Information Overload (IO)

Pre-study of a tool to identify individual IO adaption and coping strategies.

Author: Janine Kettels
Supervisor: Birgitta Fagerström-Kareld
Semester: Spring 2012
Course code: 4IK00E
Abstract

Continuing on from the research identifying information overload as a problem, this qualitative investigation aims to highlight the human element within our technologically advanced world. This paper takes a journey through the long history of our attempts to manage information – from organising papyrus scrolls to reading blogs. Have we developed our management skills in tact with the ever increasing sources of information?

According to vast amounts of literature, the problem of information overload is widespread. This research aims to help explore individual adaptation and coping of information overload by use of a questionnaire. The questionnaire was designed to interest people in disclosing their strategies. To avoid adding more information load on a person whom is possibly overloaded, the questionnaire used a visual tool and semi-structured open-ended questions. This proved to be a popular choice when pre-tested by a panel of people. The panel consisted of a sample of the target population - people that work in organisations. This target population was chosen as they need to be productive by making informed decisions.

The results indicate that it can be difficult to answer questions about the reactive and proactive strategies used to regulate information load. With the help of cognitive interviewing, the participants revealed that such strategies are often done “subconsciously”.

**Keywords:** Information overload, information management, information literacy, cognitive interviewing, questionnaire pre-testing, visual tools, pre-studies, participatory design
Acknowledgements

I would like to thank all who participated in the pre-test interviews. A special thanks to my other critics, who were also a source of valuable support – the other students in the Degree project course.

A special mention to my supervisor whom introduced me to pre-testing, tools, participatory design and curbed my creativity without taking away from it. Most of all for broadening my horizons to show that similarities can be found in studies about Health and Social Care – it’s not all Business and Commerce (who knew!).
Table of contents

1 Introduction ___________________________________ 6
  1.1 Background ___________________________________ 5
  1.2 Statement of the research problem ____________ 6
  1.3 Aim, objective and research question ____________ 6
  1.4 Target audience ________________________________ 6
  1.5 Disposition ___________________________________ 7

2 Review of the literature and previous research ____________ 8
  2.1 Definitions of information and overload ____________ 8
  2.2 The quest to manage information ________________ 9
  2.3 No one perfect answer __________________________ 10
  2.4 The person construct ____________________________ 12
  2.5 The inverted U-curve ____________________________ 13

3 Method ____________________________________________ 14
  3.1 Research design ________________________________ 14
    3.1.1 Pre-test studies with participants ____________ 14
    3.1.2 Tool development _________________ 15
    3.1.3 Questionnaire questions ________________ 15
  3.2 Data collection __________________________________ 16
    3.2.1 Sampling ________________________________ 16
    3.2.2 Participants ____________________________ 16
    3.2.3 Empirical procedure ______________________ 17
  3.3 Tool testing and analysis ___________________________ 18
  3.4 Validity _______________________________________ 19
  3.5 Reliability ______________________________________ 19
  3.6 Delimitations/Limitations ___________________________ 20
  3.7 Ethical issues ________________________________ 20

4 Results and Analysis ___________________________________ 22
  4.1 Lexical problems ________________________________ 22
  4.2 Logical problems ________________________________ 22
  4.3 Computational problems __________________________ 23
  4.4 Tool format ____________________________________ 23
  4.5 An unexpected response __________________________ 25

5 Discussion ___________________________________________ 26
Appendix
- Questionnaire
1 Introduction

Fundamentally, information overload occurs when there is too much information. This in itself is not a problem. The problem stems from whether information is managed effectively. If everyone could manage, then you could stop reading here! This may not always be the case, so please read on...

1.1 Background

Why do we need information? For a start, it helps us to understand. Take a real case scenario: a sign with the writing: "Scientia potentia est". Is it just three meaningless groups of randomly arranged letters? For those who know Latin or have other prior information, then they recognise it as the quote: “knowledge is power”. Did you need this information? Sometimes we get information without us asking for it. This is an everyday occurrence where information is coming at us, sometimes even if we search for it or not. The theme of this study is to emphasise that it is a person's choice. You choose whether you need to know, how you find out, when you find out and how much information you need. It’s all part of your own personal strategy to cope with all the information thrown at us, and to adapt to new forms. Some may have ignored the sign, others might have looked it up at a more convenient time, and a few may have been so curious that they went straight away to ask the owner of the sign or used the internet to find out.

For an organisation, information is seen as the key to success (Edmunds and Morris, 2000, p.18). Within the workplace, many professionals need information to do their job (knowledge workers, etcetera). Medical practitioners, for example, need information for updates on new developments. Marketing departments require information about their customers. There is a lot of information at hand, and even more has become available since the internet opened up a whole new world of information access.

On the one hand, the internet alone has made us more effective – we have many sources of information available at our fingertips. On the other hand, we have so much information available that it can make us ineffective. It is time consuming to surf the internet and it is difficult at times to know how much we can rely on what we find. These days a variety of material is published (printed or electronic books, newspapers, magazines and journals) – more than ever before, and growing. It would be a hopeless task to try to read a newspaper from cover to cover, as before you were finished with one, the next one would already be published!
Information requires management – too much information is not necessarily better. Individuals need the right information in the right amount at the right time. An overload of information can result in uncertainty and delay the making of an accurate decision. Information overload (IO) often occurs when the individual attempts to process too much information.

The individual needs to arm themselves with the know-how to be able to prevent or deal with IO. It is in the best interest of businesses to know how their employees are coping. Where are the employees in their quest to manage information? Is it going to overload employees even more by investigating their adaption strategies?

