The Information Overload Paradox:
A Structural Equation Modeling Analysis of Data from New Zealand, Spain, and the USA

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ABSTRACT

The information overload phenomenon has been studied for many years, and has proven to be more complex than researchers believed it to be. The study presented here aims at shedding some light on the complexity of information overload, by examining the relationship between perceived information overload intensity and three traditional and one nontraditional information overload predictors. The nontraditional predictor was power distance, which was manipulated through the collection of data from 184 local managers and professionals in New Zealand, Spain and the USA. The data analyses employed partial least squares-based structural equation modeling, and led to one surprising conclusion: perceived information overload intensity seems to be more strongly related to power distance than to the volume of written information or number of information transactions processed by an individual. This conclusion is referred to here as the information overload paradox. [Article copies are available for purchase from InfoSci-on-Demand.com]

Keywords: *Hofstede's Model; Information Overload; New Zealand; Partial Least Squares Method; Power Distance; Spain; Structural Equation Modeling; USA*

INTRODUCTION

Typically information overload has been viewed as problematic and as leading to losses in work productivity and quality of work outcomes. Information overload has also traditionally been a driver of information technology developments; information technology solutions have often been developed specifically to help individuals cope with information overload (Foley, 1995; Turetken & Sharda, 2004). As early as 1970, the award winning writer and futurist Alvin Toffler argued that information overload would become one of the main problems facing modern society and organizations (Toffler, 1970). The emergence of the Internet and its increasing use by individuals and organizations (Chung & Tan, 2004; Teo, 2007) has been presented as

contributing to increasing levels of information overload (Kiley, 1995), apparently lending support to Toffler's (1970) prediction.

Generally speaking, information overload can be defined as a state in which the amount of information an individual must process exceeds the individual's information processing resources (O'Reilly, 1980). This does not necessarily mean that if an individual's own mental information processing resources are limited information overload will necessarily ensue. Some individuals may use tools, such as information systems, or even other individuals (e.g., assistants) to effectively cope with information overload. Therefore, it is possible that an individual may be responsible for processing a great deal of information, much more than he/she could process alone, and yet experience little or no information overload.

That one can effectively cope with information overload through technology and human assistants highlights the complexity of the information overload phenomenon, and the need for more creative studies addressing it. Such studies arguably should include investigations involving different organizational cultures, since the nature of the interaction between individuals in an organization may strongly affect perceived and actual levels of information overload experienced by the various members of the organization. Certain organizational cultures may incorporate unstated rules of interaction that push information overload away from individuals higher up in the organizational hierarchy, and onto their subordinates' shoulders. That may happen if there is a perception among managers and professionals that this is an acceptable state of affairs; a perception that may be motivated by large differences in organizational power held by different organization stakeholders.

The study presented here aims at shedding light on the complexity of the information overload phenomenon by looking at it from a different and arguably novel lens. The study examined the relationship between perceived information overload intensity and one nontraditional and three traditional information overload predictors. One of the goals of the study was to compare the influence, if any, of the nontraditional predictor against the more traditional ones.

Power distance was the nontraditional predictor. Power distance is part of Geert Hofstede's model of cultural dimensions (Hofstede, 2001; Lippert & Volkmar, 2007), and is defined as the extent to which less (and more) powerful members of organizations (e.g., employees and their supervisors) accept that power is distributed unequally.

The traditional information overload predictors were the volume of written information processed by individuals, in terms of pages read and written on a daily basis; the number of information transactions, or the average number of information giving and information receiving interactions per working day; and business process knowledge, assessed as the number of months of formal education and hands-on practice needed to perform work-related activities well.

This is a cross-cultural research study (Hunter, 2006) in which variations in the power distance predictor were incorporated into the study's design through the collection of data from three different countries, which also differ significantly in terms of power distance. Data were obtained from 184 local managers and professionals in New Zealand, Spain, and the USA. The data were analyzed employing partial least squares-based structural equation modeling. The analysis led to one surprising conclusion, which is that perceived information overload intensity is more strongly related to power distance than to the volume of written information or the number of information transactions processed by an individual. This surprising conclusion is referred to here as the information overload paradox.

RESEARCH BACKGROUND AND HYPOTHESES

Much research on information overload has taken the view that the phenomenon has both organizational and societal implications (Ed-

munds & Morris, 2000; Jones et al., 2004), and that those implications are more negative than positive. More frequently than not, information overload is perceived as an undesirable occurrence that must be either minimized or completely eliminated (Glazer et al., 1992; Meyer et al., 1997). In many cases, new technology-based information visualization and summarization solutions are seen as among the key solutions to the problems posed by information overload (Johnsson, 1991; Turetken & Sharda, 2004).

Even though an individual may resort to information technologies and even to other individuals for effective information processing, there is evidence that managers and professionals often are not very successful in their attempts to deal with information overload in organizational settings (Edmunds & Morris, 2000). Many of those information processing aids, such as electronic collaboration technologies, can indirectly lead to an overall increase in the amount of information that an individual has to process (Schultze & Vandenbosch, 1998).

