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Abstract

In the present competitive organizational environment more organizations are implementing knowledge management initiatives to gain strategic advantage. One such initiative is that of implementing electronic knowledge repositories (EKR) which often leads to a rapid increase in the quantity of information employees must process daily, raising concerns of employees being overloaded. This is especially true for current EKRs using distributive technology, enabling customizable individual workspaces which can result in loose knowledge structures. This paper identifies a new type of information overload (IO), extending the concept as occurring in both knowledge seekers and contributors and uses cognitive dissonance theory to provide evidence that IO can change employees' perception of EKR usage. This research paper provides the first empirical evidence that overload has no sufficient affect on EKR continuance intention directly, but has a significant negative affect on the two main success measures: Perceived usefulness and satisfaction of the system.

Keywords: Electronic Knowledge Repository, Information Overload, IS Continuance, Cognitive Dissonance Theory, Knowledge Management Success.

1 INTRODUCTION

In recent years more organizations have identified 'organizational knowledge' as a strategic tool that can be used in gaining competitive advantage in today's highly competitive markets (Teece 2000). As such, organizations are heavily investing in knowledge management systems (KMS) to leverage their knowledge resources; spending on knowledge management (KM) could rise from \$2.7 billion in 2002 to \$4.8 billion in 2007 (Babcock 2004). These knowledge management initiatives result in a huge increase in the amount of information employees must go through in their daily work processes (Bawden 2001, Feather 1998, Hiltz and Turoff 1985, Lewis 1996).

This is especially true for organizations using electronic knowledge repositories (EKR), where employees must go through large quantities of semi-processed information contributed by peers. Most EKRs are built on distributive technology to facilitate the 'ease of use' of these systems by giving employees more flexibility in the knowledge reuse workspace (Cross and Baird 2000). These EKRs allow employees the freedom to customize their knowledge sharing environments to their preference, thus resulting in loose knowledge structures. This results in the creation of knowledge environments which are highly prone to the creation of duplicative information and knowledge silos (Schultze and Orlikowski 2004).

Researchers across various disciplines have found that the performance of an individual correlates positively with the amount of information he or she receives up to a certain point; if further information is provided, the performance of the individual will rapidly decline (Chewning and Harrell 1990). This phenomenon is commonly referred to as information overload (IO). Over the years, many researchers have raised concerns about IO in various contexts in which employees are faced with increasing quantities of information (Bawden 2001, Edmunds and Morris 2000, Hiltz and Turoff 1985, Jacoby 1977, O'Reilly 1980, Schick et al. 1990). Even though most information in organizations is held in some sort of IS, surprisingly few papers in IS research have investigated the concept of IO per se. Some researchers have indirectly alluded to the dangers of IO such as Garud and Kumaraswamy (2005); it was observed that IO was among one of the unanticipated outcomes that resulted when people within an organization started to actively engage in knowledge sharing behavior. The paper suggested that the creation of IO translated to breaking the virtuous course of knowledge reuse to a vicious cycle in which employees ended their active participation in the KMS.

The objective of this research paper is to provide insights into the concept of IO with regard to its impacts on KMS continuance. The motivation and main contributions of this paper is as follows:

- The basis of investing heavily in knowledge management (KM) initiatives is to increase employees' decision making effectiveness. However, past IO researchers unanimously agree that when people are in a state of overload, their decision making effectiveness is compromised. It is therefore of utmost importance for organizations to understand how IO affects the continuous use of KM initiatives such as that of EKR.
- Past research done on IO have regarded it as a concept faced only by people who seek information. This paper identifies a new type of IO that occurs in the EKR context; where people can become overloaded in both knowledge seeking situations, as well as knowledge contributing situations.
- The few research papers which have proposed frameworks to measure KMS continuance have overlooked the after effects of creating a successful knowledge sharing environment, to account for unexpected outcomes such as that of the creation of vicious cycles caused by factors such as IO. It is important to understand the magnitude of the negative impact this has on EKR continuance.

This paper is organized into eight sections. The next section looks into literature from prior research. We then discuss the theoretical background of this study in the third section. The fourth section looks into the research model and hypothesis development. The fifth section describes the research methods

followed by results and implications for research and practice. The last section summarizes the main findings and the main research contribution of the paper.

2 LITERATURE REVIEW

This section reviews a selection of literature relevant to this study. As KM encapsulates the main research area of IS that we are investigating, first and foremost we look at prior analysis done in KM research. Secondly, we look into EKR, our main research environment within KM that is the focus of this paper, and why IO in EKR context is important and different from other KM initiatives. In the next section we look into distributive technology, the most commonly used EKR technology, and some concerns raised by researchers. As the purpose of this research paper is to investigate how IO affects the success of EKR, in the last section we look into EKR success models to identify the main EKR success measures used in prior research.

2.1 Knowledge Management

KM is defined as ‘a systemic and organizationally specified process for acquiring, organizing and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more effective and productive in their work’ (Alavi and Leidner 1999). If an organization is successful at its KM, it could act as the primary tool against competition (Grant 1991, 1996; Spender 1996; Teece 2000) and extends an organization’s survival (Nevis et al, 1995). Organizations can use a variety of tools to facilitate knowledge sharing and in research academia these tools are collectively known as KMS; ‘a class of information systems applied to managing organizational knowledge. That is, they are IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer, and application’ (Alavi and Leidner 1999).

2.2 Electronic Knowledge Repository

EKR is the most widely prevalent form of KMS used in the repository model (Grover and Davenport 2001), and has been defined as an ‘on-line computer-based storehouse of expertise, knowledge, experience, and documentation about a particular domain of expertise where knowledge is collected, summarized, and integrated across sources’ (Liebowitz and Beckman 1998). EKR have also been referred to as organizational memory systems (Ackerman 1994) or organizational memory information systems (Stein and Zwass 1995), all sharing the same underlying components; a knowledge base, a cataloguing system, document access control, a search and navigation capability, and a possible variety of advanced features such as e-mail notification or commenting (Ackerman 1998). Researchers have divided EKR users into two main roles: A knowledge seeking role – users seeking knowledge from EKR for reuse, and a knowledge contributing role – users contributing content to populate the EKR (Bock et al. 2006). Though this distinction is conceptual in nature, the same individual can be a contributor or a seeker at different points of time, there is a clear distinction between the roles in cases such as that of social exchange costs and benefits (Kankanhalli et al. 2005).

2.3 Distributive Technology

EKR can be used to store various forms of organizational knowledge such as external knowledge, structured internal knowledge and informal internal knowledge (Davenport and Prusak 1998).