1.2 Statement of the research problem
Technology is evolving at an exponential rate. It is giving us fast access to new information, allowing us to save and search old information and expanding our reach around the globe. If we let all this information daunt us then it can become a problem. It is important for us to recognise that if we don’t take charge, chances are, we will encounter problems.

Within our competitive business world, it’s important that good decisions are made, and made fast. We need to be productive, and know how to access accurate information quickly. Our employers need to know how we are doing as there is barely time or resources for remedies that don’t fit our individual needs. Do they know if employees know how to cope with IO? Have they developed their own tools and strategies to be able to adapt? Is there a quick way to check this? Can awareness of IO be raised, leading to a greater interest to manage information even better?

At the end of a literature review on IO, Edmunds and Morris (2000, p.26) concluded that further research on IO needs to be carried out among business organisations. They believed that it would be valuable to determine the extent of IO currently being experienced and what strategies are being used to combat the problem.

1.3 Aim, objective and research question
The aim of this research is to explore if people are coping with the array of information available, and how they have adapted. The objective is to devise a tool to identify individual information management.

The research questions (RQ) are:
-RQ1 – How should a tool be designed that would allow investigations into people’s IO reduction strategies?
-RQ2 – How does the participant perceive and interpret the diagnostic tool?

1.4 Target audience
The audience targeted for this work are academics within the field of information management. A great deal of research has been spent on
defining the causes of IO. There is also a lot of literature providing solutions and countermeasures. The findings from this study aims to build on recognition for individual adaption and organisation awareness of IO. Apart from the scholars, here are some examples of a wider audience that can be included, including those whom have any combination of the following:

- have a letter box, television, newspaper, radio
- have papers to read, email access, faxes they receive, telephones to answer.
- use the internet, an intranet, a library
- want to keep up-to-date, maintain a competitive edge
- attend meetings, instant message
- hear gossip and opinions (Farhoomand and Drury, 2012, p.129)

In particular, it is anticipated that the reader is interested in open discussions with others regarding IO – mainly to find help through others. Even those that wish to raise awareness of IO, or take the IO “pulse” to check employees’ wellbeing, can find the results of this work rewarding.

### 1.5 Disposition

The thesis’ starts with a background of information today, in particular within organisations. The scene is then set by detailing the thesis’ particular interest in information overload – is the individual coping?

The next chapter guides the reader through the research problem and is followed by an identification of the intended target audience.

For readers new to the area, some definitions and a brief history of information and its management are given in a review of the literature. Previous research into the area of information overload is also examined. This highlights the theories that many other researchers have to explain why we have problems with IO, and what they propose to be the causes. The review section ends by returning to back to the topic of interest – the individual. These last two chapters concentrate on one of the causes of IO, the person construct, and show a theory of how IO affects the person.

The central part of the thesis covers how the research was conducted. First the strategy of inquiry is given and why a qualitative research was chosen. This is followed by a description of the interview technique, and questionnaire with a visual tool and semi-structured questions. The data was collected by cognitive interviewing (which is explained later), and gathered within the researchers own place of employment. A short empirical procedure is then provided, with reference to the actual questionnaire in the appendix.

A section is allocated as to how the data was analysed and interpreted by means of a matrix. The matrix, by Conrad and Blair (1996), does not require the user to be an expert, however its use results in a more professional
questionnaire. Examining the responses of a pre-test panel identifies problems – before the questionnaire is put into use. It is also designed to seek the perspective of others, rather than just the researchers. This is related to the validity and reliability stage of the thesis. Although the use of cognitive interviewing is not without fault, it is a means of identifying problems with a questionnaire.

The research has been conducted ethically so as to protect the participants, researcher and educational institution. It is a common part of thesis writing and a separate section is dedicated to those issues surrounding ethics and integrity.

Towards the end of the thesis, the participant’s responses will be presented in the results chapter which also includes analysis of problems that arose. This is then followed by a discussion of the results. Although the problems were minor and the questionnaire was well received, some new research proposals are given to further develop the area of information and its management.

2 Review of the literature and previous research

This review will lead the reader through the previous research and explain relevant definitions. The entire section has a “funnel” structure, that is, it starts with a theoretical background and narrows down to the main current topic at hand.

2.1 Definitions of information and overload.

Information is data that has meaning, as Davenport and Prusak (2000, p.3) state in their book. Information is also data that is organised in some way that has a recognisable shape (Newell, et al., 2009, p.3).

As seen in figure 1, information is derived from data. Data is the raw material that creates information (Davenport and Prusak, 2000, p.3). Information is important as it is used to make decisions, and we gain knowledge from making decisions.
This, plus experience and other knowledge, can then lead to a higher understanding – known as wisdom.

Overload is both a noun and a verb according to a dictionary definition (Merriam-Webster, 2012). The dictionary also explains that the verb “overload” is made up of a prefix (over-) and an object (-load). When something is “over”, then it is often regarded as being “too much, or too great” of something, in this case “too much or too great a load”. An example of this, keeping with the theme of the research, is: The person is overloaded with information. As a noun, and still within the theme of the research: I’m suffering from information overload.