Complicating the picture further is the fact that information overload is rarely measured directly and objectively. Usually information overload can only be measured indirectly and subjectively, through perceptions of information overload. Many attempts to measure information overload directly and objectively fall into the trap of measuring it through effects that are caused by information overload. Decision quality, for example, is generally expected to go down as information overload goes up (Eppler & Mengis, 2004). Yet, using decision quality as a proxy measure for information overload would conflate cause and effect.

When one looks at communication at work on a daily basis, written information exchanges such as those through electronic messages and printed documents seem to be the ones used to convey high volumes of information; with lower volumes transferred through unwritten information exchanges, such as oral and telephone exchanges (Wainfan & Davis, 2004). These patterns are probably motivated by choices that have a cognitive basis, as argued by Robert and Dennis's (2005) cognitive model of media choice. For example, unwritten information exchanges pose difficulties for the time-disconnected review of complex information, which may be necessary for the effective understanding of work-related activities. Hypothesis H1 below incorporates the notions that high information volumes more often than not cause information overload, and that high information volumes are more likely to be exchanged through written than unwritten media.

H1: *The volume of written information processed at work on a daily basis is significantly and positively related to perceived information overload intensity.*

As can be inferred from hypothesis H1, this study is particularly concerned with information overload as perceived by workers. Arguably, perceived information overload is not the same as actual information overload. Nevertheless, it is reasonable to conclude based on past research that the two variables are highly correlated, and that negative effects such as the deterioration of decision-making abilities are often associated with perceptions of elevated information overload (Edmunds & Morris, 2000; Eppler & Mengis, 2004; Evaristo, 1993).

While written information exchanges at work are associated with high volumes of information transfer, both written and unwritten information exchanges seem to be associated with a high number of information transfer transactions (Chervany & Dickson, 1974; Evaristo, 1993). A simple scenario can help illustrate this point. Let us consider a lawnmower sales representative who has received a manual about lawnmowers, containing complex information that he must understand in order to do an effective job as a salesperson. He then sends 3 brief e-mails and places 5 short telephone calls over a week to his manager, with the goal of clarifying parts of the lawnmowers' manual. In this example, a large written information exchange (the receipt of the lawnmowers' manual) leads to several short and fragmented written and unwritten information exchanges. This discussion highlights the difference between

volume of information processed, and number of information transactions. Both are likely to be associated with information overload (not only the first), because they are both associated with information exchanges that use up workers' cognitive and time resources (Speier et al., 1997). This is incorporated into hypothesis H2, which is stated below.

H2: *The number of information transactions taking place at work on a daily basis is significantly and positively related to perceived information overload intensity.*

The information overload literature suggests that individuals employ coping mechanisms when facing information overload, and that those mechanisms present a certain degree of uniformity. Jones et al.'s (2004) study shows that individuals experiencing information overload in online interaction environments are more likely to respond to and generate simple messages, as opposed to complex messages. This could potentially have a negative overall effect on the outcomes of tasks performed by the individuals, and illustrates the fact that not all coping mechanisms are likely to be effective ones in the long run.

There is also evidence that certain business process characteristics are associated with reasonably effective information overload coping mechanisms, especially when one looks at those types of mechanisms from an individual competence perspective (Lindgren, Henfridsson, & Schultze, 2004). One example of this is the amount of knowledge viewed as necessary to perform work well in connection with a business process (Iselin, 1989). The rationale here is that properly trained and more experienced individuals are better able to cope with information overload (Camerer & Johnson, 1991; Chervany & Dickson, 1974), and that the explicit recognition that individuals must be appropriately trained to perform work well contributes to that proper training. This leads to the conclusion that the amount of business process knowledge necessary to perform work well is inversely correlated with perceived information overload. The conclusion is incorporated into hypothesis H3, formally stated below.

H3: *The amount of business process knowledge necessary to perform work well is significantly and negatively related to perceived information overload intensity.*

Kock's (2000) research suggests one additional predictor of perceived information overload that is arguably associated with what Hofstede (2001) refers to as power distance, or the extent to which less (and more) powerful members of a national culture accept that power is distributed unequally. The majority of respondents in Kock's (2000) study, when asked for the main reasons why they experienced information overload at work, indicated that pressure placed on them to perform tasks efficiently and effectively was the main reason. This finding is consistent with other studies that linked information overload perceptions with time pressure experienced by individuals (see, e.g., Evaristo, 1993; Schick et al., 1990). Geert Hofstede has conducted extensive studies of organizational and national cultures (Hofstede, 1980, 1991, 2001), and has identified power distance as being likely associated with stress at work. The reason seems to be that individuals who are more accepting of power differentials in organizations are also likely to feel more time pressure to perform work well. (Nearly all individuals in organizations have to report to other individuals, which makes power differentials ubiquitous.) This conjecture, combined with the notion that information overload is associated with time pressure, leads to hypothesis H4.

