2000). Getting Beyond The Simple Assumptions Of Organizational Impact. *Bulletin of the American Society for Information Science, 26.* Retrieved October 30, 2006 from http://www.asis.org/Bulletin/Mar-00/johnson.html

This resource includes references to a social informatics researcher named Rob Kling who asserts that productivity on the corporate scale does not increase significantly even after considerable investment in technology. There are several references to findings having to do with worker response to new technology and the social relationships that play a part in technology selection, adoption, implementation and acceptance. This reference helps build the Purpose for this study as environmental information surrounding the topic of productivity factors.

The American Society for Information Science and Technology ("ASIS&T") has been working to "improve access to information" since 1937. It is a society of information professionals with over 4000 members in more than 50 countries. Members include scientists, managers, legal professionals, students, and librarians. The society offers international information science conferences, opportunities for continuing education, a scholarly journal published by Wiley, an online bookstore, and other publications related to information science and technology.

Palmquist, M., et al. (2006). Content Analysis. Writing@CSU. Colorado State University Department of English. Retrieved November 12, 2006 from http://writing.colostate.edu/guides/research/content/.

The Palmquist website includes an eight-step guide to conceptual analysis used to form the Method section of this study. Palmquist and students in the graduate class he teaches (Research Methods and Theories) have contributed to the writing guide for over ten years. The guide includes several established content analysis resources in it's own annotated bibliography and is the result of multiple iterations of refinement. The Palmquist site is a sub-component of the Colorado State University Writing Studio, an online environment provided for writing students and teachers. Mike Palmquist, Professor of English, is Project Director for the CSU Writing Studio.

IBM Research Division References

Authors for the following studies are members of IBM Research. They have published several studies related to social computing technologies, human computer interaction, and social aspects of computing. Their work is frequently cited by other researchers in most of the published material regarding the development of social computing technology. IBM researchers include scientists, mathematicians and Nobel Prize winners. Their purpose includes studying business process optimization, a topic closely linked with the concept of worker productivity. IBM Research is seen as an authority on the subject throughout the literature. Published information is peer-reviewed.

Dryer, D.C., & Eisbach, C. (1999). At What Cost Pervasive? A Social Computing View Of Mobile Computing Systems, *IBM Systems Journal*, *38*, 652-676.

Mobile (pervasive) computing technologies are a subset of the broader topic of social computing. In this article, the authors advise system designers to consider the "mechanisms behind interpersonal satisfaction and collaborative productivity". Their work is based on social interface theory which states that "humans respond socially in their interactions with machines". The idea is that there are factors that can be built into human computer interactions to take advantage of this normal human response. Concepts from this reference form the basis of this study, and are used to develop Brief Purpose and Full Purpose. The reference is also selected as part of the data set used for coding in Data Analysis.

Erickson, T., Halverson, C., Kellogg, W.A., Laff, M., & Wolf, T. (n.d.). Social Translucence: Designing Social Infrastructures That Make Collective Activity Visible, IBM T. J. Watson Research Center

Erickson et al are the designers of the Babble System, a primitive digital social proxy designed to include social translucence (having to do with providing "perceptually-based social cues" to the community of users – things like feedback and knowledge of others' activities, which leads to accountability). The concept of social translucence is foundational in developing the topic for this study. Erickson and colleagues appear several times in the collected literature as authors and as cited references.

Kellogg, W.A. (2005). Research and Emerging Trends In Social Computing, IBM Research | *Social Computing Group,* IBM Corporation.

This is a recent presentation from IBM's Social Computing Research Group. Several aspects of social computing are discussed, including the concepts of social translucence and beneficial outcomes, including productivity gains. The authors pose some important questions regarding the future of social computing. This resource is used as foundation for developing the Purpose and Problem Area sections of this study. It is selected as one part of the data set and is used in Data Analysis. It also provides the study definition for "social computing".

Thomas, J.C., Kellogg, W.A., & Erickson, T. (2001). The Knowledge Management Puzzle: Human And Social Factors In Knowledge Management, *IBM Systems Journal, 40,* 863-884.

This reference provides an abundance of material related to factors in social computing and includes descriptions of studies in which productivity is an observed or measured result. This reference is used in the Purpose and Problem Area sections of this study and it is also selected as one part of the data set for coding, used in Data Analysis.

CHAPTER III. METHOD

PRIMARY RESEARCH METHOD

This study uses literature review as the primary research method. A literature review "describes theoretical perspectives and previous research findings regarding the problem at hand" (Leedy, 2005, p. 64). A review of the selected literature ties together previous work to make the central topic of this study better understood and the results more meaningful (Leedy, 2005, p. 65).

Content analysis is the approach used for data analysis. Leedy & Ormrod (2005) defines content analysis as "a detailed and systematic examination of the contents of a particular body of material for the purpose of identifying patterns, themes, or biases" (p. 142). A specific process known as conceptual analysis (Palmquist et al., 2006) is used to guide the coding process during the data analysis.

LITERATURE COLLECTION

A wide search is conducted in several academic databases in the fields of computer science and business. Databases preliminarily searched, accessible on the University of Oregon Libraries website, include:

ACM Digital Library
ArXiv Index
CiteSeer Index
IEEE Computer Science Digital Library
INSPEC Index
Web of Science Index
UO Libraries' Catalog Library
Google Scholar Search Engine
Academic Search Premier Index
Summit Union Catalog Library
WorldCat

Internet searches are also conducted, resulting in several articles discussing social computing in today's business environment (Information World Review, 2006) (Oravec, 2002) (Belanger, 2002) (Lim, 2002) (Anandarajan, 2002) (Stanton, 2002) and (Churchill, 2004). Initial key search terms for both academic databases and internet searches include combinations of:

project management
mass computing
social computing
social networking
ubiquitous computing
workplace
productivity
worker productivity
blog
wiki
podcast

In all cases, literature meeting the following criteria is saved for further investigation:

- Full-Text of literature is available in a downloadable digital format
- Access to literature does not require a subscription or access fee

- Literature is available in English
- Literature is from 1998 and later, reflecting modern emergence of social computing
- Literature is either a published study, commentary on published study, or an article

The highest number of relevant returns comes from the keyword combinations of “social computing” and “productivity”, making those terms the primary terms for filtering of the found literature. A cursory review of the resulting collection of literature ensures that the data is relevant to those terms.