To accommodate all these different types of organizational knowledge, more and more organizations are looking at flexible EKR solutions. One such technology is that of using organizational portals as EKRs (such as Microsoft Sharepoint Services). These portals are built upon distributed technology

which enables employees in these organizations to have individual workspaces where they can contribute their views on previously stored organizational knowledge by quoting information from peer workspaces (Hazra 2002). Distributed technologies can be used for creating virtual forums that connect experts (Cross and Baird, 2000). Employees not only turn to databases or policy and procedure manuals to obtain information, but also rely upon a network of relationships for information and advice (Kim, 1993). Virtual forums emphasize linkage among people for the purpose of knowledge exchange. This can certainly be a tool for communications with physically distant employees for sharing knowledge and for learning from one another. Therefore, knowledge directories of virtual communities proved location of expertise (Ruggles, 1998).

The distributive technology's purpose is to simplify knowledge structures and to allow employees the freedom to customize their knowledge reuse workplace (Cross and Baird, 2000). The distribute technology can use the ontology that helps to effectively access content to structure a knowledge stored and support to automatically change and revise them. Nevertheless duplicated data grows whenever employee share and reuse information in EKR. It creates frustration due to low quality data and gives to another meaning. It makes it much harder to seek information and keep up furnish information. This leads to information overload which can cause information seekers and contributor to feel stress(explored further in the latter part of the paper).

2.4 Understanding EKR Continuance

In order to understand how IO affects continuance in the EKR context, one needs to identify the success models used in past research with regard to KM/EKR. The most widely used model to study KM success is DeLone and McLean's IS Success model (1992; 2003). Researchers have extended the IS Success model to EKR by focusing on the knowledge reuse aspect. Two proposed KM/EKR success models have appeared in recent years: the Jennex and Olfman KMS Success Model (2003) and the Kulkarni et al. KM success model (2006).

Jennex and Olfman (2003) KMS Success Model differs from the IS success model when we look into the sub-dimensions of the two models; the Service Quality dimension is incorporated into System Quality, the Information Quality dimension is renamed 'Knowledge/Information Quality', and the 'Intention to Use' dimension is expanded to include a "Perceived Benefit" dimension. This model however lacks the social aspects of KMS success, which have been highlighted in research papers by Kankanhalli et al. (2005) and Bock et al. (2005).

More recently Kulkarni et al. (2006) introduced a similar KM Success model but it differs from the Jennex and Olfman (2003) model by incorporating organizational factors within it. This model takes KM as an organizational wide change rather than just a change in the IS system; the findings point out the importance of organizational mechanisms that encourage and promote the sharing/reuse of organizational knowledge in KM.

Another recent success model which uses the same two success measures used by Jennex and Olfman (2003) and Kulkarni et al. (2006)--perceived usefulness and satisfaction, which specifically focused on post-adoption stag--is that of Bhattacharjee's (2001) IS Success Model. This is especially relevant in the EKR context in which the benefits of the system depend on the long term accumulation of knowledge leading to richness of the repository (Kulkarni et al. 2006). Although Bhattacharjee's (2001) model has not been applied in EKR context in prior research (due to parsimonious models and similarity of independent variables), we believe it is a suitable model to use in investigating how IO affects continuance of EKR in the post-adoption stage. This model uses the Expectation-Disconfirmation Theory (EDT) and the Cognitive Dissonance Theory (CDT) to theorize and validate that perceived usefulness is more crucial for acceptance intention, and satisfaction is more dominant for continuance intention (Bhattacharjee 2001).

3 THEORETICAL FRAMING

This paper uses the theory of IO to investigate the effects of overload in the EKR context. According to Alavi and Leidner (2001), competitive advantage gained by using organizational knowledge as a strategic tool resides in the application of the knowledge rather than in the knowledge itself. The theory of IO relates to Alavi and Leidner's (2001) concerns of knowledge application: Individuals in the IO state cannot effectively assimilate the knowledge they seek, compromising their ability to apply the knowledge in their work tasks. Similar findings were observed by Ko et al. (2003), in which 'absorptive capacity' of an individual or organization was identified as one of the critical components in the knowledge transfer process. In some cases, it was found that IO affected people may be unable to locate what they need most causing them to overlook what they themselves would consider critical (Herbig and Kramer 1994). Before we proceed further in applying the theory of IO in the EKR context, in the next section we introduce how the theory of IO came about and how IO has been defined in prior research.

3.1 Theory of Information Overload

The theory of IO arises from the fact that the quantity of information that one needs to process is increasing at a much faster rate than people can process it (Bawden 2001). Over the years different terms have come about with regard to IO; cognitive overload (Vollmann 1991), knowledge overload (Hunt and Newman, 1997), information fatigue syndrome (Wurman 2001) and analysis paralysis (Stanley and Clipsham 1997). Nevertheless there is general consensus in the research community that the concept of IO needs to be looked into since IO reduces the decision making effectiveness of people (Bawden 2001, Edmunds and Morris 2000, Haksever and Fisher 1996, Gallupe and Cooper 1993, Hiltz and Turoff 1985, Jacoby 1977, Jansen and Poot 2006, Malhotra 1982, O'Reilly 1980, Schroder et al. 1967, Schneider 1987, Schick et al. 1990, Schultze and Orlikowski 2004).

3.2 Definition of Information Overload

At the most basic state, IO refers to the simple notion of receiving or having to go through too much information (Eppler and Mengis 2004, Shenk 1997). In order to go to a deeper definition of IO, researchers have taken two major paths: They have looked at IO in an objective sense and in a subjective sense.

Objectively, IO can be defined based on the information processing view, that IO occurs when the information processing requirements (IPR) exceed the information processing capacities (IPC) of an individual (Tushman and Nadler 1978). The IPR refers to a given amount of information that has to be processed within a certain time period (Eppler and Mengis 2004). IPC refers to an individual's ability to engage in such cognitive processes as selecting, sorting, and organizing information and decision making capabilities (Schultze and Vandenbosch 1998). This approach has led to more experimental research with regard to IO (O'Reilly 1980) and was mostly used by researchers in the field of marketing (Malhotra 1984).

Subjectively, IO has been investigated by researchers who believe that IO cannot be investigated under experimental conditions, as the time constraints and forced absorption set in experimental conditions does not apply in most real life situations (O'Reilly 1980). These researchers define IO as being burdened by a large supply of information that cannot be assimilated, leading to breakdown: Feelings of stress, confusion, pressure and anxiety when in an IO state (Edmunds and Morris 2000, Farhoomand and Drury 2002, Feather 1998, Hiltz and Turoff 1985, O'Reilly 1980, Rogers and Agarwala-Rogers 1975).