H4: *Power distance is significantly and positively related to perceived information overload intensity.*

The link predicted through hypothesis H4 is arguably more counterintuitive than the links predicted through hypotheses H1, H2, and H3. It also contradicts some evidence suggesting that societies that present high power distance are also polychromic (Hall, 1976; Waarts &

van Everdingen, 2006). In polychromic societies individuals pay less attention to time constraints in business-related activities than in monochromic societies. It should be noted, however, that the evidence in question has not suggested the existence of a causal relationship between power distance and the extent to which a society is polychromic. These two constructs may be independent from each other.

A simple work-related example can be used to illustrate the link predicted through hypothesis H4. Let us assume a plant manager who is overloaded with information about the plant's operation; information that she needs to make various decisions on a daily basis. The manager may experience a reduction in the amount of information overload by employing a decision support system that automatically summarizes that information for her based on a pooling of information from other systems. Yet, the benefits of that reduction may be lost due to an increase in the time pressures placed on her by other managers to whom she reports. She may be asked to provide additional information to those managers, who are higher up in the organization's hierarchy, and who may be more demanding because of their knowledge of the existence of the decision support system. Those extra information processing demands may be amplified by a significant power distance, causing an overall increase in perceived information overload intensity experienced by the plant manager.

RESEARCH METHOD

Data from 184 local managers and professionals were collected in New Zealand, Spain, and the USA. In terms of gender distribution, 70.7% of the respondents were males. The respondents' distribution in terms of economic sector was approximately as follows: service (87%), manufacturing (12.5%), and agriculture (0.5%). In terms of distribution by country, 26.6% of the respondents were from New Zealand, 41.3% were from Spain, and 32.1% were from the USA. Generally the respondents were evenly distributed across countries in terms of gender and economic sector.

The managers and professionals were participating in executive education programs in their respective countries at the time the data were collected. The data were collected through questionnaires distributed in class by research collaborators who taught in the executive education programs. The questionnaires used in the three countries had the same questions. The questions make up a measurement instrument that was previously used and validated in the single-country study reported by Kock (2000). Those used in Spain were first translated to Spanish. In order to check the correctness of the translation, the questionnaire in Spanish was back-translated to English by a second translator, and then compared with the original questionnaire in English by a third translator. Questions included both perceptual and demographic items, and referred primarily to work activities conducted on a regular basis by those individuals (see Appendix).

The analysis of the data was conducted through variance-based structural equation modeling employing the partial least squares method (Chin, 1998, 2001; Chin et al., 1996). It included independent variables, of which three were defined as latent variables and measured through two indicators. Unlike traditional reflective measures (Chin, 1998, 2001), each indicator refers to a different facet of the same underlying construct, which justifies the use of only two (as opposed to many) indicators (see, also, Kline, 1998). The analysis also included control variables. The main dependent variable of the structural model was information overload intensity. These variables as well as brief related definitions and measurement descriptions are shown in Table 1. The Appendix provides a more detailed description of the measurement items used for the perceptual variables.

The three independent latent variables were volume of information processed, number of information transactions, and business process knowledge. One of the independent variables, namely power distance, was assigned a specific score for each country. The scores were taken

Table 1. Main variables of this study

Independent variables	**Definition/measurement**
Volume of information processed	Average number of pages read and written per working day
Number of information transactions	Average number of information giving and information receiving interactions per working day
Business process knowledge	Number of months of formal education and hands-on practice needed to perform work-related activities well
Power distance	The extent to which less powerful members of a national culture accept that power is distributed unequally
Control variables	**Definition/measurement**
Gender	Gender (male or female) of the individual participating in the study
Sector	Economic sector (service, manufacturing, or agriculture) of the organization to which the individual belongs
Business process complexity	Average number of relevant work-related decisions made and different work activities performed made on a working day
Decision-making style	Decision-making style in terms of scope (focus on details or big picture) and rationality (intuitive or rational)
Dependent variable	**Definition/measurement**
Information overload intensity	Perceived information overload intensity experienced at work

from Hofstede's (2001) cultural dimensions model, and were the following: 22 for New Zealand, 57 for Spain, and 40 for the USA. That is, among the three countries New Zealand was assigned the lowest power distance score, followed by the USA., and then Spain with the highest power distance score. Two of the control variables were demographic variables: gender of the respondent and economic sector. The other two control variables were perception-based variables: business process complexity and decision-making style.