DATA COLLECTION AND ANALYSIS

A final set of 15 selected references (see Appendix B) forms the data set that is examined using an eight-step conceptual analysis method described in the Content Analysis Writing Guide at the Colorado State University website (Palmquist et al., 2006). This method is chosen in order to work with a detailed procedural guide during the actual coding process. Additionally, conceptual analysis enables development of patterns and themes as they relate to the topic in a systematic manner, meeting Leedy's definition of content analysis (2005, p. 142). A description of the eight step method (Palmquist et al., 2006) and it's usage in this study follows.

Step 1 – Level of Analysis

For this study, analysis is conducted primarily at a concept level. Analysis is also conducted at a word/phrase level.

Step 2 –How Many Concepts Will be Coded

Two key concepts of worker productivity (Nasar, 1993) and social computing (Social Computing Group, 2005) frame the analysis, particularly in relation to each other. A pre-defined set of five factor categories is used to facilitate the coding process. The set of factor categories are related to social computing and include: (1) "success factors" (Gebauer, 2004, p. 21) (Clases, 2003, p. 7), (2) "social factors" (Dryer, 1999, p. 654) (Von Thaden, 2000), (3) "productivity factors" (Dryer, 1999, p. 673), (4) "human factors" (Dryer, 1999, p. 673), and (5) "social organizational factors" (Von Thaden, 2000).

Worker productivity (Nasar), particularly as it relates to outputs and their relationships with varying inputs, is an important element in coding. A social computing factor on its own does not get coded, but a social computing factor presented in the literature in relationship to worker productivity is coded.

As concepts are identified (either by identifying a social computing factor and then identifying the relationship to worker productivity or by identifying a reference to worker productivity and then identifying the associated social computing factor), they are further identified as belonging to one of the five pre-defined factor categories.

Step 3 - Coding for Existence or Frequency of a Concept

Concepts are coded based on existence. Concepts that are the same as (or similar to) previously coded concepts are also coded. When collapsing of categories is performed (see later in Data Presentation), redundant concepts are presented as a single entry. Thus while the context of individual pieces of literature may vary, the same (or similar) concepts are only reported one time in the final report.

Step 4 - How to Distinguish a Concept

A moderate amount of interpretation by the researcher is allowed during the process of factor identification. "Factors", for instance, may be referenced as "aspects" or as something more mundane like "parts". In every case, however, the factor or aspect (or part) needs to have a discernible relationship with worker productivity based on what is available in the data. As potential coding entries are found, they are evaluated in the context of the literature. In some cases, the social computing factor is identified first and the relationship is then identified in the

context of the literature. In other cases, a reference to worker productivity is identified first and the relationship to a social computing factor is then identified in the context of the literature. In either type of case, both elements of (i) a social computing factor and (ii) a reference to worker productivity need to exist in relationship to each other for the concept to be recognized as a factor.

Step 5 - Rules for Coding

The translation rules (Palmquist et al., 2006) used are presented below:

- Concepts, whether specified or generalized, considered to be factors in social computing relevant to worker productivity, are evaluated on a case-by-case basis. For a given case, one of the two key elements of (i) a social computing factor and (ii) a reference to worker productivity is initially identified. If the second element can be found and the relationship between the two elements is evident, the case is considered a "hit".
- The researcher determines the fit of a factor with respect to the set of five pre-defined social computing categories, selected for this study. Definitions for the following categories are included in the Definitions section of this paper: (1) "success factors" (Gebauer, 2004, p. 21) (Clases, 2003, p. 7), (2) "social factors" (Dryer, 1999, p. 654) (Von Thaden, 2000), (3) "productivity factors" (Dryer, 1999, p. 673), (4) "human factors" (Dryer, 1999, p. 673), and (5) "social organizational factors" (Von Thaden, 2000). If a concept can fit neatly into one of the five pre-defined factor categories, the concept is considered to be an

element of that category. The specific aspect of worker productivity addressed in each factor is noted as part of the coding record.

- All identified factors are classified into one of the initial five pre-defined factor categories. Factors that emerge during the coding process and that cannot be aligned within one of these larger categories, are discounted.

Step 6 - "Irrelevant" Information

Relevancy is determined by the researcher during steps four and five (above). Irrelevant information is ignored.

Step 7 – Coding

The texts are coded manually. For each text, initial identification and coding of concepts (factors) is performed using a highlighter on a printed copy of the text. Secondarily, coding is manually keyed into a digital document using modern office productivity software on a laptop computer, allowing for sortability and search capabilities for the researcher. The template used for a digital coding record for a single identified factor is displayed below in Figure 1:

Factor identified in the literature	**Aspect(s) of social computing addressed**	**Aspect(s) of worker productivity addressed**	**Pre-defined larger factor category**	**Source**
(the concept)	*(social computing element/s)*	*(worker productivity element/s)*	*(one of the five pre-defined categories)*	*(source)*

Figure 1: Data Analysis Coding Template

Data Analysis coding results are presented in Table 1: Identified Factors, Classified by Five Pre-defined Categories, in the Analysis of Data chapter.