Looking into these two definitions of IO and applying them into the EKR context, we believe that the objective definition of IO is less relevant. This is because employees using the EKR need not process

all the information at once; EKR is an asynchronous medium and employees can visit the information when they feel the need to. Additionally, this paper's intention is not to investigate individual's information processing capacity, but to understand how occurrence of IO relates to EKR success measures over time, thus measuring IPC is also not relevant for this paper. Therefore, in this paper we adopt the definition of IO used by researchers who investigated IO in the subjective sense. We follow these researchers' methodology of using surveys to investigate IO.

3.3 Information overload outcomes

As previously mentioned, the major finding that almost all IO researchers agree on is that IO reduces the decision making effectiveness of individuals. Looking more deeply, the major outcomes of IO could be summarized into the following key points: Individuals feeling stress, strain, and anxiety, thus threatening productivity and the adoption of new technology (Farhoomand and Drury 2002, Lewis 1996); individuals losing perspective of work tasks and leading to confusion (Denstadli and Lines 2004, Schick et al. 1990, Schultze and Orlikowski 2004); individuals in an IO state have a greater tolerance for error (Payne 1976, Sparrow 1999, Stanley and Clipsham 1997); IO leads to lower job satisfaction in individuals (Jacoby 1984, Lewis 1996, Reuters 1998), and individuals are unable to use the information they seek when making important decisions (Bawden 1999, Hiltz and Turoff 1985).

Another important but contradicting finding with regard to IO is that of individuals being more satisfied in overloaded situations (O'Reilly 1980). Staw (1975) gives a possible explanation for this view, that performance may be attributed by individuals to certain positive situations and that this might give rise to the belief that 'more information is better'. In his paper, Bawden (2001) mentions that under circumstances in which negative outcomes of overload are outweighed by other positive considerations, individuals simply decline to be overloaded. This is in line with research papers that have found that individuals attempt to minimize the effects of IO by developing coping mechanisms. Some of the major findings with regard to developing coping mechanisms include decision makers resorting to choice heuristics in an effort to reduce cognitive strain (Payne 1976) and individuals becoming highly selective in their information search (Jacoby 1984, Schultze and Vandenbosch 1998, Janssen and Poot 2006).

Looking into the technology adoption in organizations, most researchers agree that introduction of new information technology (IT) both helped and hindered the creation of IO. To some extent, IT provided tools to help employees gain more control over information (Schultze and Vandenbosch 1998), thus helping them in coping with the large amount of information. At the same time, it also made it all too easy to accumulate large quantities of information, leading to environments which are highly susceptible to IO. IT acted as a 'double edged sword' (Bawden 2001).

3.4 Information overload in KMS context

From our literature review of IS research, we came across only one paper that specifically focused on IO in the KMS context, authored by Schultze and Vandenbosch (1998), in which the paper investigated outcomes of IO in groupware environments. This is a surprising fact considering that IO has been a major concern raised by many IS researchers ever since Hiltz and Turoff raised issues related to IO in computer mediated communications in 1985. Before proceeding to investigate IO in an EKR context, it is important to look at the findings of prior research papers that have investigated IO in IS research. A handful of papers were selected which investigated IO as a research objective and a summary of these research papers is given below in Table 1.

Author(s)	Focus	Findings
Hiltz and Turoff (1985)	Analyzed effects of IO in Computer-mediated communication systems (CMCS).	CMCS users feel compelled to observe all the communications they can access so that nothing relevant is overlooked.

		When users in CMCS feel overloaded they either withdraw from the discussions or become more selective in their discussion participation.
Schultze and Vandenbosch (1998)	Investigated how IO affects use of groupware technologies.	Found no relation between the increases in the amount of information and overload. Users developed coping mechanisms to counteract being in an overloaded state.
Franz (1999)	Developed a framework to understand the determinants of IO and the 'cause-effect' relationship with media theories.	Users wanted access to more information even in an overloaded state. Users felt more confident when faced with more sources of information.
Gallupe and Grise (2000)	Explores the problem of information overload within face-to-face electronic meeting context.	Individuals in an overloaded state were less satisfied and were less likely to advocate the system to peers. Overloaded individuals were less effective in generating categories and slotting ideas into them.
Bawden (2001)	Identified major causes of IO in the emerging Information Communication Technology (ICT) era.	Email was identified as a major source of IO in modern organizations. Diversity of information sources resulted in increasing the IO; use of intranet, extranet and internet concurrently.
Jones et al (2004)	Studied individual information-overload coping strategies in interactive public online group discourse such as Usenet.	<ul style="list-style-type: none"> • Users are more likely to respond to simpler messages in overloaded mass interaction. • Users are more likely to end active participation as the overloading of mass interaction increases.

Table 1. Summary of IS papers related to overload

With the exception of Schultze and Vandenbosch (1998), all other research papers found evidence of IO occurring in the IS environment. In this instance, it was found that individuals in groupware environments avoided being overloaded by developing coping mechanisms at the same rate as that of increasing information, similar to Jacoby's (1984) findings in which individuals stopped well short of overloading themselves in the product purchase environment.

On the contrary, Hiltz and Turoff (1985) observed that people had a tendency to overload themselves in IT environments which provided access to huge quantities of information. Hiltz and Turoff (1985) cited that this is because people often felt compelled to read more than necessary just in case they might miss out on a relevant piece of information. Similar observation was made by Franz (1999), in which people outweighed the dangers of being overloaded by the satisfaction and confidence that they gained when they sought more information. Gallupe and Grise (2000) found that most individuals were not aware that they were overloaded, but almost all overloaded individuals were affected by IO leading to decreased effectiveness in information processing. More importantly, Jones et al. (2004) found that individuals tend to avoid or end participation when they face IO. In the EKR context, such outcomes can have major consequences if users limit or end their participation in their knowledge sharing behavior.

Evidence of such outcomes has been mentioned in two recent case study based research papers. The Garud and Kumaraswamy (2005) paper investigated challenges faced by Infosys (a globally acknowledged firm for its leadership as a knowledge enterprise) in its quest in creating a successful EKR. It was found that when employees were given the incentive to articulate their knowledge, the rate at which the knowledge base grew led to overloading the employees, threatening to disrupt the very virtuous circle that Infosys generated with considerable investment of time and money. Similar findings were observed by Janssen and Poot (2006), in which an organization's knowledge sharing

facilities inadvertently contributed to the problem of IO. The research was done by qualitative means to understand if individuals differ in their ability to develop coping mechanisms against IO. It was found that people who were more prone to overload could not escape the vicious cycle of IO. It was also observed that employees who could not avoid this were more inefficient in their work strategies; in extreme cases this lead to employee burnout.