2.2 The quest to manage information

According to Bawden and Robinson’s (2009, p.183) review, they identified that the first possible mention of information overload is from the Bible:

_There is no end to the making of many books, and much study is exhausting to the body._

_(The Bible, Ecclesiastes. 12:12)_

It seems that the speaker in Ecclesiastes had great foresight – some two thousand years later and the making of books has not ended, nor does it appear to be slowing down. Last year, Jonathan B. Spira released a book titled: Overload! How too much information is hazardous to your organisation (Spira, 2011). We are still writing books and apparently still in need of help with our information. What has changed is that we have more information to deal with than when Jesus was (literally) a child. Bawden and Robinson (2009, p.184) list some statistics, such as, that more information has been created in the past 30 years than in the previous 5000 years. What is
not mentioned is if our quest to manage information is developing at the same rate.

Statistics also provide us with how much information is available. Bawden and Robinson (2009, p.184) described that it would take over 200,000 years to “read all the Internet”, allowing 30 minutes per document. At this point, this review of literature will take a stand against what is often documented. There is no argument that there is a lot of information to manage, however, who has said that we need to know all the information that is available? As Aeschylus (Davenport and Prusak, 2000, p.7) said, even before the birth of Jesus, that:

“Who knows useful things, not many things, is wise”.

In a book on information overload, Miller (2004) explores why we might unwisely want to devour all the information that is available. He suggests that people can have feelings of guilt over the readily available information coming at us in its many forms. The guilty feelings, he explains, comes from not having the time or not being able to absorb it all. Miller tries also to “free” modern day individuals by advising them that they don’t need to know everything:

“Do I really need to know whom Anne Heche is dating?”

Edmunds and Morris (2000, p.19) have found that people can worry and become anxious about whether an important piece of information has been missed in the volume of material that is being processed. Later in their review (p.21) they refer to Handy’s (1995) research and that people often feel they have to constantly keep up-to-date and receive more and more information.

One of the academics trying to get the message across about information management is Clay Shirky (cited in Bergamaschi, Guerra and Leiba, 2010, p. 11). The authors capture that Shirky takes a different view:

“There’s no such thing as information overload, there’s only filter failure.”

We have to manage our information, for example, by filtering – we certainly don’t have 200,000 years at our disposal! Even if we did, we wouldn’t remember it all. We also have to manage our information by knowing what we know well, and knowing how to find the rest. Take the story of the student who asked Albert Einstein, “Dr Einstein, how many feet are there in a mile?” Einstein said he didn’t know. The student assumed he had to be joking, but when pressed for an explanation, Einstein answered, “I make it a
rule not to clutter my mind with simple information that I can find in a book in five minutes.” (Miller, 2004, p.300).

There is some speculation that in the future we may be able to enhance our brain through biotechnology, or take drugs to slow down or even halt memory loss (Forster, 2006, p.10). Why do we want all this information and what would we do with it if we could remember it all? Guus Pijpers (2010, p.313) stated that one of the main reasons people look for information is its ability to reduce uncertainty about events in the real world. However, as we will see in later in this chapter, large amounts of information do not always mean large reductions in uncertainty. Large amounts of information can have the opposite effect.

2.3 No one perfect answer
The cause of IO is, according to Eppler and Mengis (2004, p.330) a mix of five constructs: person, information, task, organisational design and information technology (IT). Their interrelation is depicted in the diagram below.

![Diagram of the five causes of IO.](image_url)
This illustration shows the complex nature of IO. Eppler and Mengis (2004, p.330) and Ruff (2002, p.6) break down each construct:

- person: receiving, processing, communicating, personal traits
- information: quantity, frequency, intensity, quality
- task (or process): that which needs information to be completed
- organisational design: the formal and informal work structures
- IT: what is used and how it is used

This group of researchers mean that there cannot be a definitive solution – IO is a mix of all five factors, not because of one of them. This is supported by Nejadirani and Rajabzadeh (2011, p.10422), however they believe that IO is caused by four factors: person, organisational design, IT and information. The authors do not stipulate “task” as being a factor. But is it a coincidence that they all mention the person first?

2.4 The person construct

Those that have also come to the conclusion that there is no one perfect answer include Edmunds and Morris (2000, p.26). The authors stipulate that there is a general need for the person to have greater information literacy. Information literacy (IL) has long been associated with libraries, which can be seen when searching for information on IL. It is an area that is also well established in educational institutions and health organisations. Finding a definition that is suited to businesses is almost as elusive as defining IO. Bawden (2001, p.251) reviewed the concept and concluded that it is better to explain than define the term. To assist in explaining IL, three examples from Bawden’s review will be used. One that is related to business, the second relevant to IO and the third due to its succinct style (appropriate to reducing IO!):

- information literacy, as opposed to computer literacy, means raising the level of awareness of individuals and enterprises to the knowledge explosion, and how machine-aided handling systems can help identify, access and obtain data, documents and literature needed for problem-solving and decision-making (Horton, 1983, as cited in Bawden, 2001, p. 228)
- in the midst of the information explosion, the ability to access, retrieve and evaluate information should constitute a significant part of today’s definition of literacy (Ford, 1991, as cited in Bawden, 2001, p. 243)
- information literacy is the ability to access, evaluate and use information from a variety of sources (Doyle, 1994, as cited in Bawden, 2001, p.231)

Karr-Wisniewski and Lu (2010, p.1069) make an important point from their study of technology overload in that the dimensions are based on
individualised perceived measures. Therefore, two knowledge workers exposed to the same work environment may vary as to their perceived levels of information, communication, and system feature overload being based on individual differences. After Farhoomand and Drury (2002, p.130) completed their empirical study, the authors concluded that “a full understanding of the phenomenon of too much information and only ineffective ways to process it is problematic because it is largely influenced by knowledge workers’ personal information processing ability, along with the contextual variables related to individual tasks and work environments”. These are groundbreaking investigations as they remove the focus from the need to concentrate research within one demographic.