DATA PRESENTATION

Step 8 – Analysis Of Results

Analysis of results proceeds in three stages. First, results from the initial coding process are displayed in Table 1. After coding has completed, the digital coding records are further examined in stage 2, in light of the two key concepts of worker productivity (Nasar, 1993) and social computing (Social Computing Group, 2005). Results in Table 1 are reviewed in relation to the particular needs of the audience for this study, which include considerations for human resource, information, and organizational management. The initial set of recorded factors (see Table 1) is reviewed for predominant patterns and themes. Results are re-grouped in a way that reports each factor only once as part of a thematic set. The goal at this stage of analysis is to re-group the factors into sets that share a common theme.

During this second stage of analysis, the re-grouped sets of factors are reviewed once again, in light of Nasar's definition of worker productivity (1993) (focused on an individual's contribution to overall output). Only those factors that reflect a worker productivity context as defined by Nasar (1993) are included. A second set of tables is developed (see Tables 2 – 5 in the Analysis of Data chapter) structured to reveal the predominant patterns and themes found within the set of factors as a whole. The template used for presenting factor categories that reflect worker productivity is displayed below in Figure 2:

FACTORS THAT REFLECT WORKER PRODUCTIVITY: ***(category title and brief definition)***			
Factor identified in the literature	**Aspect(s) of social computing addressed**	**Aspect(s) of worker productivity addressed**	**Source**
(the concept)	*(social computing element/s)*	*(worker productivity element/s)*	Anandarajan, p. 53

Figure 2: Factors That Reflect Worker Productivity Template

In stage three of the analysis, a series of tables (see Tables 6 – 9 in the Analysis of Data chapter) is produced showing the thematic properties related to social computing and worker productivity. This series of tables is based on the factor categories developed in stage two. The template used to display the results at this third stage of refinement is displayed below, in Figure 3:

(final factor category title)	
Thematic Element	**Relationship to Worker Productivity**
(element)	*(description of relationship)*

Figure 3: Thematic Factor Category Template

The tables showing the thematic properties of the factor categories are then used as a framework for developing a guide that information managers can refer to when selecting social computing technologies that support worker productivity. Using the information from the tables, content is developed for a guide designed as a printable, viewable, and downloadable PDF document composed of Q&A items describing identified social computing factors and their relationship to worker productivity.

Q&A items that are included in the guide are written to focus on the relationships that exist between certain components of social computing and worker productivity as defined by Nasar (1993). By presenting this information in Q&A form, the guide can be used as an informative decision-making reference with specific focus on worker productivity and is intended to supplement other evaluative criteria used by an information manager when selecting social computing technologies.

The guide is published in Portable Document Format (DataCore, 2006), allowing for digital storage on computer disk or other portable media, posting on an internal website, printing and distributing or attaching to email communications. The value to the information manager comes from the flexible and accessible format. An information manager may use the information as a reference for factors to look for in potential technologies when worker productivity is an important consideration. He/she may also wish to use it as a persuasive tool with others in their organization depending on the current stage in their social computing technology selection project.

CHAPTER IV. ANALYSIS OF DATA

Literature selected for content analysis is arranged in alphabetical order (by formal citation) and carefully reviewed during the coding process following the guidelines and criteria established in the Method chapter. When aspects of social computing in relationship to worker productivity are identified, the concept is recorded as a "factor". In some cases, a reference to worker productivity is found first and the relationship to social computing is established second. Each identified factor is classified according to one category in a pre-defined set of five larger social computing categories, and reported below in Table 1, along with the source.

Forty-four factors are identified and documented. All 15 selected sources are represented. Six of the sources only provide one factor; three of the sources provide five or more factors (Dryer 1999, Gebauer 2004, and Information World Review 2006). Of the five pre-defined categories, productivity and social are the most represented with 21 and 18 factors identified as members. Factors concerning productivity include (i) mobility and (ii) support for existing relationships, technology, and work practices. Factors concerning social include: allowance for chance encounters, mutual awareness of the activities and interests of others, and a provision for interpersonal communications including expressive communications. The other three pre-defined categories of success, social organizational, and human are represented by 13, 11, and six identified factors respectively. Twenty four factors are classified as members of more than one of the pre-defined categories. The social computing and worker productivity aspects that are identified are numerous and varied due to the contextual nature of these specific attributes of identified factors.

Factor identified in the literature	Aspect(s) of social computing addressed	Aspect(s) of worker productivity addressed	Pre-defined larger factor category	Source
Internet (internetworking with a web of external entities)	Workplace	Distractions Less outputs	Productivity	Anandarajan, p. 53
Internet (internetworking with a web of external entities)	Collaboration	Automation	Productivity	Anandarajan, p. 53
Complexity Reduction	Usability	Less inputs	Productivity	Anandarajan, p. 53
Allowance for playful use	Connectivity Collaboration Learning	Knowledge Expertise	Human	Anandarajan, p. 54
Support for employee-employer social contracts (economic and psychological)	Social context	Motivational inputs for both sides of contract.	Social Organizational	Anandarajan, p. 54
Awareness of others' interests	Relationships Transparency	More outputs based on knowledge of/about relationships	Social	Carter, p. 305
Public Peripheral Display with Lightweight Tracking System	Collaboration Common Ground	Increased inputs	Social	Carter, p. 314
Allowance for chance encounters	Knowledge transfer	Increased inputs	Social	Churchill, p. 40
Provides for social accountability	Group needs emphasized over individual needs	Increased outputs (from group)	Social	Churchill, p. 41
Promotes development and maintenance of trust	Team Quality Social Context	Team efficiency/ effectiveness	Success & Social Organizational	Clases, p. 7
Allow for social communication	Interpersonal communication	Increased inputs due to immediacy	Social & Success	Dryer, p. 654
Accessibility	Pervasiveness Ubiquity	Increased Outputs Less Ramp-Up / Learning	Productivity	Dryer, p. 674
Familiarity - Form of technology	Form	Learning	Social & Productivity	Dryer, p. 674