4 RESEARCH MODEL

From our review of IO and the parsimonious model of EKR continuance that is adopted in Bhattacherjee’s (2001) IS continuance model, we developed a research model (shown in Figure 1) that investigates how IO affects the EKR continuance in the post-adoption stage. The reasoning is divided into two parts: 1) similar to prior KMS success models, this model includes the main success measures of KMS, which are perceived usefulness and satisfaction; 2) the IS continuance model is based on ECT and CDT which we believe could be used in explaining effects of IO on individuals; IO results in creation of a state similar to ‘psychological discomfort’, a state which can result from being in a state of dissonance.

According to Festinger (1957), an individual has cognitive elements about himself, his past behavior, his beliefs and attitudes. If one does not follow from another, they are said to be dissonant and arouse a psychological discomfort called cognitive dissonance. In the case of IO, users’ initial attitude towards the system is positive; EKR is considered as a tool to help them reduce the cognitive effort of managing huge quantities of information. Over time, however, they realize the system itself can become a burden, and this deviation between prior attitude and subsequent behavior of overloading themselves can cause the individual to be in a state of dissonance (Hollon and Chesser 1976, Karahanna et al. 1999). Individuals who are in this dissonance state would try to reduce the dissonance by either changing their attitude towards it or by changing their behavior to avoid it (Festinger 1957).

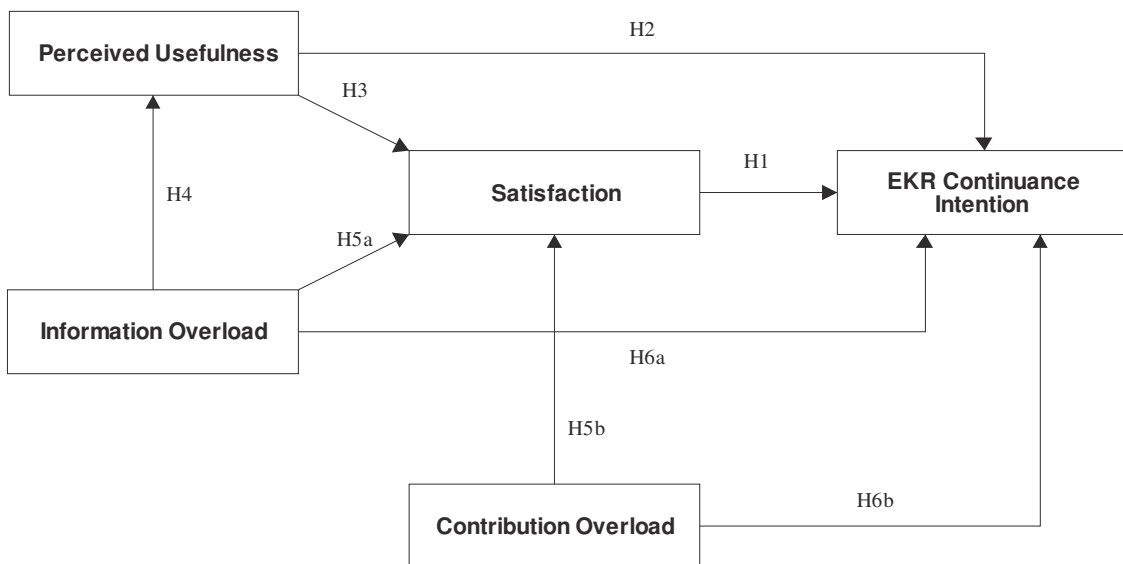


Figure 1. Research Model

The research model uses two types of overload constructs in the EKR context. This is because we believe that both seeker and contributor can be affected by overload but under different circumstances, resulting in different outcomes. For the knowledge seeker we maintain the term IO and are defined as

a state in which the EKR seeker feels he/she cannot effectively assimilate the information he/she seeks. Due to the negative aspects of distributive technology alluded to in the literature review section, for knowledge contributors we introduce a new type of overload and refer to it as contribution overload (CO). Contributors in the EKR context make a substantial number of contributions over the years. A situation similar to IO occurs because all these contributions need to be maintained and updated. We define CO as a state in which the EKR contributor feels he/she cannot effectively manage the information he/she contributes.

4.1 Research Hypothesis

The following section explains how the six research hypotheses are established in the research model.

From marketing research context, satisfaction is defined as individuals' feelings of pleasure or disappointment resulting from comparing their perceptions of a product or service's performance to their expectation levels. In Swan and Trawick's (1981) research paper, the findings indicated that satisfaction determines intentions to patronize or not to patronize the store in the future. This relationship is substantiated in the EKR context by Bhattacharjee (2001), indicating that satisfaction was a significant predictor of IS continuance in the context of online banking services. Similar findings were observed by Devaraj et al. (2002), in which satisfaction was the major determinant of channel preference (continuance intention) in the context of Business-to-Consumer (B2C) e-commerce. This leads to our first hypothesis:

***H1:** Users level of satisfaction is positively associated with their IS continuance intention.*

Davis et al. (1989) points out that people form intentions towards behaviors that they believe will increase their job performance. This is also true where enhanced performance is instrumental in achieving various rewards that are extrinsic to the task context, such as promotions or monetary gains (Vroom 1964). In this case, the extent to which EKR usage is related to increasing a persons' job performance may reflect its perceived usefulness, thus he/she will engage in continuing to use EKR to enhance his or her job performance. TAM hypothesizes perceived usefulness as a direct predictor of acceptance intention, and Bhattacharjee (2001) proved that this holds true in continuance contexts. This leads to our second hypothesis:

***H2:** Users' EKR continuance intention is positively associated with their perceived usefulness of EKR use.*

Past research in EDT gives significant evidence that perceived performance is positively related to satisfaction (Anderson et al. 1994, Spreng et al. 1996). In the post-adoption stage of EKR usage, perceived usefulness can be viewed as similar to perceived performance. Bhattacharjee (2001) found that satisfaction was affected by their confirmation of expectation from prior IS use and post-adoption perceived usefulness in an online banking services context. Similarly, Rai et al. (2002) empirically assessed the Seddon's IS success model (1997) in a quasi-voluntary IS use context. They found a significant path from perceived usefulness to user satisfaction. This leads to our third hypothesis:

***H3:** Users' perceived usefulness of EKR use is positively associated with their satisfaction with EKR use.*

Over the years researchers have alluded to the fact that when individuals are in a state of overload, they are more prone to making mistakes and errors in their work tasks (Farhoomand and Drury 2002, Klapp 1986). This is mainly due to the coping mechanisms individuals use to reduce the burden of IO; individuals become highly selective causing them to overlook what they themselves would consider critical (Herbig and Kramer 1994, Sparrow 1999). Overtime EKR users' expected benefits of using the system does not materialize. According to CDT, this disconfirmation of expectation would lead to users trying to remedy this dissonance by distorting or modifying their perception about the usefulness of the system in order to be more consistent with actual experience. This leads to our fourth hypothesis:

H4: *Users' perceived usefulness of EKR use is negatively associated with their degree of IO.*

According to industry research conducted to investigate the effects of IO, it was found that 60% of managers suffered stress due to IO and were emotionally affected leading to lower job satisfaction (Reuters 1996). Academic research points to similar findings in which people in an overloaded situation can cause them to feel confused (Schick et al. 1990), frustrated (Harasim 1987) and stressed (Hiltz and Turoff 1985). In extreme cases this leads to physical ill health (Lewis 1996). For knowledge seekers, these outcomes are caused due to the overload of information they have to process in the EKR environment. Similarly for knowledge contributors, similar outcomes are likely to occur due to the overload situation created by the vast quantities of contribution they have to manage and maintain. Based on EDT, when users are overloaded, an EKR user's initial expectation about the system is disconfirmed and he/she is likely to change his/her evaluation of satisfaction with EKR use accordingly. This leads to our fifth hypothesis:

For seekers - H5a: *Users' satisfaction with EKR use is negatively associated with their degree of IO.*

For contributors - H5b: *Users' satisfaction with EKR use is negatively associated with their degree of CO.*

For most researchers, the relationship between overload and intention of usage has been regarded as obvious, requiring little or no empirical support for substantiation. There have been several instances where researchers have alluded to the fact that overload does inhibit continuance intention: Overloaded users tend to withdraw from discussion groups in computerized conferencing systems (Hiltz and Turoff 1985); users are more likely to end active participation in online interaction spaces when overloaded (Jones et al. 2004); overload disrupted the usage of the KM portal at Infosys (Garud and Kumaraswamy 2005), and overloaded users cannot escape from the vicious cycle of IO leading to burnout (Janssen and Poot 2006). Applying CDT, we can deduce that under conditions of long term dissonance created by the overload situation, users are likely to shift from 'change of perception' to 'change of behavior' to lessen the dissonance (Brehm and Cohen 1962). This leads to our last hypothesis:

For seekers - H6a: *Users EKR continuance intention is negatively associated with their degree of IO.*

For contributors - H6a: *Users EKR continuance intention is negatively associated with their degree of CO..*

5 RESEARCH METHODOLOGY

The proposed research model was empirically assessed by using survey methodology as the main means of data collection. A total of 162 survey respondents were organized (participant's characteristics in Table 2): 75 from part-time NUS MBA classes who were familiar with EKR, 38 from organizations in the Maldives using EKR systems and 49 from organizations in Singapore using EKR systems. Out of the total 162 respondents, 144 were used in the final data analysis; 18 responses were discarded on the basis of not listing suitable EKR. All respondents have experienced using EKR in their organizations. Although the specific system introduced in each organization was different, the general characteristics of the technology introduction and usage processes were comparable. Generally, these were considered important to permit the pooling of data across technologies/organizations. Pooling data across different technologies/organizations is consistent with prior research (Davis et al., 1989, Venkatesh & Morris, 2000). The collected data has controlled by the experience of using EKR.

		Frequency	Percentage
Gender	Male	99	68.8
	Female	45	31.3
Age	< 25 years	5	3.5
	25 – 30	77	53.4
	> 30	50	34.8
	Missing	12	8.3
Work Experience	< 1 year	16	11.1
	2 – 4	68	47.2
	> 5	60	41.7
Experience using EKR	< 1 year	48	33.3
	2 – 4	74	51.4
	> 5	22	15.3
Organizational Size	<= 100 employee	9	6.3
	101 – 500	45	31.3
	501 – 1000	51	35.4
	> 1000	39	27.1
Training	at present organization	21	14.6
	at prior organization	23	16
	No Training	100	69.4

Table 2. Participant's Characteristics

Instruments used in the survey were developed and pilot tested by following the recommendations by Churchill (1979). All scale items used (with the exception of satisfaction) in the survey are based on seven-point Likert scales anchored between 'strongly disagree' and 'strongly agree'. Satisfaction items were based on seven-point semantic differential scales borrowed from the Bhattacharjee (2001) IS Continuance model. No suitable measures were found for measuring IO; Schultze and Vandenbosch (1998) directly ask users if they felt overloaded – problematic because different people define IO differently; O'Reilly (1991) asked if users receive too much information than they require to deduce overload – problematic because information load does not directly lead to overload. As such, scale items were self-developed (refer to Appendix A for all scale items used in the survey) and conceptually validated the using Moore and Benbasat (1991) sorting procedure; Kappa scores averaged 0.927 and the average overall placement ratio of items within the target constructs was 0.96, indicating that all the items were categorized as intended. The descriptive statistics of variables are shown in Table 3.

	N	Minimum	Maximum	Mean	Std. Deviation
Perceived Usefulness	144	2.75	6.75	5.1563	.88395
Intention	144	1.25	7.00	4.9635	1.30457
Satisfaction	144	1.50	7.00	4.8090	1.35034
Information Overload	144	1.00	7.00	4.0243	1.16712
Contribution Overload	144	1.00	6.00	3.9184	1.07695

Table 3. Descriptive statistics

Note: all measures are 7-point scales with anchors 1=strongly disagree and 7=strongly agree.

6 DATA ANALYSIS

This paper follows the two stage-methodology research model analysis proposed by Anderson and Gerbing (1988), the first stage establishing the strength of the constructs and the second stage of examining the strengths of relationships between the constructs. All the data analysis in this paper was conducted using PLS-graph version 3.00 and SPSS software version 15.

Convergent validity was assessed using three tests: 1) Item reliability, 2) Cronbach's Alpha and composite reliability of the constructs, and 3) average variance extracted (AVE). For item reliability, all items exceeded 0.7 as recommended by Chin (1998), ranging between 0.83 and 0.95. Cronbach's Alpha and composite reliability of all scale items was higher than 0.707 as recommended by Thompson et al. (1994), and ranged between 0.88 and 0.97. AVE for all items exceeded the minimum of 0.5 set by Fornell and Larcker (1981), ranging between 0.75 and 0.88(see Table 4).

Construct	Cronbach's Alpha	Reliability	Correlations of latent variables					
			AVE	PU	IO	SAT	CI	CO
PU	0.954	0.967	0.88	0.864				
IO	0.886	0.922	0.746	-0.354	0.938			
SAT	0.954	0.967	0.88	0.522	-0.392	0.938		
CI	0.923	0.945	0.813	0.495	-0.303	0.626	0.902	
CO	0.893	0.926	0.758	-0.341	0.555	-0.075	-0.421	0.871

Table 4 Convergent validity and Correlations

Discriminant validity is assessed by examining (1) factor analysis results, (2) the relationship between correlations among constructs and the square root of AVEs, and (3) cross-loading (Chin 1998, Fornell and Larcker 1981). The scale item loadings test required that each item loads more highly on its stipulated construct than all other constructs (Jarvenpaa and Staples 2000). In this paper, factor analysis with principal component analysis (PCA) and Varimax rotation was used to examine the scale item loadings. The resulting values show that all factor loadings were greater than the commonly accepted threshold of 0.5 (Hair et al. 1998), and ranged between 0.773 and 0.860. All the items loaded correctly to the intended constructs; eigen values ranged from 9.041 and 1.297. Table 5 indicates that all constructs satisfy this test..

Construct	Components				
	CI	SAT	IO	PU	CO
PU1	.205	.138	-.198	.845	-.125
PU2	.149	.155	-.193	.806	-.131
PU3	.239	.202	-.035	.773	-.103
PU4	.145	.238	-.077	.801	-.065
CI1	.859	.268	-.147	.148	-.166
CI2	.861	.226	-.098	.233	-.186
CI3	.854	.264	-.048	.213	-.083
CI4	.860	.301	-.086	.233	-.114
SAT1	.257	.807	-.218	.262	-.198
SAT2	.340	.811	-.169	.231	-.139
SAT3	.322	.848	-.065	.227	-.132
SAT4	.249	.866	-.160	.187	-.114
IO1	-.122	-.134	.819	-.159	.256
IO2	-.159	-.195	.853	-.101	.224
IO3	-.053	-.105	.839	-.160	.206
IO4	-.025	-.086	.883	-.079	.219
CO1	-.035	-.323	.255	-.068	.784
CO2	-.159	-.196	.170	-.130	.854
CO3	-.083	-.085	.358	-.111	.791
CO4	-.236	.034	.214	-.133	.787
Eigen Values	9.041	3.020	1.708	1.430	1.297
% of Variance	45.204	15.102	8.54	7.15	6.485
Cumulative %	45.204	60.306	68.846	75.996	82.481

Table 5 Factor Analysis Results

An examination of cross-factor loadings (Table 6) also indicates good discriminant validity, because the loading of each measurement item on its assigned latent variables is larger than its loadings on any other construct (Chin 1998; Gefen et al, 2000; Straub et al. 2004).

Consturct	PU	IO	SAT	CI	CO
PU1	0.9087	-0.3693	0.4486	0.4499	-0.3320
PU2	0.8619	-0.3520	0.4398	0.3983	-0.3208
PU3	0.8366	-0.2352	0.4600	0.4589	-0.2700
PU4	0.8462	-0.2622	0.4578	0.4021	-0.2534
KOV1	-0.3538	0.9006	-0.3635	-0.3052	0.5259
KOV2	-0.3245	0.9272	-0.4183	-0.3363	0.5172
KOV3	-0.3263	0.8841	-0.3202	-0.2298	0.4730
KOV4	-0.2580	0.8931	-0.2850	-0.1888	0.4776
SAT1	0.5222	-0.4336	0.9383	0.5694	-0.4523
SAT2	0.4982	-0.3821	0.9408	0.6233	-0.3967
SAT3	0.4847	-0.2931	0.9393	0.6072	-0.3643
SAT4	0.4509	-0.3564	0.9336	0.5465	-0.3624
IOC1	0.4246	-0.3263	0.5892	0.9363	-0.3837
IOC2	0.4863	-0.2977	0.5716	0.9417	-0.3908
IOC3	0.4530	-0.2314	0.5708	0.9184	-0.2904
IOC4	0.4917	-0.2793	0.6169	0.9550	-0.3389
COV1	-0.2810	0.5018	-0.4513	-0.2950	0.8794
COV2	-0.3272	0.4480	-0.4080	-0.3747	0.9168
COV3	-0.2878	0.5631	-0.3142	-0.2796	0.8641
COV4	-0.2919	0.4349	-0.2649	-0.3514	0.8193

Table 6 Correlations between measures and Latent Variables

All items also passed the second discriminant test of looking at the correlation between two constructs and the respective AVE. Chin (1998) suggests that discriminant validity is satisfied when the square root of the AVE for each construct must be greater than the correlations between it and all other constructs.

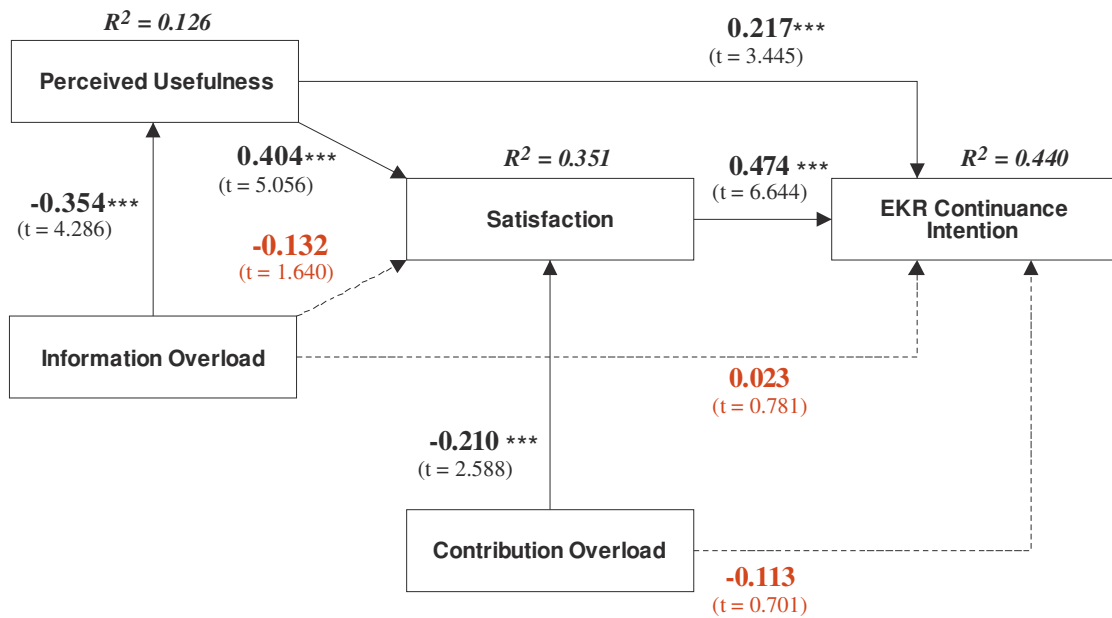
For further accuracy a multicollinearity test was done to minimize any error that could arise from high correlations (e.g., a correlation of 0.626 between CI and SAT). A common method variance test was done to reduce any errors due to bias in using questionnaires to collect data. For the multicollinearity test, VIF ranged between 1.43 and 1.56 and tolerance ranged between 0.63 and 0.69, which is within the valid standards. For the common method variance test, 83.6% of variance was explained by five factors rather than one factor contributing to the correlations, thus this is valid according to Podsakoff and Organ's (1986) recommendations.