2.5 The inverted U-curve

When searching for information about IO, the reader often comes across diagrams with an arch, or what could be described as an upside-down “U” (Karr-Wisniewski and Lu, 2010, p.1062; Eppler and Mengis, 2004, p.326; Nejadirani and Rajabzadeh, 2011, p10422; Ruff, 2002, p.2; Griffeth, Carson, Marin, 1992, p.236; Paul and Nazareth, 2010, p.32). For some, without the knowledge to understand what this means, then it is just data! In keeping with the pattern of this review, some background information will be provided first to increase your knowledge of this area.

The arch in the shape of an upside-down “U”, or inverted U-curve, depicts many theories. Table 1 below explains some of them:

<table>
<thead>
<tr>
<th>Name</th>
<th>Example of use</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Law of diminishing marginal returns</td>
<td>Economy</td>
<td>Anne Robert Jacques Turgot stated in 1767, that it can never be imagined that a doubling of expenditure on agriculture will double the product.</td>
<td>Brue, 1993, p.186</td>
</tr>
<tr>
<td>Curvilinear relationship</td>
<td>Numerous</td>
<td>A relationship between 2 or more variables which is depicted graphically by anything other than a straight line.</td>
<td>Marshall, G., 1998</td>
</tr>
<tr>
<td>Cognitive load theory</td>
<td>Learning</td>
<td>Performance has been shown to degrade by either underload or overload. Looks at load from complex learning tasks on working memory.</td>
<td>Paas et al., 2003, p.64</td>
</tr>
<tr>
<td>Yerkes-Dodson law</td>
<td>Stimulation</td>
<td>Experiment with mice conducted in 1908. Researched learning impairment with increased electric shock.</td>
<td>Palethorpe and Wilson, 2010, p.421</td>
</tr>
<tr>
<td>Inverted U-curve</td>
<td>Marketing/Consumer Behaviour</td>
<td>Related to available information per brand: “Total information load” leads to first an increase and then a decrease in decision accuracy.</td>
<td>Scammon, 1977, p.148</td>
</tr>
</tbody>
</table>
Kuznets’ hypothesis  Economic development  Simon Kuznets’ research results from 1955: income inequality first increases, but after a turning point it decreases.  Pessoa, 2009, p.813

The mathematical and economical basis for the inverted U-curve fits in well even for IO. Basically, with an increasing amount of information a person uses to be more productive, there will be a point where the addition of “one more unit” will actually decrease productivity (Karr-Wisniewski and Lu, p.1062). The inverted U-curve is depicted below in figure 3.

![Inverted U-curve](image)

Figure 3. Information load as an inverted U-curve (Source: Eppler and Mengis, 2004, p.326)

3 Method

In this section, information about the methodology is provided to the reader.

3.1 Research design

In designing a tool that explores personal IO strategies, the nature of this research required a pragmatic approach. This is one of Creswell’s (2009, p.6) four worldviews, which help to identify the philosophical ideas behind the research. The pragmatic worldview is an action-orientated approach to solve the research problem. Rather than focusing on one method or philosophy, this research has used many sources to gain knowledge and understand the problem.

The research was executed systematically to develop and test the instrument (Fagerström-Kareld, 2012). In accordance with pragmatism, this allowed “a freedom to choose the methods, techniques, and procedures of research that best meet needs and purposes” (Creswell, 2009, p.11).
A qualitative inquiry has been chosen here due to the researcher relying heavily on the interviewees descriptions. The key idea behind qualitative research is to learn about the problem or issue from participants. This means that apart from adopting a pragmatic worldview for the study, there is an element of the advocacy and participatory worldview (Creswell, 2009, p.9). With this approach, participants help design questions, however more importantly it will be these individuals and people like them that it is hoped will reap the rewards of the research.

3.1.1 Pre-test studies with participants
Conrad and Blair (1996) have a model built exclusively for identifying problems with questionnaires – problems which may lead to misunderstanding of questions which may end in the researcher not getting the results they were after. The model is intended for use while a questionnaire is under its draft stage. More about the model and its matrix is included in the following chapter on data analysis and interpretation.

Including others to participate in a tools development before it being used is recommended. One area that favours participation is computer systems design. Greenbaum (1993, p.32) explains that “it is a way for systems developers to get in the door with strategies that indeed increase the likelihood of more worker participation, and offer concrete suggestions for designing systems that might better fit the working environment”. This method is called “Participatory Design, (PD)”. Qualitative research results can be used by a design group to help with decision making while planning the orientation of the design (Sjöberg and Timpka, 1998, p. 182). These are the principles that have guided the development of the tool.

3.1.2 Tool development
To identify individual IO adaption and coping strategies, it was decided that the best place to start looking was to go direct to the source – the individual. From the literature search there did not appear to be a model or tool available for use. This led to the development of tool, in the form of a questionnaire, which could be used. The questionnaire starts with a short description of IO and is followed by a colourful depiction of the inverted U-curve. This was a conscious decision as not all individuals are familiar with IO concepts and terminology. This is the challenge that Smith (2010, p.1) encountered in their research. Smith’s use of visual tools helped people make associations and communicate. It was found that images enabled people to share and listen better when they had a “live” dialogue with someone else. Nicholson-Cole’s (2005, p.258) investigation found advantages with visual tools. These advantages were used and applied in the development of the questionnaire. These included the use of a visual tool to condense complex information. Time to understand content and reduced word content was deemed to be
important if someone has IO, and also for interest in completing the questionnaire. A visual tool can also be helpful to understand the word content, particularly if the respondent does not know a word – this could also be due to the questionnaire being in English and completed by a participant who does not have English as their native language. In Nicholson-Cole’s (2005, p.260) criticisms, the researcher made it clear that the questionnaire designer, albeit that they are scientifically informed, are subjective. Even with the best judgement, the expert may not present an image which appeals to everyone.