Factor identified in the literature	Aspect(s) of social computing addressed	Aspect(s) of worker productivity addressed	Pre-defined larger factor category	Source
Ease of input/output	Interface	Learning Accuracy	Productivity	Dryer, p. 674
Perceived relevance for nonusers	Appearance	Acceptance	Social & Productivity	Dryer, p. 674
Appeal - similar to Familiarity; includes a likeability attribute	Interface Appearance	Resistance Learning	Human & Productivity	Dryer, p. 674
Non-disruptive to natural social behaviors	Social Context	Disruptions	Social & Productivity	Dryer, p. 674
Support for existing hierarchical relationships (power)	Social Context	Learning Power	Social Organizational & Productivity	Dryer, p. 674
Mobility (pervasive technology)	Pervasiveness Ubiquity	Immediacy Response Accuracy	Productivity	Dryer, p. 674
Provides for interpersonal communication	Communication Social Context	Speed	Social & Productivity	Dryer, p. 674
Support social relationships	Social Context	Innovation Acceptance	Social Organizational	Dryer, p. 674
Does not facilitate Trust in a virtual team	Team Quality Social Context	Amount/quality of inputs	Social & Social Organizational	Dubinsky, p. 246
Supports mutual awareness (of others' activities)	Relationships Transparency	Increased inputs	Social	Erickson, p. 1
Supports accountability (for individuals' activities)	Relationships Social Context	Motivation (Self) Defense	Social	Erickson, p. 1
Complement existing information systems (integration with)	Technology	Usability	Success & Productivity	Gebauer, p. 19, 37
Task/technology fit (fit between the technology and the tasks it supports)	Technology	Efficiency	Success	Gebauer, p. 21
Functionality	Function	Usability Uptime	Social & Productivity	Gebauer, p. 22
Portability	Pervasiveness Ubiquity	Availability Response	Social & Productivity	Gebauer, p. 22

Factor identified in the literature	Aspect(s) of social computing addressed	Aspect(s) of worker productivity addressed	Pre-defined larger factor category	Source
Technology Form (screen and keyboard size, login procedures, etc.)	Form	Learning Usability	Social & Success	Gebauer, p. 37
Skepticism by Management	Social Context Acceptance	Usability	Success	Information World Review, p. 19
Trust by Management	Social Context Acceptance	Usability	Success	Information World Review, p. 19
Support by Management	Social Context Acceptance	Usability	Success	Information World Review, p. 20
Compliance with Regulatory Requirements	Acceptance	Complexity Availability	Success & Social Organizational	Information World Review, p. 20
User Acceptance	Acceptance	Resistance Learning	Success & Social Organizational	Information World Review, p. 20
Disruption on existing work practices	Social Context	Processes Disruptions Learning	Success & Productivity & Social Organizational	Information World Review, p. 20
Inclusion of Social Translucence	Social Context Transparency	Increased inputs	Success & Productivity	Kellogg, p. 6
Structure of System Allows Cyberloafing	Social Context Workplace Context	Motivation Less Inputs	Human & Productivity	Lim, p. 66
Allows for Constructive Use of Recreation	Social Context Connectivity	Learning Innovation	Human & Productivity	Oravec, p. 63
Internet (internetworking with a web of external entities)	Connectivity	Disruptions Distractions	Human & Productivity	Stanton, p. 55
Provides Awareness of a Coworker's Activities	Social Context	Accountabil-ity	Social & Productivity	Thomas, p. 867
Provides for Expressive Communication	Communica-tions Social Context	Increased inputs	Social & Success	Thomas, p. 871
Design Considers Social Context in which System is Used	Social Context Design	Learning	Social Organizational	Von Thaden
Design Considers How Information is Searched and Used	Search Design	Accessibility Learning Increased Inputs	Human & Social Organizational	Von Thaden

Factor identified in the literature	Aspect(s) of social computing addressed	Aspect(s) of worker productivity addressed	Pre-defined larger factor category	Source
Allows for Rapid Establishment of Common Ground among Users	Social Context Relationships	Increased inputs	Social & Social Organizational	Von Thaden

Table 1: Identified Factors, Classified by Five Pre-defined Categories

After coding, the result set as reported in Table 1 is re-examined for predominant patterns and themes. The goal at this point is to identify themes that relate to the needs of the audience, as outlined for this study. Needs include such things as human resource, information, and organizational management concepts. Identified themes can assist information managers in their technology decision-making duties when selecting social computing technologies that support worker productivity. Four larger categories are developed pertaining to the identified themes: (1) accessibility (in this context, how the social computing technology is made available and usable to users and user groups); (2) behavior (in this context, referring to the "human" aspect of social computing); (3) communications (in this context, refers to a focus on interpersonal communications, e.g., a very common interpersonal social behavior found in several physical and virtual social contexts); and (4) social context (in this context, refers to relationships between users, organizational roles, and user groups when two or more of them are involved). Factors presented in Table 1 are re-arranged in light of their individual relationships with these four larger categories and presented in Tables 2-5 below. Every entry from the original set of results is incorporated in the new set of four categories. Three of the tables include factors from five or more sources. None of the original sources are represented in all four tables.

The first table, accessibility, is the second largest table of the four. Accessibility is made up of a variety of factors having to do with a social computing technology being available, accepted and used by all information resource users and decision-makers. Sixteen factors are presented, representing five sources. Factors include such things as: user acceptance and user-perceived relevance, fit with existing technology, and portability/mobility.