Common method variance test was developed by Podsakoff and Organ (1986), to reduce any problems that may arise because of bias in filling up questionnaires (Campbell and Fiske 1959, Fiske 1982). We used Harmon's single factor test (Podsakoff and Organ 1986) where if significant amount of common method variance is present, a single factor will emerge and it will account for most of the covariance in the independent and criterion variables. Using factor analysis with unrotated solutions was

examined with scree tests to determine the number of factors explaining meaningful variables. The results showed in Table 5 that 82.5% of variance was explained by 5 factors rather than one factor contributing to the correlations; thus common method variance problems do not exist.

6.1 Structural Model Evaluations

After validating the measurement models, a PLS-graph was used to evaluate the hypothesis in the research model. A Jack-Knife re-sampling technique in PLS-graph was used to obtain t-values where the t-value higher than 1.960 was significant at $p < 0.05$ and the t-value higher than 2.576 was significant at $p < 0.01$. The results show that the R2 for EKR continuance intention is 0.44 (Figure 2), which means that the model accounts for 44% of the variance in the dependent variable, exceeding Falk and Miller's (1992) recommendation of 10%.



Significance: ** $p < 0.05$ *** $p < 0.01$

Figure 2. PLS Results

7 DISCUSSIONS AND IMPLICATIONS

In this section we look into the major findings of the proposed research model by categorizing it into two main parts. In the first part we will look into the validity of the IS continuance model in the EKR context. In the second section we look into the concept of overload in the EKR context. In the last part of this section we look into the major implications of these findings with regard to researchers and practitioners.

7.1 Validity of IS continuance model

As the proposed research model is based on Bhattacharjee's (2001) IS continuance model, these findings provide empirical evidence that support the validity of the model in an EKR context. H1 and H2 substantiate Bhattacharjee's (2001) findings that both satisfaction and perceived usefulness are the main determinants of continuance intention in the post-adoption stage of IS use (accounting for 44% of variance). Looking at the strength and path coefficients of the relationships, H1 was found to have a more significant affect than H2; the path coefficient of H1 is at 0.474 while H2 is at 0.217. These findings agree with prior researchers who have established that at the post-adoption stage, satisfaction is a stronger predictor of continuance intention than perceived usefulness (Bhattacharjee 2001, Chiu and Hsu 2004, J.C. Roca et al. 2006). H3 was also supported in our research model with a path coefficient of 0.404 at $p < 0.01$ significance, which substantiates the relationship between perceived usefulness and satisfaction: The higher the employee's perception of the system being useful in their work tasks, the more satisfied they were with the system (Bhattacharjee 2001, Chiu and Hsu 2004).

7.2 Information overload and perceived usefulness

As hypothesized in H4, information overload had a negative impact on the employees' perceived usefulness of the system with a path coefficient of -0.354 at $p < 0.01$ significance. The main function of EKR in an organization is to provide support for managing the huge loads of an organization's knowledge, thus improving an employee's knowledge application capabilities. However, in the state of IO, this objective of EKR is not achieved because it inhibits an employee's ability to assimilate the knowledge in the system. This substantiates findings of IO researchers who have observed that people in an overload state are in a paralyzed state or they engage in highly selective behavior (Franz 1999, Jones et al. 2004, Schultze and Vandenbosch 1998).

7.3 Overload and Satisfaction

The results provide interesting observations with regard to the relationship between overload and satisfaction. It was found that H5 was not supported for knowledge seekers while it had significant impact on knowledge contributors, satisfaction with the EKR with a path coefficient of -0.210 at significance of $p < 0.01$. First we will look at the overload versus satisfaction relationship from the knowledge seeker's perspective and later from the knowledge contributor's perspective.

For seekers, the result for H5a does show a negative path coefficient of -0.132, but it was not statistically significant enough to have any impact on the research model. A possible explanation comes from O'Reilly's (1980) research in which he found that individuals in an IO state were more satisfied than those who were not. Similar findings were observed by Franz's (1999) research wherein people felt more confident as they gained more information.

For contributors, hypothesis H5b was supported. This provides the first empirical evidence that CO can have an impact on EKR success measures – satisfaction with the EKR. In this case, the path coefficient was -0.210 at a significance of $p < 0.01$. Thus, CO can lead to reduction in employee's satisfaction level with the system. This can be explained by the fact that contributors are overwhelmed with the number of contributions that he/she has to maintain.

The difference in hypothesis support for H5 can be explained by looking at the difference in the two roles. For contributors, the overload arises from his contributions, which most of the time have no direct benefit for him (assuming that social factors are not significant enough). Unlike knowledge seekers, there are no factors that indicate increasing his/her contribution increases his/her satisfaction or confidence; nothing to overcast the dissatisfaction caused by the overload. CO, then, has a direct effect on employee satisfaction with EKR. This difference is important to notice because it shows that organizations have to worry about CO as much as IO; IO affects perceived usefulness while CO

affects satisfaction. Taking into consideration that the two roles are only conceptually different, employees can be both seekers and contributors, and organizations must worry about both IO and CO.

7.4 Overload and continuance intention

From both a knowledge seeker's perspective and a contributor's perspective, hypothesis H6 was not supported. This provides empirical support that the concept of overload does not directly relate to an employee's intention of using the EKR. This could be because the employee's intention to continue using EKR might be based on many other factors, and the impact of overload is too small for employees to take into consideration. This is in line with the theory of reasoned action (TRA) wherein intentions are only affected through attitude, rather than directly. This can also be explained by using CDT, in which researchers have found that people in a state of dissonance are more likely to change their attitude than their behavior in order to reduce the dissonance (Festinger, 1957). This is especially true in mandatory conditions like that of employees working in a knowledge sharing environment in which use of EKR is a requirement. Thus, even though prior researchers have observed instances of employee's ending participation when faced with overload, the dissonance created might not be sufficient for the employee to change his/her behavior; rather he would reduce the dissonance by changing his attitude about EKR.