3.1.3 Questionnaire questions
The questionnaire is semi-structured and made up of open-ended questions. The questions are focussed on gaining an insight into how individuals are coping with information, two questions were asked to find out about the proactive and reactive strategies they are using. The third question is aimed at indicating which of the five constructs (person, information, IT, organisational design, task) the individual perceives as being the cause of their IO.

3.2 Data collection
A backyard research (Creswell, 2009, p.177) will be carried out where the researcher will perform a data collection within their own place of employment. It is a convenient and natural setting which incurs low costs, with the exception of time costs. The setting in this study is an office and production facility which is part of an operating company. It is also expected that it is the typical setting as to where work-related questionnaires would commonly be filled out.

Backyard research also lends itself well to be able to understand the experiences of participants. The interviews will need to find out as much as possible and this may take time, trust and follow-up discussions. The participants need to clearly say whether the tool has any problems. To do this, cognitive interviewing will be used to pre-test the questionnaire. Cognitive interviewing, an amalgamation of cognitive psychology and survey research methodology, is a method that can be used to reduce non-completion and non-response of survey questions and questionnaires (Drennan, 2002, p.58). Drennan believes it should be used where “questionnaire completion may pose particular problems” – in this case overloading possibly already overloaded people. The same researcher found that this type of interviewing lends itself well to new concepts – which is relevant as it is not expected that many participants are familiar with the inverted U-curve.
3.2.1 Sampling
First the author sought out employees who were willing to participate. Feedback about the IO diagnostic tool was gained by semi-structured interviews. Creswell (2009, p.179) identifies that one of the limitations to interviews is that “not all people are equally articulate and perceptive”. In this case, and also following Creswell’s advice (2009, p.178), the participants were “purposefully selected”. Those chosen are able to elicit views and opinions – at least according to the author’s observations. More specifically, the participant was asked to think out loud and these thoughts were recorded.

3.2.2 Participants
As in Ayyagari, et al’s (2011, p.843) study, the target population is not limited to any particular occupation. The operating company that the participants work at is small (45 employees), and many do not fit under a specific occupation – they have a set of responsibilities. These include logistics, financial, technical and manufacturing. Two of the participants are managers. Six people in total took part in the pre-study.

All the participants have information that they need to manage as part of their job process. Those that participated spend at least fifty percent of their working day at their desk in their own office. Some divide their time between office work and factory work.

The participants included both males and females. Their ages range from early twenties to early fifties. The working backgrounds of these participants are also varied - some of them have remained with the current employer since leaving school, others have had several different employers and have even worked abroad. The education level includes at least secondary school level, and a couple of the participants have gone on to study at tertiary level. None of the participants have English as their native language.

3.2.3 Empirical procedure
The interviews were done in-person. This made it convenient to visually observe the material content of the tool during the discussion. Two individual interviews were conducted and two interviews were done with participants in pairs. The participants were asked to evaluate the questionnaire (see appendix 1). Where the participants were in pairs, they were encouraged to discuss with each other what they thought of the questionnaire. The questions used to start discussions were: “Tell me what you thought?” and “How did you find the content of the questionnaire – was anything unclear or difficult to understand?” When a discussion appeared to near its end, the researcher prompted them into other areas of discussion, for example: “Why do you think such a questionnaire was created?”
Each person’s description was recorded in an interview protocol. It was the authors responsibility to interpret the replies and follow-up questions were used for clarification where needed.

3.3 Tool Testing and analysis

Perception and interpretation of the information, diagram and questions were the main items of focus. These are important parameters within the tools design. As is addressed in the first research question, a tool should be well designed to increase reliability. To allow a person’s strategy to be investigated, the tool must accurately transfer itself to the person. The analysis looked at the fifteen possible response problems that may occur with questionnaire completion that Conrad and Blair (1996) have developed. The model proposed by these researchers was chosen, not only for its appropriateness in identifying problems, but also because it can be used by researchers without extensive experience with the model. The analysis consists of three response stages and five problem types. In their model they assume that a respondent executes their response in three stages:

- understanding (understanding the question and determining what information is being requested and how to provide it);
- task performance (the mental operations to be able to produce a response); and
- response formatting (producing an acceptable response and fitting it into the response options).

The five problem categories, as developed by Conrad and Blair (1996), are as follows:

- lexical problems (e.g. understanding terms, words, idioms, meanings);
- inclusion/exclusion problems (determining whether certain concepts are to be considered within the scope of a word, or not. Such as, “doctor” – to include or exclude “chiropractors”);
- temporal problems (understanding or interpreting questions involving time periods, such as “in the last year” – to mean the last calendar year or the last twelve months);
- logical problems (caused by connectives, contradictions and presuppositions in questions which leads to confusion and response uncertainty); and
- computational problems (where respondents have difficulty processing and manipulating information, such as with memory, language, mental arithmetic and complicated question syntax).