CATEGORY #1: ACCESSIBILITY (available and usable by users and user groups)

Factor identified in the literature	Aspect(s) of social computing addressed	Aspect(s) of worker productivity addressed	Source
Internet (internetworking with a web of external entities)	Collaboration	Automation	Anandarajan, p. 53
Complexity Reduction	Usability	Less inputs	Anandarajan, p. 53
Public Peripheral Display with Lightweight Tracking System	Collaboration Common Ground	Increased inputs	Carter, p. 314
Accessibility	Pervasiveness Ubiquity	Increased Outputs Less Ramp-Up / Learning	Dryer, p. 674
Familiarity - Form of technology	Form	Learning	Dryer, p. 674
Ease of input/output	Interface	Learning Accuracy	Dryer, p. 674
Perceived relevance for nonusers	Appearance	Acceptance	Dryer, p. 674
Appeal - similar to Familiarity; includes a likeability attribute	Interface Appearance	Resistance Learning	Dryer, p. 674
Mobility (pervasive technology)	Pervasiveness Ubiquity	Immediacy Response Accuracy	Dryer, p. 674
Complement existing information systems (integration with)	Technology	Usability	Gebauer, p. 19, 37
Task/technology fit (fit between the technology and the tasks it supports)	Technology	Efficiency	Gebauer, p. 21
Functionality	Function	Usability Uptime	Gebauer, p. 22

Portability	Pervasiveness Ubiquity	Availability Response	Gebauer, p. 22
Technology Form (screen and keyboard size, login procedures, etc.)	Form	Learning Usability	Gebauer, p. 37
Compliance with Regulatory Requirements	Acceptance	Complexity Availability	Information World Review, p. 20
User Acceptance	Acceptance	Resistance Learning	Information World Review, p. 20

Table 2: Category #1 - Accessibility

Table 3, behavior, having to do with the "human" aspect of social computing includes eight factors representing seven sources. In brief, the seven factors are: internetworking, allowance for playful use (including cyberloafing and constructive recreation), non-disruptive to natural social behaviors or existing work practices, and a design that considers user search behavior.

CATEGORY #2: BEHAVIOR (the "human" aspect of social computing)			
Factor identified in the literature	**Aspect(s) of social computing addressed**	**Aspect(s) of worker productivity addressed**	**Source**
Internet (internetworking with a web of external entities)	Workplace	Distractions Less outputs	Anandarajan, p. 53
Allowance for playful use	Connectivity Collaboration Learning	Knowledge Expertise	Anandarajan, p. 54
Non-disruptive to natural social behaviors	Social Context	Disruptions	Dryer, p. 674
Disruption on existing work practices	Social Context	Processes Disruptions Learning	Information World Review, p. 20
Structure of System Allows Cyberloafing	Social Context Workplace Context	Motivation Less Inputs	Lim, p. 66
Allows for Constructive Use of Recreation	Social Context Connectivity	Learning Innovation	Oravec, p. 63

Internet (internetworking with a web of external entities)	Connectivity	Disruptions Distractions	Stanton, p. 55
Design Considers How Information is Searched and Used	Search Design	Accessibility Learning Increased Inputs	Von Thaden

Table 3: Category #2 – Behavior

Table 4, communications, has the fewest number of factors. Three factors representing two sources are presented. The three factors are allowance for social communication, interpersonal communication, and expressive communication.

CATEGORY #3: COMMUNICATIONS (interpersonal communications)			
Factor identified in the literature	**Aspect(s) of social computing addressed**	**Aspect(s) of worker productivity addressed**	**Source**
Allow for social communication	Interpersonal communication	Increased inputs due to immediacy	Dryer, p. 654
Provides for interpersonal communication	Communication Social Context	Speed	Dryer, p. 674
Provides for Expressive Communication	Communications Social Context	Increased inputs	Thomas, p. 871

Table 4: Category #3 - Communications

Table 5, social context, is the largest table of the four and represents the largest number of varied sources. Seventeen factors are presented, representing 11 sources. Factors include such things as: support for social translucence, social contracts, accountability, and awareness of others and their activities.

CATEGORY #4: SOCIAL CONTEXT (relationships between users, organizational roles, and user groups)

Factor identified in the literature	Aspect(s) of social computing addressed	Aspect(s) of worker productivity addressed	Source
Support for employee-employer social contracts (economic and psychological)	Social context	Motivational inputs for both sides of contract.	Anandarajan, p. 54
Awareness of others' interests	Relationships Transparency	More outputs based on knowledge of/about relationships	Carter, p. 305
Allowance for chance encounters	Knowledge transfer	Increased inputs	Churchill, p. 40
Provides for social accountability	Group needs emphasized over individual needs	Increased outputs (from group)	Churchill, p. 41
Promotes development and maintenance of trust	Team Quality Social Context	Team efficiency/ effectiveness	Clases, p. 7
Support for existing hierarchical relationships (power)	Social Context	Learning Power	Dryer, p. 674
Support social relationships	Social Context	Innovation Acceptance	Dryer, p. 674
Does not facilitate Trust in a virtual team	Team Quality Social Context	Amount/quality of inputs	Dubinsky, p. 246
Supports mutual awareness (of others' activities)	Relationships Transparency	Increased inputs	Erickson, p. 1
Supports accountability (for individuals' activities)	Relationships Social Context	Motivation (Self) Defense	Erickson, p. 1
Skepticism by Management	Social Context Acceptance	Usability	Information World Review, p. 19
Trust by Management	Social Context Acceptance	Usability	Information World Review, p. 19
Support by Management	Social Context Acceptance	Usability	Information World Review, p. 20
Inclusion of Social Translucence	Social Context Transparency	Increased inputs	Kellogg, p. 6
Provides Awareness of a Coworker's Activities	Social Context	Accountability	Thomas, p. 867

Design Considers Social Context in which System is Used	Social Context Design	Learning	Von Thaden
Allows for Rapid Establishment of Common Ground among Users	Social Context Relationships	Increased inputs	Von Thaden

Table 5: Category #4 – Social Context

The information presented in Tables 2 – 5 is re-examined once again in light of Nasar's (1993) definition of worker productivity. The goal at this step of analysis is to focus on a set of issues important to information managers, re-framed in such a way that the thematic properties related to worker productivity are more discernible. Results from this level of refinement are displayed below in Tables 6 - 9.