This finding also sheds light on the contradiction in IO research wherein no substantial negative affect of overload was observed (O'Reilly 1980). This is possibly because these researchers have looked into IO as affecting system/organizational success directly. According to our results, IO and CO do not affect EKR success directly, which is possibly why organizations often overlook the negative effects of IO and CO. At the same time, we observed that IO and CO affect EKR success indirectly through perceived usefulness and satisfaction. Therefore, organizations cannot afford to overlook affects of overload in their investigation of EKR success.

8 IMPLICATION FOR PRACTITIONERS

The first major implication is that of raising awareness about the concept of overload. Most organizations implementing EKR are focused on adopting the EKR and creating a successful knowledge-sharing culture within the organization. Unfortunately, organizations frequently overlook the continuous use of EKR in post adoption, in which possible unexpected outcomes, such as vicious cycles, could appear (Garud and Kumaraswamy 2005). One such unexpected outcome is that of IO and this paper provides empirical evidence that the problem of overload is far from being just a concept used in research academia. Out of 144 responses, 48.7% rated they were facing some degree of IO and 31.2% rated they were facing some degree of CO.

The second major implication comes from the fact that this paper provides the first empirical evidence that overload affects EKR continuous use. It is very likely that organizations often overlook the affects of overload because they find that this has no direct impact on the continuous use of EKR. According to our findings, even though there is no direct affect, overload can affect EKR continuous use indirectly. Additionally, using CDT we provided evidence that when employee's are overloaded, their perception about the system is affected. Thus, when the employee feels stressed or confused due to IO, he/she would change his/her attitude towards the EKR by reducing his/her perception of how useful the system is, also reducing the satisfaction with the EKR. This is an important finding because it provides a possible answer to situations in which even though organizations implement the best EKR available, employees might undermine the EKR.

The third major implication of this paper is with regard to the use of distributive technology in developing EKR. This paper provides the first empirical evidence that such technology can introduce a new type of overload, CO, wherein contributors find it hard to keep track/maintain all his/her

contributions. This is mainly because the distributive technology provides too much flexibility in the data structure in which employees have the freedom to customize his/her knowledge sharing workspace using peer contributions. Thus, the data is duplicated throughout the EKR and if a contributor wants to edit or update, he/she has to go through all the peer workspaces to find who has made use of that particular contribution.

The last major contribution of this research paper comes from the fact that organizations have to make a distinction between the two roles of EKR users. This paper provides the first empirical evidence that the two roles affect the EKR success measures differently from the overload perspective. For knowledge seekers, overload does not have a negative affect on their satisfaction of EKR while for contributors overload does have a substantial affect on their satisfaction with the EKR. Therefore, organizations must formulate different approaches in tackling overload in the two roles: For seekers, more focus should be put on reducing the use of selectivity in information processing, while for contributors organizations need to focus on creating a stricter data structure such that contributors can manage their contributions with less effort.

8.1 Implication for researchers

The first major implication of this paper is that of developing a framework to understand how the concept of overload affects EKR continuous use. This is a departure from prior research, since rather than assuming IO affects EKR continuous use, this paper investigates how IO could lead to a negative affect on EKR continuous use. The findings of this paper conclude that the effects of IO might not be substantial in affecting an employee's continuance intention of EKR directly. Rather, the concept of overload affects EKR continuous use indirectly by means of having a negative impact on the two main factors of perceived usefulness and satisfaction of the system. This provides a new approach to investigate overload outcomes, focusing on indirect effects rather than direct effects.

The second major implication applies to all IO researchers. This paper provides the first empirical evidence that outcomes of overload on individuals could translate to changing their perception about the EKR system: For example, prior research provides evidence that IO affects satisfaction levels of the employees, but this paper provides evidence that this reduction in satisfaction could lead to employee's change of satisfaction towards the EKR itself. This paper borrows the theoretical backing of CDT to explain this effect of IO, thus providing a new research path that could be explored.

The third major implication comes from the fact that this paper introduces a new type of overload to research. Prior IO researchers have only applied IO for individuals seeking information, but this paper identifies that the concept of overload could apply to people contributing information. In this case, this paper provides empirical evidence that CO is a valid construct in the EKR context. Researchers could therefore extend this perspective of overload to other mediums. Additionally, this paper provides new scale items for both IO and CO, which could assist researchers who investigate the concept of overload in the subjective manner.

8.2 Potential limitations

The first limitation comes from the fact that only 48% of the data collected was from specific organizations identified for using EKR with a certain degree of distributive information. The rest of the data was collected from graduate classes where different respondents used different EKR technologies. The degree of distributed technology might vary in the implementation of those organization's EKRs. Though the diverse data collection helps in establishing the external validity of the results, it increases the error in finding a relationship between IO and CO to distributive technologies.

The second limitation comes from the fact that the data was collected at one instance of time. Thus the causality is not always concrete, unlike that of a longitudinal study. If this study can be conducted over time within an organization, we could gain a better understanding of how overload affects the EKR environment. As such, we would be able to establish more confident findings about the casual relationships between overload and EKR continuous use.

The third limitation is that of control variables used in this study. Even though the data collection asked to note which EKR was used, there is no way to measure the actual quantity of data present in these organizations. As different organizations have varying quantities of information within their EKRs, there is the possibility that some of these organizations did not have enough information in the system to cause overload. Therefore, the results could be improved if the data could be collected from only organizations having a sufficient amount of information such that there is the possibility of overload occurring in their ERKs.

9 CONCLUSION

The goal of this research paper was to investigate if and how overload affects the EKR continuous use in organizations. From our research findings we have observed that overload is an important factor in the EKR continuous use and that even with the increase in search technologies, employees are still facing overload states in their use of EKR. Most importantly, this paper introduces a new research model to investigate overload in organizations and uses ECT and CDT in explaining its effects on individuals and the system itself. This research also provides for the first empirical evidence that overload is not a sufficient factor in changing employees' continuance intention directly; rather, overload affects EKR continuous use indirectly by having an affect on perceived usefulness and satisfaction, negatively impacting the two main determinants of EKR continuous use. Additionally, this paper contributes to the whole of IO research by extending the concept of the overload state occurring only in information seekers, to the overload state occurring in both information contributors and seekers. A new construct CO and its scale items are validated in this research paper. Most importantly, this research paper provides evidence for both practitioners and researchers that overload is an important concept that must be investigated and measured if system success is to be achieved in the long run.

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