For a more detailed explanation of each category, the articles from Drennan (2003) and Conrad and Blair (1996) are good sources. A matrix showing the fifteen cells that make up the protocol is shown in the table below.
Table 2. Response and problem matrix. (Source: Conrad and Blair, 1996)

<table>
<thead>
<tr>
<th>RESPONSE STAGE</th>
<th>Understanding</th>
<th>Task Performance</th>
<th>Response formatting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROBLEM TYPE</strong></td>
<td><strong>Lexical</strong></td>
<td><strong>Omission/Inclusion</strong></td>
<td><strong>Temporal</strong></td>
</tr>
<tr>
<td><strong>General comments surrounding the tool will also be taken into account. This will include any ideas that lead to an improvement in understanding, interpretation and motivation to complete.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.4 Validity

The use of cognitive interviewing aims to lift the views of other people, as opposed to the researcher themself dominating with their perspective. Drennan (2002, p. 62) found that the presence of a researcher creates a distraction, resulting in artificiality of the overall process. In this research, each participant was therefore allowed some time with the questionnaire to concentrate and develop their thoughts.

The interviews were limited to those that were deemed to be articulate and perceptive (see previous chapter on Sampling). By discriminating against those not equally able to voice their thoughts, this could deem the questionnaire not suitable to this part of the population.

The inverted U-curve, being diagrammatical, was assessed by the author to be a reasonable way to transfer the concept of IO. This being in contrast to reading large amounts of text as in the case of books or lengthy explanations on the topic. Although the study is concerned with IO, the inverted U-curve was not reduced to show only overload. This should not be taken to mean that by choosing to introduce the questionnaire and its topic by text would lead to invalid measurements. The inverted U-curve diagram is as attempt to define IO without words due to there being many different literal meanings. Defining IO with text rather than a diagram was avoided in this instance as it is a complex subject to define. The diagram in this case keeps the matter broad, with confusion or directing it into a specific area of work, personal attribute, etcetera – which could compromise the neutrality of this research. A diagram and open questions in the tool was designed to not exclude any individual from being measured.

The validity of the questionnaire as a tool increased, as even though the inverted U-curve is generally agreed upon by several researchers to define IO
(see chapters 2.5 – The inverted U-curve), it is still important to test this on people who have not seen it. Successful interpretation of the diagram leads the participant into the questionnaire, and allows them to consider how they can change their situation by increasing or decreasing information load (x-axis).

3.5 Reliability

Through the use of the Conrad and Blair matrix, the pre-test study of the tool could be performed again. One advantage of this pre-test was that the interviews were with the same interviewer. If another person was to interview people about the questionnaire, then it is crucial that they too listen to the judgement of the participants. Pre-testing and the use of the matrix was used to increase the reliability of participants to be able to use the tool.

Over time, the questionnaire should be re-evaluated. There may be an end to the making of many books, perhaps technology will aid our management or, it may load us with even more information. Conducting a study prior to the use of a questionnaire is relevant as long as the problem remains complex. Because IO has not been reduced to a single source, the questionnaire must reach across a broad range of the population. To increase the reliability of this study, even though the sample was within the same organisation, it was interdisciplinary. It cannot be relied upon to receive the same response from participants – nor is it the meaning of this qualitative research to do so. The aim of this tool is not to generate consistent answers. It is imperative that answers are given. It would be unreliable if the tool was not used because of unwillingness of the individual to participate, or problems leading to the participant having problems with time, health, motivation, etcetera during completion.

3.6 Delimitations/Limitations

One of the more obvious limitations to this study is actually sending out the questionnaire and getting results on how the individual is managing. On one hand, this would be interesting to see if IO is mostly hype and propaganda to sell books and enrol in courses. On the other hand, the questionnaire is a tool. It is meant to give more than statistics about how many are coping or not. Here, the individual will be treated as such, rather than being in “a percentile” or even, dare we say “average”.

Consequences of IO will not be covered here as this can be found in other journal articles. The negative effect on productivity has been studied by Kock, Parente and Verville (2008) and Karr-Wisniewski and Lu (2010). Kock, Parente and Verville (2008) also found that the quality of work suffers when large amounts of information is processed. Bawden and Robinson’s (2009, p.183) review article acknowledge that health can be damaged in extreme cases. Research that Spira (2011) conducted found that the cost of IO
can also be expressed in monetary terms. Work related stress and other health issues are not just confined to IO. Overload of work can also contribute to disharmony, as Ayyagari, Grover and Purvis (2011) explain, if individuals are required to work under time pressures and strict deadlines. All these elements of job satisfaction are important, however are not within the focus of this study.

3.7 Ethical issues

The background for the research will be openly communicated to the participants. The thesis proposal and final thesis will be available to the organisation and Linneaus University/Centre for Information Logistics. Consent from the organisation and its participants has been received for both conduct and publication. The reasons for this being that it may be used out of context by media or competitors and/or reflect poorly on the organisation.

Participant’s personal information will not be exposed unless the participant expresses a desire to do so. Any information from participants will be confidential. The data remains the property of the author and will not be shared outside the project. It is not part of any appraisal or job-related evaluation. Should the organisation require an internal evaluation of IO then they are free to utilise the published thesis in the same way they would access and gain knowledge from any published paper.

It is the participant’s decision alone in their choice of answer. The questions are not to be answered in large groups, nor influenced by the organisation or author.

This thesis and its purposes are fully intended to reduce IO and not contribute to it. Should the survey lead to an overload risk (or any other risk, such as work interruption) then the participant has the right to withdraw from the survey. This will be anonymously referred to and written into the results as “incomplete”. The same applies to people not wanting to continue.

The study is not involved in sorting the results into specific demographics, nor will brands of IT equipment, computer programs etcetera be mentioned. It will not be taken into account in any differences that may be found.