Hofstede's (2001) cultural dimensions model comprises power distance scores that have been obtained primarily based on data collected from employees of a single organization (i.e., IBM) with offices in various countries. This may be seen as detrimental to the external validity of those scores, and their use as country scores. Nevertheless, one could also argue that the differences in power distance proposed by Hofstede among various countries provide a conservative measure of the actual differences in power distance among those countries. The reason is that being part of the same multinational organization (i.e., IBM) would tend to reduce variation of power distance measures obtained from different countries (Hofstede, 2001; Mani, 2007); that is, the multinational organization's management-employee interaction rules and procedures could be expected to have a uniformity-inducing effect on power distance perceptions, even if a small one. This rationale suggests that the power distance scores proposed by Hofstede can be used in studies that hypothesize effects of score differences on endogenous variables, as this study does, as opposed to studies that hypothesize null effects based on similarities in scores (Bing, 2004; Chiang, 2005).

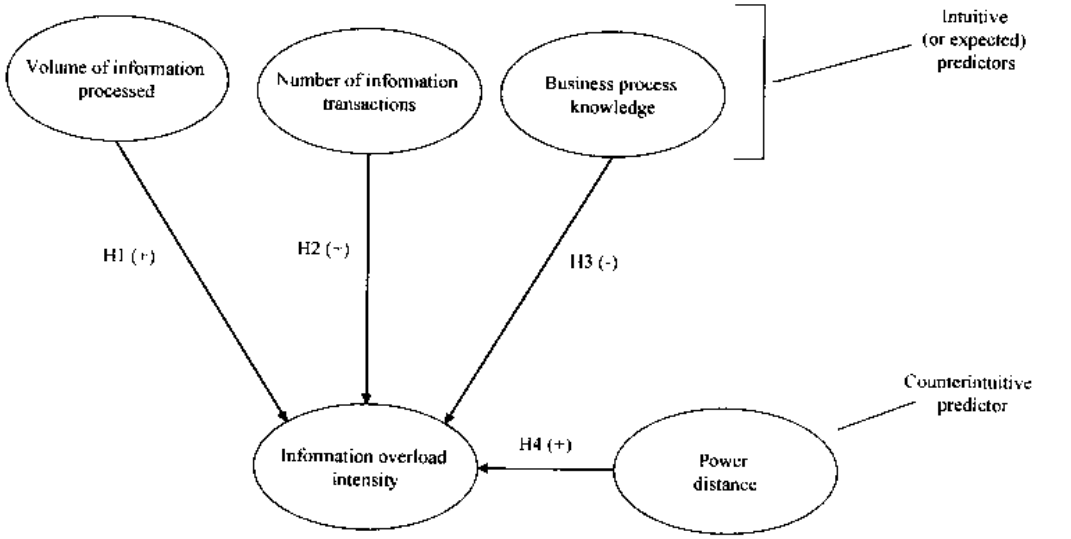
Figure 1 shows the hypotheses as part of a structural equation model. Each hypothesis is shown next to a path in the model, together with the expected sign of the relationship represented through the path. That is, a "+" sign indicates a positive predicted relationship between two variables in the model, and a "-" sign indicates a negative predicted relationship. The control variables are not represented because no predictions were made regarding their relationship with other variables; that is, their inclusion in the analysis was exploratory. In the structural equation model, the control variables were added as variables that actually pointed to the main dependent variable of the model, but with no a-priori predicted relationships with that variable.

In Figure 1, three variables are indicated as intuitive predictors of the variable information overload intensity. Those variables are volume of information processed, number of information transactions, and business process knowledge. They are indicated as such because it is intuitive to think of them as contributing to increase (the first two) or decrease (the third) information overload intensity. Power distance, however, is indicated as a counterintuitive predictor because its relationship to information overload intensity is less direct and obvious.

VALIDATION OF THE MEASUREMENT MODEL

Structural equation modeling results can generally be considered trustworthy if the underlying measurement model passes some validation tests. Those tests normally address reliability and validity concerns (Kline, 1998; Rosenthal & Rosnow, 1991). Validity tests come in many forms, and the most widely used are convergent and discriminant validity tests. When used in combination and in the context of questionnaire-based studies, reliability and validity tests allow for the conclusion that respondents generally: (a) answered questions in a careful way, as opposed to answering in a hurried and mindless manner; (b) understood the questions in the way that they were intended to be understood by the researcher who designed the questions;

Figure 1. Hypotheses shown as paths in a structural equation model



and (c) understood the questions in the same way as the other respondents.

Reliability tests are conducted through the calculation of reliability coefficients, such as composite reliability coefficients, and their comparison with a certain threshold coefficient (Nunnaly, 1978; Nunnally & Bernstein, 1994). Similarly, convergent validity tests rely on the calculation of factor loadings, and the comparison of those loadings against a threshold loading (Hair et al., 1987). Finally, discriminant validity tests rely on the calculation of correlations between latent variables and the comparison of those correlations with average variances extracted for each latent variable (Fornell & Larcker, 1981).

Table 2 displays factor loadings, cross-loadings, and composite reliability coefficients for the three latent variables in the structural equation model. The loadings and cross-loadings are shown under the columns labeled "Infvol" (volume of information processed), "Inftran" (number of information transactions), and "Knowle" (business process knowledge). The extraction method used in the calculation of the loadings and cross-loadings was principal components, and the rotation method was varimax (Ehremberg & Goodhart, 1976; Thompson, 2004). Those loadings that were expected to be conceptually associated with the respective latent variables are shown in shaded cells. In the column indicated as "CR" the composite reliability coefficients calculated for each of the latent constructs are shown also in shaded cells.

For a measurement model to be considered as presenting an acceptable level of convergent validity certain factor loadings must be .5 or above; namely the loadings of indicators expected to be conceptually associated with their respective latent variables (Hair et al., 1987). Those are the loadings shown in shaded cells in Table 2, which range from .78 to .91, and therefore meet the criterion for acceptable convergent validity.

Similarly to the convergent validity criterion, a measurement model is generally considered to present an acceptable level of reliability if the composite reliability coefficients are equal to or greater than a certain threshold. Normally, that threshold is expected to be .7 (Fornell & Larcker, 1981; Nunnaly, 1978). As can be seen from the "CR" column in Table 2, the composite reliability coefficients ranged from .712 to .953, which allows for the conclusion that the reliability of the measurement model used in this study is acceptable.

With the model validated in terms of convergent validity and reliability, the next step is to assess the model's discriminant validity. Table 3 displays several figures that can be used in this assessment. The correlation coefficient calculated for each pair of latent variables is shown in the cell where each pair of variables cross each other, and the square root of the average variance extracted (also known as AVE) for each of the latent variables is shown in the diagonal within parentheses.

One can consider a measurement model to present an acceptable level of discriminant validity if the square root of the average variance extracted for each latent variable is above all values belonging to a certain set of values. Those values are the correlations between the latent variable in question and all of the other latent variables in the measurement model (Fornell & Larcker, 1981). As can be inferred from Table 3, all of the square roots of the average variances extracted are higher than the correlations shown below them or to their left. (Those are all of the correlations involving each latent variable.) Therefore, one can conclude that the discriminant validity of the measurement model is acceptable.

The above discussion suggests that the measurement model employed in this study meets the general criteria that allow for the conclusion that it is both reliable and valid. This is a precondition for the interpretation of the results of the structural equation modeling analysis, discussed below. Based on the results of the validity and reliability tests, one can conclude that the level of measurement errors found in the data is likely to be low enough that the results of the analysis can be used for

Table 2. Factor loadings and composite reliabilities

	Infvol	Inftran	Knowle	CR
Infvol1	.78	.26	-.03	.712
Infvol2	.85	.12	.07	
Inftran1	.14	.84	.14	.940
Inftran2	.19	.82	.13	
Knowle1	.03	.10	.91	.953
Knowle2	.02	.20	.90	

Notes:
Infvol = Volume of information processed
Inftran = Number of information transactions
Knowle = Business process knowledge
CR = Composite reliability

Table 3. Correlations and square roots of AVEs

	Infvol	Inftran	Knowle
Infvol	(.741)		
Inftran	.314	(.941)	
Knowle	.045	.278	(.954)

Notes:
Infvol = Volume of information processed
Inftran = Number of information transactions
Knowle = Business process knowledge
Coefficients shown in cross-cells are correlations
Square roots of average variances extracted (AVEs) are shown in diagonal

a credible assessment of the hypotheses guiding the study.

DATA ANALYSIS RESULTS

Figure 2 summarizes the results of the structural equation modeling analysis conducted to test the hypothesized relationships proposed earlier. Arrows represent relationships between variables, and β coefficients associated with each relationship are shown near the arrows. Also near the arrows, and below the β coefficients, are the hypotheses associated with the relationships.

The β coefficients are the estimated path coefficients associated with each of the hypothesized relationships. The symbol "*" follows the β coefficients associated with relationships significant at the .05 level; and the symbol "**" at the lower and more stringent .01 level. The letters "NS" stand for "not significant" and are shown in place of the β coefficient for one statistically insignificant relationship. The actual sigma associated with that relationship was .16, which is much higher than the .05 threshold generally used for hypothesis testing.

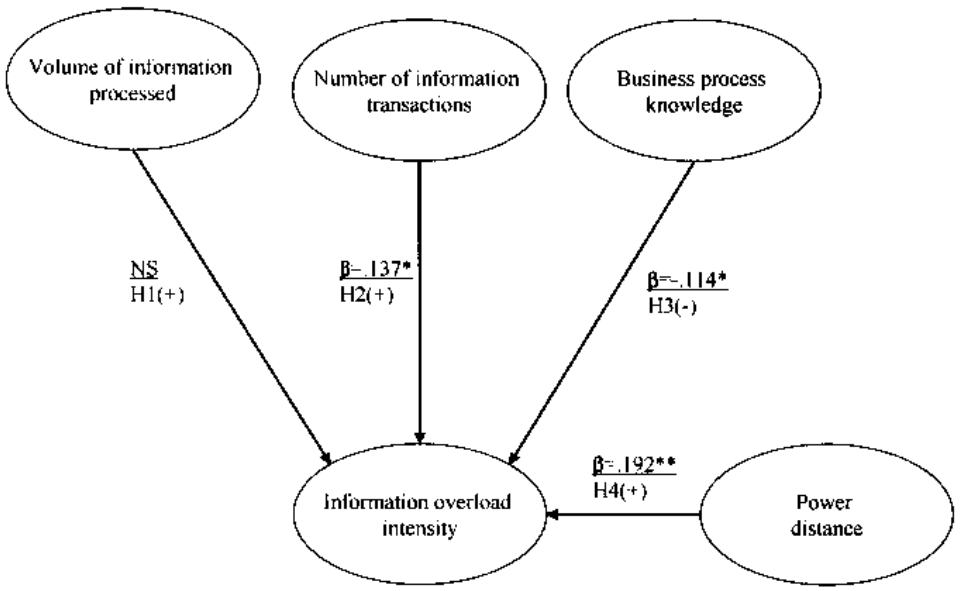
Figure 2 suggests, somewhat surprisingly, that the volume of information processed by individuals, in terms of pages read and written

on a daily basis, is unrelated to the perceived information overload intensity experienced at work by those individuals. The number of information transactions, or the average number of information giving and information receiving interactions per working day, was found to be significantly and positively related to perceived information overload intensity (β=.137, P<.05).

Business process knowledge, assessed as the number of months of formal education and hands-on practice needed to perform work-related activities well, was found to be significantly and negatively related to perceived information overload intensity (β=-.114, P<.05). That is, business processes that require more knowledge acquisition time and effort to be executed effectively seemed to be associated with lower levels of perceived information overload intensity.

Finally, power distance, or the extent to which less powerful members of a national culture accept that power is distributed unequally, was found to be significantly and positively related to perceived information overload intensity (β=.192, P<.01). In terms of the strength of the hypothesized relationships, this relationship between power distance and perceived information overload intensity was a great deal stronger than the relationships between the number of information transactions and perceived information overload intensity (approximately 40% stronger), and business process knowledge and perceived information overload intensity (approximately 69% stronger).

Figure 2. Path coefficients in the structural equation model and related hypotheses



Notes:

β = path coefficient associated with a relationship
** = relationship significant at the .05 level*
*** = relationship significant at the .01 level*
NS = relationship not significant

As discussed earlier, the following control variables were included in the structural equation modeling analysis as possible predictors of perceived information overload intensity: gender of the respondent, economic sector (service, manufacturing, or agriculture) of the organization to which the individual belongs, business process complexity (measured through the number of work-related decisions and different work activities on a working day), and decision-making style in terms of scope (focus on details or big picture) and rationality (intuitive or rational). None of these control variables were found to have a significant relationship with perceived information overload intensity.

DISCUSSION

Not only is perceived information overload strongly related to power distance, according to the structural equation modeling analysis results, but that relationship appears to be stronger than the relationship between perceived information overload and other more intuitive predictors. Among those more intuitive predictors are the volume of written information and number of information transactions processed on a daily basis. The volume of written information processed on a daily basis seems to be unrelated to perceived information overload. This is rather surprising, since it is reasonable to assume that most of the information flow in organizations takes place through written media.

Moreover, the relationship between power distance and perceived information overload intensity appears to be 40% stronger than the relationship between number of information transactions and perceived information overload intensity. This observation comes from the comparison of the absolute path coefficients in the structural equation model, assuming that their absolute values reflect the strength of their associated two-variable relationships.

When we look at percentage of explained variance, the picture is similar. The contribution of power distance to explaining the variance of the variable perceived information overload is greater than the combined contribution of the variables business process knowledge and number of information transactions. Essentially what this means is that power distance is a better predictor of variance in perceived information overload than the other variables with significant paths in the model combined.

The above findings constitute the essence of what is referred to here as the information overload paradox, which is also reflected in the summary of the hypothesized predictions provided in Table 4. The fact that hypothesis H1 was not supported by the analysis results indicates that the associated prediction was incorrect. It nevertheless lends additional support for the information overload paradox idea. That is, volume of written information processed on a daily basis, which likely correlates highly with

Table 4. Support for the hypotheses based on the results

Hypothesis	Supported?
H1: The volume of written information processed at work on a daily basis is significantly and positively related to perceived information overload intensity.	No
H2: The number of information transactions taking place at work on a daily basis is significantly and positively related to perceived information overload intensity.	Yes
H3: The amount of business process knowledge necessary to perform work well is significantly and negatively related to perceived information overload intensity.	Yes
H4: Power distance is significantly and positively related to perceived information overload intensity.	Yes

the total amount of information processed daily, does not matter much in terms of information overload perceived by the individuals processing the information.

Put simply, the paradox entails the conclusion that perceived information overload is more strongly related to power distance than to the volume of written information or number of information transactions processed by an individual. This paradoxical conclusion follows from the above findings, and is likely to serve the basis for further research, either with the goal of disproving it, or to further our understanding of the information overload phenomenon. The conclusion suggests that our understanding of the phenomenon is rather limited, and in dire need of expansion and refinement.

The importance assigned to the above conclusion assumes that perceived information overload is a good proxy for actual information overload, given the data collection and analysis methods employed in this study. While it is very likely that perceived information overload is not the same as actual information overload, it is reasonable to conclude that the two variables are highly correlated, and that the negative effects of information overload are often associated with perceptions of information overload (Edmunds & Morris, 2000; Eppler & Mengis, 2004; Evaristo, 1993). Actual, as opposed to perceived, information overload is difficult to measure objectively (Evaristo, 1993; Kock, 2000).

While the information overload paradox does go against much of the literature on information overload, it is consistent with the belief that perceived pressure placed on an individual to perform work-related tasks efficiently and effectively is one of the main reasons why an individual experiences information overload (Kock, 2000; Schick et al., 1990). Given this, one can reasonably infer that perceived time pressure to accomplish work-related tasks has a significant and negative impact on the cognitive abilities of an individual, and thus a similar impact on decision-making quality. As such, work-related pressure may be viewed as having a relationship with decision-making quality that is similar to that described by the information overload inverted U-curve (Eppler & Mengis, 2004), but with the magnitude of the effect amplified by power distance.

As far as the control variables are concerned, one noteworthy result is that both males and females seem to experience information overload equally. Also, the insignificant relationship between business process complexity and perceived information overload is consistent with the significant and negative relationship between business process knowledge and perceived information overload. That is, given the latter relationship, one would expect business process complexity to be met with better preparation by workers in terms of knowledge acquisition, and thus no related increase in information overload.

Several of the results in connection with the control variables go against much of the information overload literature. The insignificant relationship between decision-making style and perceived information overload intensity goes against Kock's (2000) suggestion that decisional scope (i.e., whether one focuses on details or the big picture when making decisions) is significantly associated with information overload. The insignificant relationship between economic sector and perceived information overload intensity goes against the notion that volume of information processed affects information overload (Eppler & Mengis, 2004), although in a somewhat indirect way. The reason is that the amount of information processed in service organizations is generally considered to be significantly higher than in manufacturing organizations (Davenport & Prusak, 2000; Drucker, 1995). This insignificant relationship is nevertheless consistent with the other findings of this study.

LIMITATIONS

As mentioned earlier, the managers and professionals who provided the data for this study were participating in executive education programs in their respective countries at the time the data were collected. Because of the nature of those

programs, as well as the recruitment approaches employed, the vast majority of the participants were probably long-term residents of and, in many cases, native to the countries in which the data were collected. However, this cannot be ascertained for all of the participants because data about their nationality were not collected. Arguably a variation in within-country nationality could have led to corresponding within-country variability in the answers provided by the participants. Given that lower within-country variability in answers would have generally led to stronger effects in our model, it is safe to conclude that our main findings do not have to be revised. Nevertheless, future studies aimed at replicating the findings of this investigation should include one or more questions related to the respondent's nationality.

A related limitation of this study is that the data does not differentiate between bosses and subordinates, nor contains specific details about each group. The notion of power distance refers to the relationship between bosses and subordinates, and perceptions by members of both groups, and thus would be best investigated through the explicit collection of data about each group. Given the design of this study, its focus is primarily on subordinates, as it assumes that all of the participants in the study have a boss. This is a fair assumption, since almost everybody has a boss in any organization; for example, even chief executive officers report to certain groups, such as boards or directors and shareholders. Arguably the focus on subordinates is generally appropriate in this study, since information overload is more likely to impact subordinates than bosses. Nevertheless, future studies of information overload should collect data at both ends of the boss-subordinate relationship so that a broader understanding of the phenomenon can be achieved.

As with any innovative research project, further research is needed to assess whether the findings of this study are an aberration, or whether they are likely to be repeatedly observed in similar organizational contexts. It is possible that the results of this study are due to measurement errors, although the results in connection with the validation of the measurement model suggest that this is not very likely. Some recommendations for future research can be provided in this respect.

One recommendation is to measure the constructs through multiple (i.e., more than two) indicators, and in some cases to combine those measures with other measures that are less subjective. This is particularly recommended in connection with perceived information overload. The quality of decisions made by the respondents is an example; it could be assessed through objective measures in connection with the outcomes of those decisions. Such combination of measures could be used for data manipulation checks.

Another recommendation for further research is to measure variations in power distance at the individual, group, or organizational units of analysis. Such measurement could be accomplished through the inclusion of one or more questions related to power distance into the questionnaire. This follows from one of Hostede's (2001) key observations regarding his cultural dimensions model, which is that organizations have their own cultures and those cultures may be different from the national cultures of the countries in which they operate. Measuring variations in power distance would also allow for the assessment of whether the respondents' are representative of the countries or cultures of which they are assumed to be part, and perhaps the removal of unrepresentative respondents from certain analyses.

CONCLUSION

The phenomena addressed through information systems research often appear simple at first, only to reveal inner complexities upon closer examination. The identification of paradoxical results is one of the many ways in which research progress can be achieved, and the complexity of information systems phenomena unraveled (Pearlson & Saunders, 2001; Whitley & Darking, 2006). Underlying this study is the belief that information overload is a complex and

misunderstood phenomenon. As such, it needs to be investigated from different perspectives, such as in investigations involving different organizational cultures, and the various results triangulated so that the multiple facets of the phenomenon can be properly grasped. It was assumed in this study that the nature of the interaction between individuals in organizations might significantly influence information overload. Predictions were made here about information overload that incorporate traditional as well as nontraditional views of the phenomenon. Among the nontraditional views is the one that certain organizational cultures may incorporate unstated rules of interaction that may lead to perceived pressures on individuals, which are in turn reflected in information overload perceptions.

The relationships between perceived information overload and several independent and control variables were investigated. Data from 184 local managers and professionals were collected in New Zealand, Spain, and the USA; and analyzed employing partial least squares-based structural equation modeling. The independent variables were the volume of information processed by individuals, in terms of pages read and written on a daily basis; the number of information transactions, or the average number of information giving and information receiving interactions per working day; business process knowledge, assessed as the number of months of formal education and hands-on practice needed to perform work-related activities well; and power distance, or the extent to which less powerful members of a national culture accept that power is distributed unequally. Organizational power distance was manipulated by the collection of data from three countries that differ significantly in their power distance scores, according to the cultural dimensions model proposed by Hofstede (2001).

The control variables in this study were the gender of the respondent, economic sector (service, manufacturing, or agriculture) of the organization to which the individual belongs, business process complexity (measured through the number of work-related decisions and different work activities on a working day), and decision-making style in terms of scope (focus on details or big picture) and rationality (intuitive or rational).

Contrary to predictions, the volume of written information processed by the individuals was found to be unrelated to perceived information overload intensity experienced at work. The number of information transactions and business process knowledge were found to be significantly related to perceived information overload intensity; the former positively and the latter negatively related. Power distance was found to be significantly and positively related to perceived information overload intensity. Surprisingly, this relationship was found to be much stronger than the other relationships, and its contribution to explaining the variance of the variable perceived information overload was found to be greater than the combined contribution of the other two significant relationships. As for the control variables, none of them was found to have a significant relationship with perceived information overload intensity.

The findings of this study are paradoxical in light of the existing research literature on information overload, as well as in light of commonsense expectations. It is intuitive to assume that the volume of information and number of information transactions processed should be more strongly related to information overload than any other possible variable; this assumption follows directly from the definition of information overload (Eppler & Mengis, 2004; O'Reilly, 1980). Yet, this study found support for the notion that perceived information overload is more strongly related to power distance than to the volume of written information and number of information transactions processed by an individual. This conclusion notion is referred to here as the information overload paradox.

A key implication of this study for practitioners is that the manipulation of power distance is likely to have a stronger impact on perceived information overload than the manipulation of other variables that may be less controllable. As discussed earlier, it is difficult to reduce the

amount of information flowing in organizations on a daily basis, or the number of information transactions. Often attempts to do so relying on information technologies cause an overall increase in the amount of information flowing at work, and in the number of information transactions in which workers have to engage.

According to the results of this study, it is reasonable to argue that reducing power distance in an organization may reduce perceived information overload to a greater extent than reducing the amount of information processed by workers. Better decision-making quality is likely to ensue, possibly leading to better overall performance. An organization does not have to set up shop in another country to reduce power distance. This can arguably be achieved within the organization by the reduction of barriers between different levels of the organizational hierarchy, the flattening of the organizational hierarchy, and the use of a more democratic and transparent management style.

One would expect that the reduction of a source of stress among workers, which power distance seems to be, would allow an organization to better hire and retain talented employees. The end result may be an organization that is unique within the country in which it operates, which may in turn give it a competitive advantage.

The results of this study are counterintuitive enough to serve as the basis for future research that will not only replicate but also expand on the current research. Hopefully that will lead to a more comprehensive theoretical understanding of the information overload phenomenon. Such understanding is very much needed, given information overload's increasing importance as a societal and organizational phenomenon. The negative effects of information overload on work productivity and quality are primarily what make it an increasingly important phenomenon. Nevertheless, a better understanding of its underlying causes holds an additional potential promise. That understanding can also shed light on important mechanisms of the human mind, which is still one of the most mysterious and complex research realms.

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