Table 2 (see above) includes themes of function, form, acceptance, and mobility. Those themes and their specific relationship to worker productivity are displayed in Table 6.

Accessibility with focus on Worker Productivity	
Thematic Element	**Relationship to Worker Productivity**
Functional (easy to use)	Output is increased as a result of less complexity and a shorter learning phase.
Form of technology (physical properties)	Standardized physical attributes add to potential levels of output. Familiar form increases output (no adjustment or learning required by users).
Acceptance (by users and by the organization)	Productivity (output) is only possible if the social computing technology "fits" the organization and the users. Barriers to this acceptance include compliance requirements and lack of appeal/relevance to users. "Fit" also refers to the technology environment (existing technology) and the relationship between the technology and the tasks it supports.

Mobility/Portability	Social technologies that "follow" the user or are available in more than one physical location increase potential output.

Table 6: Worker Productivity Focus – Accessibility

Table 7 displays the thematic elements found in Table 3 (see above) concerning behavior, and include constructive playful use, non-disruption to existing behaviors and processes, and internet browsing. These behavior themes are related to behavior that can be generally expected from personnel.

Behavior with focus on Worker Productivity	
Thematic Element	**Relationship to Worker Productivity**
Allows constructive playful use	When innovative uses are explored or discovered, potential for output is increased if users are finding more efficient ways to use the technology.
Non-disruptive to existing behaviors and processes	Processes allow for more output if they are not interrupted. Inputs to worker productivity include worker behavior and process design.
Internet Browsing	Productivity is decreased when Internet browsing is included in a social technology.

Table 7: Worker Productivity Focus – Behavioral

Table 8 displays the single thematic element found in Table 4 (see above), which is allowance for interpersonal, social communication.

Communications with focus on Worker Productivity	
Thematic Element	**Relationship to Worker Productivity**
Allows or provides interpersonal, social communication.	Productivity is increased when workers are allowed or encouraged to communicate with each other.

Table 8: Worker Productivity Focus – Communications

Table 9 displays the thematic elements found in Table 5 (see above). The two thematic elements found in this category have to do with relationships in social settings. They are relationship support (support for manager-subordinate relationships, interpersonal relationships, and social contracts) and the inclusion of social translucence (awareness of others).

Social Context with focus on Worker Productivity	
Thematic Element	**Relationship to Worker Productivity**
Supports relationships	Output is increased when existing hierarchical relationships, social contracts, and meeting places/points, whether virtual or physical are supported. As elements of relationships, building of common ground and trust are factors that can increase productivity when present. If management support or trust is weak or management is skeptical of a social technology, potential output is decreased.
Includes social translucence	Awareness of other workers' activities and interests and the knowledge by a worker that others are aware of their activities and interests (I know that you know that I know) creates an environment of social translucence which contributes to an increase in output from project teams and their members.

Table 9: Worker Productivity Focus – Social Context

Based on the framing of information presented in Tables 6-9, a guide is developed that information managers can refer to when selecting social computing technologies that support worker productivity (see When Worker Productivity is a Critical Factor: A Guide to the Selection of Social Computing Technology, Conclusions chapter). The guide is composed of Q&A items written to focus on the thematic elements presented in Tables 6-9 and their relationship to worker productivity.

CHAPTER V. CONCLUSIONS

The purpose of this study is to identify relationships between aspects of social computing (Social Computing Group, 2005) and worker productivity as defined by Nasar (1993). The intention is to provide information managers with a resource they can use (along with other resources) when selecting social computing technologies. This study is particularly meaningful for the information manager if worker productivity is an element deserving consideration.

Five pre-defined factor categories are selected to begin the data analysis process. They are: social organizational, productivity, human, social and success. These categories, discovered during the early stages of searching for literature on the topic, are used as a basic framework to begin sorting of the results. The five pre-defined categories are selected with the needs of information managers in mind. In addition to managing information, these managers are frequently responsible for employees (users) as well. The selection of these categories is the first step taken by the researcher to provide meaning and relevancy for information managers. The five pre-defined factor categories are sufficient for initial coding, but do not provide value beyond initial coding. After initial coding is finished, it is readily seen that other dominant themes exist in the literature.

Further review of the content analysis results, in light of audience needs, reveals four dominant themes related to accessibility, behavior, communications, and social context. These four themes represent the core of the results and are used to frame the outcome, a series of questions and answers presented as a Q&A guide. In the guide, each theme is represented by a

general question which is followed by a short discussion of the various elements that address the question. The elements reflect the factors identified during data analysis.

The dominant theme of accessibility is viewed in multiple ways. While the technology certainly needs to be near an individual in order for that individual to use it (and, hence, be productive) (Dryer, 1999), it also needs to be accessible to the organization and the business processes that interact with it (Gebauer, 2004). If a social computing technology does not "fit" well with existing operational standards (Information World Review, 2006) and existing technology (Gebauer), it is unlikely that it will ever offer a worker the opportunity to be productive. The guide poses a question regarding the relationship between accessibility and worker productivity. The answer provided in the guide includes commentary on factors identified during analysis including user acceptance and fit with existing technologies and standards. Generally speaking, productivity is increased if a new technology fits well with the existing environment.

It is not surprising that communications is one of the four dominant themes. Even before the digital workplace was invented, communications were important to an organization. The challenge that exists in today's environment, however, is that communications (both technological and non-technological) are everywhere, providing workers with a multitude of opportunities to engage in frivolous or non-productive conversations (Dryer, 1999) (Gebauer, 2004). Information and organizational managers can benefit from the knowledge that while support for interpersonal communications can contribute to increased worker productivity (Dryer, 1999) (Thomas, 2001), unrestricted usage of communications capabilities, specifically

Internet browsing (Anandarajan, 2002) (Lim, 2002) (Stanton, 2002), has a strong negative relationship with worker productivity. The third question in the guide addresses the theme of communications. When a social computing technology includes a communications capability, the potential for productivity increases.

The two themes of behavior and social context share a common characteristic. In both cases, the surrounding context plays an important role in determining the strength and nature of the relationship between social computing factors and worker productivity. Behavior factors seem to be part of a stronger relationship (both positively and negatively) when the behavior permitted by the social computing technology closely resembles behaviors one might expect to see in the non-digital world (in real life) (Dryer, 1999). With the increasing amount of virtualization of the workplace, the distinction between virtual and real life behavior can be difficult to see. Social context factors have a similar trait. According to the literature, when a virtual environment *behaves* like a real world environment, worker productivity is found to be similar to that found in a real world environment (Anandarajan, 2002) (Carter, 2004) (Churchill, 2004) (Clases, 2003) (Dryer) (Dubinsky, 2004) (Erickson, n.d.) (Information World Review, 2006) (Kellogg, 2005) (Thomas, 2001) (Von Thaden, 2000). Churchill (2004) discusses chance encounters and the productivity that can result from them. Anandarajan (2002) describes the importance of providing support for employee-employer social contracts. Dubinsky (2004) discusses the importance of trust within a social context and its effects on productivity.

The outcome of this study, the Q&A reference When Worker Productivity is a Critical Factor: A Guide to the Selection of Social Computing Technology, is a helpful supplement to

other decision-making resources (like vendor white papers and additional studies) available to the information manager responsible for selecting social computing technologies. The four sections of the Reference are based on the four predominant themes found in Data Analysis. After further review of the content analysis results, the four themes of accessibility, behavior, communications, and social context are found to be the most meaningful for information managers and the Q&A reference is written to address each of these themes. The commentary provided in the Q&A reference includes descriptions of what can be expected in terms of worker productivity levels when the elements of the themes are present or absent. Using the Q&A reference as a guide when selecting social computing technologies will assist the information manager in making an informed decision with respect to worker productivity. The Q&A reference begins on the next page.

When Worker Productivity is a Critical Factor: A Guide to the Selection of Social Computing Technology

Introduction: This information is intended to be used by Information Managers as a reference when selecting social computing technologies that support worker productivity (output). This is not an all-inclusive information source for social computing and is to be used as a supplement to other decision-making resources.

Information is presented in the form of a set of four questions and answers, framed from the perspective of an Information Manager. Each question and answer pair focuses on a predominant theme identified during analysis of social computing technology factors and their relationship to worker productivity. The four themes are Accessibility, Behavior, Communications and Social Context.

QUESTION #1: How does *accessibility* of a social computing technology (its availability and usability for/to users) relate to productivity?

ANSWER: The term "accessibility" can be viewed in a couple of different ways. The first way has to do with the form and the function of the technology. It should be based on existing technology standards whenever possible. This includes newer technologies and standards like mobile computing. The reason is that user experience will be more productive and an increase in output can be expected if learning the technology and how to use it is minimized. The second way has to do with acceptance of the technology. Acceptance on a user level as well as an organizational level is important. The technology needs to "fit" comfortably with existing systems, the people using the systems, and the subgroups in the organization (e.g., management or system administrators). It will help if your users view the technology as appealing or relevant to addressing current issues. These factors all have a positive relationship with productivity. Include as many of them as you can in your selection.

QUESTION #2: How can human *behaviors* be leveraged by a social computing technology to get the most out of its users?

ANSWER: Make sure that the technology does not interrupt existing behaviors and processes. By minimizing learning requirements for users in the organization, less change is required and outputs from affected processes can be maximized.

The other important element to consider is off task activity, referring to activities engaged in by individuals or teams that is not strictly within the bounds of a given task or assignment. If a

technology allows for some constructive playful use, innovation can result (which, in turn can lead to increased outputs overall). However, take care to establish limits on Internet browsing, as productivity goes down when unlimited Internet browsing is allowed.

QUESTION #3: Why is it safe to assume that *communications* is an important element to include?

ANSWER: Social computing technologies that allow or provide interpersonal, social communication will bring you increased productivity. When the immediacy of an interpersonal conversation can be recreated in a digital system, worker productivity increases. While communications is identified as a predominant theme, it is closely related to social context as most communication occurs within one or more social contexts.

QUESTION #4: How accurately should a social computing technology recreate *social contexts* found in the non-digital world?

ANSWER: If a technology supports existing hierarchical relationships, social contracts (refers to people arranging ways to co-exist and agreeing to the 'contract' by choosing to remain co-existent), and/or provides meeting places based on individuals paths crossing (whether virtual or not), research reveals that productivity is increased for the individuals and for the project team. Each of these elements exists in the physical world and is typically found in organizations that share physical space (like an office building). As organizations have evolved, so have these elements, making them familiar to individuals. When these elements are recreated in a digital space, the social context is familiar, requiring less change.

If relationship elements (like building common ground and trust) are supported by a technology, productivity can increase. Support for relationships provides a higher degree of accuracy in the recreation of social contexts. The relationship between management and the technology selections made by Information Managers is also a relationship element to consider. Support from management contributes to the social computing technology's output (worker productivity).

Another important social context factor to consider is whether or not a social computing technology enables social translucence, referring to awareness of the activities and interests of others and the knowledge that others are similarly aware of your own activities and interests. This type of awareness creates an environment that contributes to an increase in output from project teams and their members. When accountability is present in a project team, the group's needs are emphasized over individual needs and motivation increases leading to increased worker productivity (increased outputs).

APPENDIX A – DEFINITION OF TERMS

Accessibility

One of the four final factor categories used in this study. The accessibility category has to do with the social computing technology being available and usable by users and user groups.

Behavior(al)

One of the four final factor categories used in this study. The behavior(al) category reflects the 'human' aspect of social computing. Human behavior is generally similar across user populations. As such, factor attributes like exploring and innovating can be found in this category.

Category

A category is a set of factors. Categories are used to organize factors into sets that can be discussed, analyzed, or referenced.

Common Ground

A term referring to an agreed upon framework for joint activity (Von Thaden, 2000). Common ground can be based on a combination of several different aspects of our social lives, including culture and experience (Von Thaden).

Communications

One of the four final factor categories used in this study. The communications category is a narrow category having a focus on interpersonal communications, a very common interpersonal social behavior found in several physical and virtual social contexts.

Conceptual Analysis

A method of content analysis in which "a concept is chosen for examination, and the analysis involves quantifying and tallying its presence … although the terms may be implicit as well as explicit" (Palmquist et al., 2006).

Content Analysis

"(A) research methodology that examines words or phrases within a wide range of texts" (Palmquist et al., 2006).

Factors

The term is used in this study to refer to aspects of social computing technologies. They are identified in a variety of ways including a pre-determined set defined by others: "success factors" (Gebauer, 2004, p. 21), "human factors" (Dryer, 1999, p. 654) and "productivity factors" (Dryer, 1999, p. 673). There are also factors that are implied (Carter, 2004, p. 307) (Thomas, 2001, p. 867). Implied factors are not specifically referred to as "factors" in the literature, but are identified as aspects of social computing that affect worker productivity.

HCI

"Human-Computer Interface - the process by which users interact with computers" (JISC, 2005).

Human Factor

A factor that is based on general human behavior resulting from the human inclination to "treat everything as social and natural" (Dryer, 1999, p. 653) including technological agents and computers.

Information Design

"The communication of knowledge through clear language and design". (Strong, 2005).

Information Managers

Persons in organizations that "plan, coordinate, and direct research and facilitate the computer-related activities of firms". (U.S. Department of Labor, 2006).

Information System

"An organized collection, storage, and presentation system of data and other knowledge for decision making, progress reporting, and for planning and evaluation of programs. It can be either manual or computerized, or a combination of both." (BJA, n.d.)

Interactive Categories

Categories that are determined *during* the conceptual analysis process as a result of the ongoing analysis. (Palmquist et al., 2006) Interaction exists between the researcher and the categorization of the results.

Knowledge Management

"The processes and/or tools an organization uses to collect, analyze, store, and disseminate its intellectual capital" (ITtoolbox, 2005).

Literature Review

A literature review "describes theoretical perspectives and previous research findings regarding the problem at hand" (Leedy, 2005, p. 64). This is performed by obtaining a variety of material related to the problem.

Organizational Mission

"… an achievable outcome for an organization. (It) should have a 5-15 year time horizon. Missions will change as they are achieved. A good mission is achievable

but at the same time is a little risky. Without a little risk or stretch, the mission may be too easily completed. It should be attainable, but a stretch for the organization, one that puts it slightly out of its comfort zone. It also should include a finish line. Without a finish line people cannot know how they are doing toward achieving the mission.

An organization may cycle through several different types of missions in its lifetime (assuming it lasts more than ten years). In addition to aligning with the purpose and values, a mission should suit the needs of the organization as well as its circumstances and times." (Willard, 2006a)

PDF (Portable Document Format)

"A universal file format that preserves the fonts, images, graphics, and layout of any source document, regardless of the application and platform used to create it" (DataCore, 2006). Used to provide digital documents to nearly anybody with a computer.

Productivity Factor

An explicitly identified factor with a strong relationship to output. See *Worker Productivity*.

Social Computing

Social Computing technologies consist of "digital systems that provide a social context for our activities" (Social Computing Group, 2005). A common example is an email system which enables conversations between two or more persons to take place in a virtual/digital environment. See *Social Informatics*.

Social Context

One of the four final factor categories used in this study. The social context category has a focus on relationships between users, organizational roles, and user groups when two or more of them are involved.

Social Factor

Similar to Human Factor, but restricted to the social environment. For example, Olson and Olson as reported in Thomas (2001) assert that "awareness of a coworker's activities" (p. 867) is a social factor that has a relationship to productivity.

Social Informatics

"Social Informatics (SI) refers to the body of research and study that examines social aspects of computerization, including the roles of information technology in social and organizational change, the uses of information technologies in social contexts, and the ways that the social organization of information technologies is influenced by social forces and social practices." (Rob, n.d.)

Social Organizational Factor

A factor present in a collaborative environment in which the organization of the social actors (the people and sometimes digital proxies) has an effect on the team. Von Thaden (2000) provides an example of a flight deck crew's makeup (the collective "team") and describes differences between individual crew members' properties and those of the crew as a collective whole.

Success Factor

A subjective term describing factors that affect the perceived value of individual or group output. Clases (2003) identifies *trust* as a success factor (p. 7).

Worker Productivity

Nasar (1993) talks about “total factor productivity” in which “contribution to (overall) output” is captured and viewed in relation to various changes in input. For this study, worker productivity is viewed in a similar light (viewed as output; can be either quantity or quality). The social computing factors at the core of the study constitute the relevant input. Worker productivity is an important concept for information managers who are selecting technologies destined to be used by their project teams. For example, when selecting a social computing technology, information managers can benefit from knowing what aspects of the technology contribute to changes in worker productivity levels. A technology that includes several aspects associated with an increase in worker productivity (output) may be desired.

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