Contact information to reach the author will be supplied if questions arise. The author has, in all due care, followed the guidelines as supplied in Creswell (2009, pp.47-92).
4 Results and Analysis

The aspects that concerned the pre-study participants are reported in the following sections. Only the areas of the model that resulted in problems are presented here.

4.1 Lexical problems

With the help of the problem and response matrix, three aspects were outstanding. The first was a lexical problem in the understanding stage. One of the participants, although understanding the word “capacity”, wondered:

*What does “capacity” really mean? Is it the same as “optimal”? What is an optimal amount of information?*

A sketch was provided to the participant that showed a straight line drawn from the top of the curve to the y-axis. The original diagram was preferred. The comment was that it wasn’t the diagram *per se*, rather that emphasis was needed to show that capacity is individual. A sketch depicting Paul and Nazareth’s (2010, p.32) inverted U-curves was provided. This shows two curves of varying lengths and heights. It was used to illustrate that two individuals can have different capacities.

The questionnaires diagram gave an impression of an “optimal” information load and what people should be aiming at (i.e. the “green” area of the diagram). Without any scientific studies to back this up, it is difficult to conclude. It could be argued that the optimal, or best situation, would be achieve highest productivity with small amounts of information. It may also be that the optimum is maximum productivity at all times – independent of information load. Again, without the support of previous research it is difficult to say if optimum is defined by the task or organisation – not the individual.

4.2 Logical problems

The lexical problem led to the second problem aspect which also came in the understanding stage: the shape of the curve is a false presupposition as it does not necessarily represent the respondents own capacity. The diagram in the questionnaire assumed that all individuals have a perfect rounded curve depicting their information load and its effect on their productivity.

Upon reflection, it should be added to the diagram in the questionnaire that it is a generalisation, and it is not meant to depict an invariable rule. It is important to emphasise that an individual’s capacity is indeed individual. Paul and Nazareth’s (2010, p.32) theoretical background to their inverted U-curve provides references to “generalists that adopt a simple view, and posit that all humans are more or less similar in processing information.” However
the researchers examined the area of cognitive psychology and found that there are multiple views. There are many other researchers that suggest that there are differences in an individuals’ processing capacity because, for example, each individual processes information uniquely.

4.3 Computational problems

The third aspect came in the task performance stage. This was a computational problem that the majority of the participants found difficult. The proactive and reactive strategies questions proved difficult to answer. It turns out the participants have strategies, however concrete examples were difficult to establish. The participants gave the following reasons as to why this was so – it was because they performed them:

“...subconsciously”
“...logically."
“...by using common sense.”
“...not by doing anything in particular – I just know”.

This type of result was not a direct criticism of the tool. Upon analysis it could mean that if it is a straight computational problem, then strategies could be listed and participants asked to tick a box next to the ones they used. However it could indicate that within this population sample, it could be that they do not have a problem with IO. It could also be that amongst this group of participants, none of them have a quest to “know everything”.

4.4 Tool format

Generally the questionnaire was well received. The use of colours and a diagram plus the clear, limited amount of text was appreciated. Also worth mentioning was the unanimous relief that it consisted of two A4 pages, few questions and space to answer freely. Comments were made regarding not having time for long surveys, one of the participants explained this clearly:

“If I get a survey with several pages full of questions then it goes straight into the bin!”

Others explained their perceived difficulty with Likert-type scales:

“Whenever I have to fill in one of those I always feel like my answer is in-between the ones given.”

“Those are not very good, my answers are always defined by what mood I am in that day”.

The colours on the second page with the questions was deemed unnecessary to one participant, however another participant appreciated the
colourful background. One participant wondered if there should be a numeric scale on the curve, for example with “10” at the top and negative numbers ascending down the curve on both sides (-9, -8, -7 etcetera). The same participant also had the following colourful suggestion:

![Inverted U-curve suggestion.](image)

Upon the results showing an unexpected problem of information “underload”, the addition of orange and red on both sides is plausible. Too little information is as undesirable as too much.

The area of information management and in particular IO was a topic of discussion that was rarely entered into, according to the participants. Two of the participants commented that the questionnaire could be used as a discussion “starter” with colleagues as a way to learn from others. One person did have colleagues with whom they could “air” problems regarding information with.

Much of this paper has talked about “individual” adaption and coping, because this is very complex and very individual. However this doesn’t mean that the individual has to go it alone. Just by using the tool as a starter and discussing it with one or two colleagues can be enough to see that they are not on their own. Team-working can be another alternative, as Newell et al (2009, p.82) point out, “the whole may be more than the sum of the parts”. Especially cross-functional team-working as a diverse range of individuals can create ideas which go beyond what any single individual could have produced individually (Newell et al, 2009, p.82).
4.5 An unexpected response

The biggest response that emerged from the questionnaire surrounded the inverted U-curve diagram. The reflection time over the diagram led to thoughts that it was more often a case of information “underload”, than information overload.

“I have always thought that my problem was that I had too much information, but now that I think about it, it’s because I don’t have enough.”

Too little information seems to cause low productivity and problems with decision making. The diagram does show that too little information has the same effect on productivity as does too much information. Although this is not the scope of this research, due to more focus on IO in information management literature, it is interesting to note some of the comments from participants. Decision making and thus productivity problems arise when the source of the information is unclear, or not defined. When some of the participants needed information, it was not always known where to find such information or who to turn to.

“I spend most of my time chasing people for information, only to find out in the end that they don’t have the information I needed anyway!”
5 Discussion

The main idea behind pre-testing a questionnaire and why many researchers acknowledge it is to identify problems, or if you will, “identification of questions that may elicit response error” - courtesy of Drennan (2003, p.59). In some cases, this pre-testing can potentially have life and death significance (referring to a bowel cancer questionnaire “screening” conducted by Pugh and Porter, 2010, p.175). Tool development is successfully done with pragmatic research. PD and cognitive interviewing allowed those of whom the tool are intended for, to reap the benefits of their peers participating in a pre-study.

Although the object of this study could be related to predicting stress and other health issues amongst those with IO, it was designed to be sensitive to the possibility that a respondent is indeed overloaded with information. The use of the large, clear and concise text, along with attractive colours and an explanatory diagram was appreciated. Having only a few questions to contemplate was popular amongst the pre-test participants. This was satisfying to hope that motivation to complete the questionnaire would thus be high. In addition, the choice to not attempt to reduce the IO research to a specific demographic was fitting, as this would have lead to a longer questionnaire. Number of questions, type of questions and time to complete was unfortunately not amongst the Conrad and Blair matrix – motivation to complete a survey is important, but the scope of this study was not dedicated to this area.

Asking people to respond to questions about their proactive and reactive strategies does not generate automatic answers as would be the case when asking someone their name, age, gender, etcetera. The claim that some of the participants subconsciously manage their information could still be classified as a minor computational problem. The reasoning behind this lies within the indication that information management is not a regular topic of discussion at some workplaces – if at all. The subconscious management could be difficult to explain amongst those who have not needed to address it “consciously”.

In summary, there were no major problems identified and the pre-test participants were generally satisfied with the questionnaire. Essentially, even though strategies may be difficult to identify, it still is a stepping stone to being more aware of information management – even increasing interest in the subject. If more emphasis is put on the person construct part of the causes of IO, perhaps the individual could further develop their strategies. With more knowledge, the individual has the power to adapt and cope even better - *Scientia potentia est*.
6 Conclusion

This study aimed to devise a way to check how individuals are adapting in their quest to manage an ever increasing amount of available information. A tool was designed to explore people’s IO reduction strategies. Even with results of other research behind the design of the tool, a pre-study test was carried out. The research questions were focused on these preparations.

6.1 Conclusions

The research findings had the outcome expected of those who qualitatively pre-study their tools: prior testing is recommended. Even the most well researched and carefully thought out design can have problems, as in the case of the tool in this study.

Using pictorial help in tools may not always be suitable or even needed if the topic is well defined. However it provides the participant with understanding in a way that is more effective than reading explanatory text. This studies’ topic of IO is complex, thus the inverted U-curve served well to describe the theory. The use of the diagram was well received.

It was shown that even though a sample of “articulate and perceptive” people participated, there was a computational problem with the questions regarding their strategies. The use of a model to identify and eliminate response problems was a large contributor to the development of the questionnaire. The model used in this case was the Response and Problem Matrix (Conrad and Blair, 1996).

In conclusion, good tool design gets the researcher closer to what they are after and improves participant reception.

6.2 Further studies

Based on the findings of this work, it is proposed that research into the problem of information “underload” should be conducted. The term information underload may not be the correct term, or the problem may not lie within the area of information management. Certainly a Google search turned up only 27,400 (0.28 seconds) hits for “information underload” compared to 3,810,000 (0.15 seconds) for “information overload”. One proposal could be to start with a study of the recent work by Swigon (2011) who sought to define the term “information limits”. Swigon also found it difficult to search within this area as different terms are given. The phenomena of information limits (for example barriers, obstacles, access to information, information flow, etcetera) does seem to have similar characteristics with the term “information underload” from this study.

In regards to the tool, one proposal for this is that a further page in the questionnaire could have been allocated as a “wild card” (Smith, 2010, p.2).
Smith used a wildcard to allow participants the opportunity to add an idea or topic that was not represented. Even though the questionnaire is focussed on IO, this would allow the individual to add any other information management comments, such as, difficulty making decisions as information is lacking. It is encouraged that a wild card, plus the other improvements found from the pre-study, be added to the tool. The tool could then be used in a second round of pre-testing, or even used directly by interested parties.

The literature reviewed for this research created a dark picture of IO due to increasing information load. Girard and Allison (2008) could not conclude that there is a problem. This researcher is less convinced than to begin with that IO is a problem! A theory worth looking into is: who is doing these studies and why? Not all authors have provided their background in the articles they submit, however at quick glance, they all seem to have a background in information management, information science, IT, communication, information systems, business, business management, education, information studies, knowledge management and not one of them in psychology. A suggestion is that the study of people should include the experts that know people best. At the very least, the cognitive psychologists could study how some people use “common sense”, whereas others are overloaded with information. The problem is not exclusive to business and commerce, so why should the research be?
References


Appendix
Information Overload (IO)

IO affects our productivity (decision making ability). Here is a key to what each coloured area represents:

**Green** - our individual capacity to process information.

**Red** – too much information.

**Yellow** – too little information.

Please take some time to reflect over the amount of information you encounter in different situations in your daily job. Then turn over to answer the questions on the next page.
What lies behind your ability to operate at capacity?

- What do you do to prevent IO from occurring? Or if you like, what do you do to stay in the “green” area and avoid the “red” area?
  Please describe any proactive strategies you use:

- If IO has already appeared, what do you do to combat it? Here we are looking at when you are in the “red” area and need to reduce the load back to the “green” area. Please describe any reactive strategies you use:

When you are not operating at capacity, please describe what you perceive to be the cause of this: