Digital Workplace

*Information overload: User perspective and application of artificial intelligence*

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Abstract

Information overload is a well-known phenomenon and researchers from the different field have identified the related factors based upon their interpretation and their respective field of specialization like psychology, information system, organizational studies, social structure and accounting. Aim of this qualitative study is to investigate user experience, their perception and opinion about the factors responsible for information overload in today’s digital workplace and how artificial intelligence is used in the organization to overcome information overload. An interpretive method is used in this study to capture the perception and experiences of users. This study has been taken place in a knowledge-intensive organization. Total seven users were interviewed, and the convenient sampling method was used to select the participants. Interviewees were selected from different job profile, age and varied years of experience to seek representation from diverse perspectives on the topic. Lichtman Thematic analysis method is used for data analysis.

This study finds that despite all technological advancement at the workplace, information overload is still a problem and should be a priority for an organization to address. We have seen some good feedback of the tools with embedded intelligence which motivates the organization to explore the use of artificial intelligence more to make information processing easier and more accessible to the right recipient.

This study also helps us to understand the need for intelligent tools at the digital workplace to manage and filter the required information to reduce information overload. The tools which can learn user behaviour and can act automatically without manual interference, augment with human intelligence and plays a vital role in reducing the overload. Even every participant was not aware of the features which are inbuilt inside the tool but over time can sense that they are getting right and accurate information.
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1 Introduction

This chapter introduces the background of the digital workplace, information overload and artificial intelligence. After the background description, the purpose of the study and research questions are defined based upon the gaps found during background discussion. This chapter concludes with the topic justification, the scope and limitations of this research as well as the structure of the thesis.

1.1 Background and Problem Area

Information flow was started with the invention of written language and propelled by the printing press in the 1400s (Dewar, 1998). The printing press was the first true one-to-many communications medium and for a long period, it has been the most widely used and accessible medium to distribute information within an organization. Introduction of computers and the availability of internet at the workplace was the first step towards information digitization and digital workplace (Lowe, 1991). Computer networking was true many to many communication mediums. With the invent of mobile technology, Computer networking has been transformed into mobility and then to always availability (Dery and MacCormick, 2012). This evolution of information flow helped to digitise knowledge and information which became available to employees on intranet through connectivity (Benson, Johnson and Kuchinke, 2002).

The modern information age (also known as the Computer age, Digital age or New Media Age) has led to the fact that information and communication processes have become the driving force of organizational evolution. Web 2.0, social collaboration through Wikis, portals, and social media have become an integral part of the workplace (Köffer, 2015) which helped the free flow of information within and outside the organization. This transformation of the workplace has not only changed the business rules of creating value but also converted physical boundaries of a workplace to virtual, gave freedom to work from anywhere anytime (Ware and Grantham, 2003).

Rapid entry of new communications and collaboration tools like Wiki, web 2.0, skype for business, Microsoft team, SharePoint, OneDrive etc converting workplace from connected to the hyperconnected workplace (Deloitte, 2018). Deloitte (2018) has defined hyper connectivity as a point where connectivity between tools and employees become inversely proportional to productivity. In other words, a hyper-connected workplace can damage teams’ productivity.

Neuroscientist Levitin (2015) in an article shared the analysis of the effects of information overload on the brain and our tendency to try to multi-task. The author argues that we easily become distracted by the information coming through different channels and even addicted to relatively trivial things (like checking emails, texts, wikis, portals) which takes time and energy from the important tasks. This is the same problem that employees are experiencing in the workplace.

All these changes in workplace generate more information that employees can possibly digest. This information overload is a defining problem of today’s workplace (Rosen and Samuel,
2015). Because of reliance on multiple devices like computers, tablets, smartphones; employees are constantly bombarded with messages, emails feeds, documents and meeting alerts. Due to this employees waste time, attention, and energy on unimportant information and interactions, staying busy but producing little of value (Rosen and Samuel, 2015). This is defeating the most important purpose of adopting all this development at the digital workplace, which is to maximize employee productivity (Zhang and Venkatesh, 2013; Köffer, 2015). Artificial intelligence (AI) technology has a capacity to classify information by usage pattern (Anandarajan, 2002). AI interacts with different applications in a similar way that people do. It can read data in excel, log into a system with its own ID and password, enter data, and log out again. Automation supported by AI can be used to read, segregate and summarise huge amount of the information in simple terms. Technically artificial intelligence uses complex algorithms to recognize patterns in the data to recommend/perform actions.

This study investigates the user-perceived factors causing information overload in a Sweden based information-intensive organization. Furthermore, this study also investigates how the organization is using artificial intelligence to overcome information overloading.

1.2 Purpose and Research questions
The digital workplace has given the freedom to work and to have access to information from anywhere, anytime. This has provided many opportunities to improve efficiency and productivity but at the same time it has opened floodgates of information, which has not been witnessed before (Ismail, 2017). Purpose of this study is to investigate the employee’s perception about the factors that may cause information overload due to increase in information flow from all directions and how an organization is using automation supported with artificial intelligence to reduce unnecessary information flow.

Hence to attain the objective of this study, the following research question will be explored

- What are the employee perceived factors causing information overload in today’s advanced digital workplace?

- How artificial intelligence can help users to reduce information overload inside the organization.

1.3 Topic Justification
Information and communication technologies (ICT) not only evaded workplace but also affected social and personal life (Ayyagari, Grover, and Purvis, 2011). Usage of technology in personal and social life encourages an employee to adopt the same at the workplace and raise expectation towards the organization to integrate these tools and devices with the workplace environment. By integrating various tools and devices to make the workplace accessible from anywhere, over the time organizations has gained a lot of productivity (Brynjolfsson and Hitt 1996; Dos Santos and Sussman 2000; Kudyba and Diwan 2002 cited in Ayyagari, Grover, and Purvis, 2011). But this gain came with a cost. All information around us has a meaning but not for everyone. A
piece of important information for one can be noise for others so it is very important to find the right recipient.

With so many collaboration tools around, information is coming from all directions. Finding right and quality information is a challenge for employees. It not only wastes energy and time but also contributes to stress. This stress is not only because of different ICT tools as mentioned by Ayyagari, Grover, and Purvis (2011) but can also be due to excess information flowing within an organization.

Just like social media, web2.0 has allowed employees to create, publish, exchange, share, and collaborate on information and knowledge (Wang, 2011). These corporate social networks and collaboration tools are flooding employees with information and possibly information overload. Not only the quantity but also the quality of information is of importance for the experience of information overload (Drössler et al., 2018). Implications of this information overload on society and individuals are studied by many scholars (Bright, Kleiser & Grau, 2015; Feng et al., 2015; Sasaki, Kawai & Kitamura, 2016; Lee, Lindsey, and Kim, 2017). Majority of studies focused on the phenomenon of information overload due to e-mail communication (Ingham, 2003; Soucek & Moser, 2010; Reinke & Chamorro-Premuzic, 2014; McMurtry, K., 2014) and technology overload (Karr-Wisniewski & Lu, 2010; Stich, J.-F., Tarafdar & Cooper, 2018).

There are very few studies talking about information overload due to newly introduced collaboration tools like Yammer, Microsoft team, office 365 etc. Researchers over a period have made a lot of effort to study the different ways of collaboration and knowledge management in an organization but managing information overload is an unexplored area. In this paper, an employee’s perception of information overload will be studied. It will also be explored how the organization is using artificial intelligence to overcome information overload. The study is carried out in a Sweden based information and technology-intensive organization.

1.4 Scope and limitation
Scope of this study is to investigate the user-perceived factors that cause information overload in the advanced digital workspace. The study is carried out in information and technology-intensive global organization. Based on the user interview and feedback it is also investigated how artificial intelligence is used in an organization to improve information filtering and provide accurate information to employees.

The study is conducted with the participation of employees who are using different collaboration tools in the workplace with the help of semi-structured open-ended questions. Semi-structured interviews are conducted with the users in the organization and leadership team which is responsible for strategic decisions to adopt different tools in the digital workplace.

Limitation of the study is its concentration only on the use of digital workplace within the organization. There are users of the same tools from various partners (outside the organization) that are not covered in this study such as suppliers and customers. Due to a huge number of employees, it will not be possible to cover all. Interviews were carried out only a few Sweden based employees due to geographical limitation. This study is conducted in Sweden only and may not be applicable globally due to the different scale of ICT literacy in different countries. Additionally, the findings of the research can’t be easily generalized, since each organization has
its own culture, industry dynamics, security concerns and limitations that drive their strategies to adopt tools for the digital workplace. Furthermore, the implementation of suggestions is out of the scope of this study which is performed for Academic purposes.

1.5 Thesis Structure
The thesis is divided into the following five chapters

Chapter 2: Literature Review
This chapter introduces the literature review which is the basis of this study. More specifically this section explains about concepts of information overload, its factors and how it can be measured, Digital workplace definition and its components and definition and usage of artificial intelligence in today’s digital workplace. This chapter concludes with the motivation and the outline of the literature relevant to this study.

Chapter 3 Methodology
In this chapter, the philosophical tradition and the methodological approach adopted for this study are described in detail. Additionally, data collection methods, research settings and data analysis methods are also described. This chapter concludes with the approach adopted to ascertain the validity, reliability and ethical considerations.

Chapter 4: Empirical Results and Analysis
In this chapter, the empirical findings from the interview analysis are presented. This chapter concludes the detail description of five identified themes from interview data analysis.

Chapter 5: Discussions on findings
In this Chapter relevance of five identified themes during data analysis are discussed thoroughly in connection with existing literature. This section ends with the discussion on how these identified themes answer to the two research questions.

Chapter 6: Conclusion
In this chapter conclusion of this study is presented. This section concludes with two important topics which talk about the reflections and the future research that can be carried out further in this area.

2 Literature Review
This chapter introduces the literature review which is the basis of this study. More specifically this section explains about concepts of information overload, its factors and how it can be measured, Digital workplace definition and its components and definition and usage of artificial intelligence in today’s digital workplace. This chapter concludes with the motivation and the outline of the literature relevant to this study.

The workplace has been transformed in several ways over the last years. Technology introduction has not only changed ways of working but also had an impact on mentality i.e. from always connected to no chance of escape (Köffer S., 2015). Following sections summarise the
literature review on different aspects related to information overload, digital workplace and artificial intelligence.

2.1 Information overload

2.1.1 Concept
An individual can receive information from either pulling information, or being pushed information (Jackson and Farzaneh, 2012) as shown in figure1. Pushed information is information that the recipient in an organization receives and has little or no control over. It may be pushed through emails, instant messengers or through different IT and collaboration tools. Pulled information is information that is on-demand and can be searched and used when required by the recipient (Kirsh, 2000 as cited in Jackson and Farzaneh, 2012). Intranet, Internal Wiki, shared documents are normally the source of pulled information.

Access of information is crucial for the success of an organization but a growing amount of information also creating a challenge to find and share quality information. This phenomenon is defined as information management paradox by White (2012). Adopting hyper-connectivity is creating challenges for both individuals and organizations in achieving both productivity and personal wellbeing (Dery and MacCormick, 2012). MacDonald (2002) supports this argument and argues that organizations and employees are threatened by information attack and need immediate attention.

Information overload is a situation when an employee feels overwhelmed by the quantity of information s/he must deal with at the workplace (Stanley & Clipsham, 1997). Professor Bertram Gross has first used the term “information overload” in 1964 (Renjith, 2017). However, the information age and availability of powerful and low-cost data collection techniques & tools are generating more information than at any other point in history. Information can be generated, distributed or duplicated with almost no cost (Hemp, 2009). Today boundaries of information are not defined by technology but by our own biology as our brain has a limited capacity of information processing (Klingberg, 2009). MacDonald (2002) argues that an intelligent community of workers no longer suffer from information scarcity but from information overload. Information overload can cost an organization to suffer from poor decision making or mistakes.
made by the employee. Consequently, it can result as increase levels of stress and bad health at work for an employee (Stanley & Clipsham, 1997).

Ireland (1997) has defined information overload a point where productivity no longer rises with improved information flows. Further increase of information can cause confusion, exhaustion and can push employees to make errors with their own work. The author has used the below figure (Figure 2) to show the relation between productivity and information.

![Figure 2 Information vs Productivity](image)

Figure 2 Information vs Productivity

Source: Adapted from Ireland (1997, pp. 2)

The author argues that during the initial phase, the right information increases the efficiency but as information flows increase, the user may find itself in a situation where s/he struggles to digest the available information. Increase in information flow beyond this point can increase the confusion and exhaustion with the user which force for more mistakes and drops in productivity.

### 2.1.2 Factors and measurement

The theories about information overload are mainly based upon characteristics of information, individual and task such as the amount of information, information processing capacity and time constraints (Jackson and Farzaneh, 2012). Information can not only measure with the amount, but it also has another factor like the quality of information. Jackson and Farzaneh (2012) have developed an information overload conceptual model to measure information overload which is used in this paper as a theoretical framework to understand user perception about information overload. The conceptual information overload model is based upon seven factors which are divided into two categories i.e. ‘For’ category which increase the likelihood of information overload, ‘Against’ category which decreases the possibility of information overload. Seven factors which affect information overload are:

**Quantity of Information:** Quantity of information is the information which is available or can be accessed through any available medium. Same information available from a different source can increase the quantity of information with no use.
Characteristics of information: Characteristics of information are defined by its complexity, ambiguity, uncertainty and novelty (Schneider, 1987 as cited by Jackson and Farzaneh, 2012). Complex and ambiguous information needs more time and processing capacity than simple and straight information.

Quality of information: Jackson and Farzaneh (2012) have associated quality of information with relevancy and validity. The information which can withstand in any situation is valid information while relevancy can be defined as important information in a situation.

Information processing capacity: Author has defined information processing capacity as the amount of information which can be integrated into a decision-making process. Information processing capacity of an individual depends upon the knowledge, experience and other personal factors.

Available time: Information processing capacity also depends upon the available time with the individual to complete a specific task.

Task and process parameters: Nature of task and different process parameters also determine the information overload situation. Jackson and Farzaneh (2012) have defined interruption as the main property of the task which can contribute to information overload. The information which has notification associated with it has higher chances of increasing the cognitive load (Speier, Valacich and Vessey, 1999).

Personal Factors: Different personal attributes like skill, motivation, and personal situation plays an important role in defining the information overload. For example, previous knowledge and experience can increase the information processing capacity while a particular negative personal situation can hamper the processing capacity.

Based upon the above seven factors, Jackson and Farzaneh (2012) have suggested conceptual information overload model shown in figure 3.

Jackson and Farzaneh (2012) have divided all factors responsible for information overload in two categories which are intrinsic factors and extraneous factors. Increase of factors shown on the right-hand side of figure 3 which are defined as extraneous factors results in increasing of information overload. On the contrary increase in intrinsic factors shown on the left-hand side of figure 3 cause a decrease in information overload.
Tipping Point: Jackson and Farzaneh (2012) have defined a tipping point as a point where the state of overloaded changed to not overloaded or vice versa.

Each factor mentioned above has its own contribution to information overload. Increase in one of the factors can increase or decrease the likelihood of information overload. Jackson and Farzaneh (2012 pp.12) have defined the following law of interaction to use this model

Law 1: Information Processing Capacity, Characteristics of Information and Available Time, cooperate with each other to decrease the probability of information overload occurrence.

Law 2: Quantity of Information, Quality of Information, Task and the Process Parameters, and Personal Factors cooperate with each other to increase the probability of information overload occurrence.

The whole conceptual model has the following two system states

Not Overloaded: If an individual can handle the Quantity of Information that needed to process then system state will be in a not overloaded state.
**Overloaded:** If the individual cannot handle the Quantity of Information that they receive and becomes overloaded by information.

Jackson and Farzaneh (2012) has constructed the following formula based upon an above-mentioned conceptual model

Information Overload =

(Characteristic of Information x Information Processing Capacity x Available Time) -

(Personal Factors x Task and the Process Parameters x Quality of Information x Quantity of Information)

2.2 Digital Workplace

2.2.1 Definition

Primarily, the introduction of information technology in the organization has introduced information overload due to its ability to produce more information quickly and to distribute this information to the wider group with no cost (Speier, Valacich and Vessey, 1999). This introduction of information technology in an organization has also given birth to a digital workplace. Benson, Johnson and Kuchinke (2002) defined digital workplace as computers and internet access available to the employee at their workplace as it was an era of starting digitization of manufacturing industry. One year later Ware and Grantham (2003) realised that information is stored online and to make use of this information, the collaboration between different departments in an organisation is an absolute requirement. So, the author defined digital workplace as deep coordination and integration between Corporate Real Estate/Facilities, Human Resource Management and Information Technology Management.

Till 2009 digital workplace was confined to computers and intranet at the workplace but after that thought leaders began to explore new words beyond the term “intranet” to refer to broader issues than just a company’s internal website for employees (Freed, 2015). Tubb (2013) has moved away from the intranet and defined digital workplace as tools provided by the organization. This was a broader definition from Tubb but defined cleared boundaries around the concept as “tools provided by organization”. With the advancement of technology in society, individuals have started to use its personal tools to do their daily job which overlaps with tools provided by the organization. This overlapping raised the expectation of employees to integrate these tools with the workplace to have the freedom to work from everywhere. They expect their digital workplace to adapt to their lifestyle, it can be a big computer screen when the employee is in office, changed to the smartphone when in café and can change to the laptop when at home. So Freed (2015 pp.3) in a blog on digital workplace group has provided following definition of the digital workplace.

“The digital workplace is an individual person’s personalized, a customized collection of computerized devices, commonly used software and connectivity solutions.”
In same year Rossi (2015) raises the bar of the digital workplace and suggests that internal users of the information system should be treated like customers and should have consumer-like computing environment which can facilitate innovative and flexible working practices. As the structure of the workforce evolves to the gig economy, Perks (2018) expressed the need to have a common platform and infrastructure for internal and external communication, collaboration, sales and delivery. Definition of the digital workplace is still evolving as per the need of changing requirements, evolution of new organization structure and technologies. Today, the digital workplace is about the basic personal tools available to create, share, collaborate, communicate and store. After reviewing all the literature on the digital workplace, the definition can be summarised as

A Digital Workplace links people, organizational structures and work processes with technology to create an exciting, affective and social, collaborative business work environment.

2.2.2 Components
Not only the new generation of employee’s value independence, creativity and flexibility than anything else but they are also moving toward freelancing (Glaumann & Björd, 2017). To keep pace with these changes’ organizations, need to adopt different digital tools and components. The different authors have concentrated on four main components of the digital workplace which are collaboration, communication, connectivity and productivity.

Collaboration: Collaboration is much talked about and most focused concept in the digital workplace. Jeffrey Bier in 1996 has provided the concept of first collaboration applications called eRoom to minimise eLearning curve for new tools (White, 2012). Over time many software applications like instant messaging, wikis and social media applications were introduced at the workplace to enable collaboration between flexible workforce.

Communication: Use of efficient collaboration technologies, such as social media or group support systems enable efficient communication between employees (Köffer, 2015). At the same time, efficient communication tools like video conferencing and internet access enabled with Wi-Fi makes collaboration technologies easy to work. Internet access, computers and different other devices make communication better between employees.

Mobility: Köffer (2015) has defined Mobility as managing the introduction of mobile technologies in the workplace, as well as supporting mobile workers in their work practices. Mobility over time has been shifted from being mobile to connected to information all the time. Mobile technologies are making collaboration application to be available in non-work settings and allowed employees to stay connected to work virtually from everywhere (Dery and MacCormick, 2012).

Productivity: The digital workplace technologies provide excellent opportunities to enhance productivity and is widely acknowledged as an important organizational asset for optimizing knowledge worker productivity (Köffer, 2015). Introduction of cloud services, big data mining and other products is helping employees to work efficiently to increase productivity.

Most of the collaboration and communication capabilities provided to fulfil the purpose of the digital workplace has enabled positive outcomes such as interoperability, productivity gains, and
access to greater quantities of information at a faster pace (D’Arcy, Gupta and Tarafdar, 2014). However, an increased number of tools at the digital workplace has generated more information which in turn created another problem known as information overload and multitasking. Overuse of digital tools, collaboration and digital interaction among employees has generated an unintended information can cause collaboration overload (Cross & Grey, 2013). The author concludes that collaboration overload increases stress and impact innovation and productive capacity negatively.

2.3 Artificial intelligence

2.3.1 Concept
Artificial intelligence (AI) is as old as computer and this name “Artificial Intelligence” was first used by John McCarthy in 1956 (Tecuci, 2012). With the development of technology concept of AI has also been developed over time. A calculator which can do the calculation much faster than the human brain while making almost no mistake can be seen one type of AI. So, AI was started as a computer algorithm which can calculate and give the desired output. With the advancement in computing processing power and its ability to handle big data set, AI is now more relying on data sets than on algorithm ((Tecuci, 2012). Smartphones which are smarter than a calculator has taken the definition of AI to another level. A smartphone can talk and interact with the human through natural language processing, can recognize a face, can remind for an important event and can do many more intelligent things. Stone et. al (2016) conclude that AI brings new technology into everyday life and as people become more comfortable to this technology, it stops being considered AI, and newer technology emerges. Stone et. al (2016) argues that the same pattern will continue in the future as AI does not deliver a life-changing product but add increment value in our daily life. Stone et. al (2016 pp. 4) has defined Artificial Intelligence (AI) as

A science and a set of computational technologies that are inspired by—but typically operate quite differently from—the ways people use their nervous systems and bodies to sense, learn, reason, and act.

So Artificial intelligence is making machines more intelligent, and this intelligence is based upon the fundamentals of human nervous system functioning. This intelligence function helps the machine to learn, function and adapts with its environment.

2.3.2 Artificial intelligence and information overload
Artificial intelligence is designed to make information processing automatic and easier and as productive as possible (Rosen and Samuel, 2015). A lot of information which is generated by different mediums like human activities and sensors can cause huge overload for a human while same information can make a machine more intelligent and helps human to take better and timely decision. One of the examples is healthcare industry where useful information from personal monitoring devices and mobile apps, can be collected and processed by computer with help of artificial technology and helps doctors to enable more finely-grained diagnostics and treatments for both individual patients and patient populations. Collie (2005) has outlined that after solving one problem which was to collect the right data, artificial intelligence is helping to
extract the meaningful information from the big data and reduce the information processing load on human.

Tools with artificial intelligence have the capacity to sort and limit the information you receive and streamline the work of reading, responding to, and sharing (Rosen and Samuel, 2015). AI embedded in the email or any tool can classify the communication which needs immediate attention based upon your reading and response time history.

Stone et. al (2016) in their report “Artificial intelligence and life in 2030” has identified two major application of AI in the workplace which are creating collaborating system and crowdsourcing. The collaboration system is about developing autonomous systems that can work collaboratively with humans. Authors believe that human and machines can complement each other in solving complex problems in the workplace. Crowdsourcing is about augmenting computing power by utilizing human intelligence to solve problems that computers alone cannot solve well. It is about the division of task between human and computers based upon different capabilities and costs.

Maes (1995) in the research paper “Agents that Reduce Work and Information Overload” has described computer programs that employ Artificial Intelligence techniques can act as personal assistant to provide active support to a user to reduce information overload. Meeting scheduling, electronic mail handling, electronic news filtering and selection of entertainment are some areas described by the author where these computer programs can provide personalized assistance with. These computer programmes acquire their competence by learning from the user as well as from agents assisting other users.

Many big organizations are using artificial intelligence to process and screen huge information coming in the form of profile or CV (Marr, 2019). This collaboration between human and machine to augment each other helps employees to do their job efficiently by reducing or filtering information.

2.4 Outline of Literature relevance to the study
The literature reviewed in this section is tightly related to the subject of this study and the research questions. This study is based upon three main concepts which are Information overload, digital workplace and artificial intelligence. Digital workplace and information overload concepts are investigated in detail to understand the relationship between both. Then artificial intelligence and its usages in the digital workplace are investigated to get the insight of the study field.

3 Methodology
In this chapter, the philosophical tradition and the methodological approach adopted for this study are described in detail. Additionally, data collection methods, research settings and data analysis methods are also described. This chapter concludes with the approach adopted to ascertain the validity, reliability and ethical considerations.
3.1 Philosophical Tradition
Johannesson and Perjons (2014) argue that positivism and interpretivism are the two most established research paradigms in information systems.

**Positivism:** Ontologically positivism assumes a reality that exists independently of human actions and experiences (Johannesson and Perjons, 2014). Positivism believes to explains regularities among phenomenon through cause and effect relationship, independent of context e.g. people, time or place. Epistemologically, positivism believes that objective knowledge about the social world can only be obtained through observation and experimentation (Johannesson and Perjons, 2014). Researcher in positivism should only be a neutral observer not a participant to avoid bias in findings due to personal interest or background. Johannesson and Perjons (2014) argued that methodologically preferred methods for collecting research evidence are large quantitative studies including interviews and questionnaires. To get objective knowledge about a subject, experiments are also highly recommended research strategies (Johannesson and Perjons, 2014). Due to the very objective aim of positivism, it fails to capture the subjective construction of social phenomenon.

**Interpretivism:** This concept was introduced by German sociologist Max Weber, who claimed that the social world, including social actions, is a result of people action and can only be understood through grasping the subjective meanings and purposes of these actions (Johannesson and Perjons, 2014). Ontologically, interpretivism believes that the social world around us does not exist independently and is a result of collective human actions. As the social phenomenon is a result of human actions so a deep understanding of a social phenomenon can be achieved by actively participating in that phenomenon together with the people who create it (Johannesson and Perjons, 2014). Epistemologically, the researcher should become a member of the culture or group being studied by participating in their daily practices. Methodologically, case studies, action research and ethnography are preferred research strategies for interpretivism.

The research approach adopted for this study is of interpretive nature since the purpose of this study is to understand user perception rather than test a hypothesis. With the interpretivism paradigm, individuals seek understanding of the world in which they live and work, develop subjective meanings of their experiences—meanings directed toward certain objects or things (Creswell, 2014). Information overload in the digital workplace environment where employees works are very dependent on their experience, knowledge and social construct and very dynamic in terms of human variables and workspace setting. As interpretive paradigm meets the requirement of the research, so it is best suited for this study as a research approach.

3.2 Methodological approach
According to Creswell (2014), qualitative, quantitative are the two most commonly used research methods.

Quantitative method is used to test objective theories by examining the cause-effect relationship among variables (Creswell, 2014). These variables are normally numbered data which are analysed with statistical tools. Most common methods used for the quantitative study are surveys, questionnaires and controlled laboratory experiments. Quantitative research methods are appropriate when ‘factual’ data are required to answer the research question; when associated
variables can be isolated and well defined and when the question or problem is known, clear and unambiguous (Hammarberg, Kirkman, Lacey, 2016)

Qualitative method is used for exploring a social or human problem by understanding the individual and group behaviour in a certain setting (Creswell, 2014). Most commonly used methods for qualitative studies are case study, action research and ethnography. Participation observation and non-participation observation.

Qualitative methods are used when questions about experience and perspective need to be answered from the standpoint of the participants (Hammarberg, Kirkman, Lacey, 2016). Since the purpose of this study is to understand the user-perceived factors for information overload and how artificial intelligence is used to reduce it, methodologically qualitative study is adopted as a research method an interpretive paradigm. Use of qualitative research method provided the opportunity to capture the real-life experiences of the participants about the information overload. It also allowed understanding how the observed organization is using artificial intelligence to reduce overload.

3.3 Data collection methods
The interview is selected as a data collection method as it gives access to attitudes, feelings, beliefs and reactions (Kennedy, Elgesem, & Miguel, 2017). Interviews also help to produces the data through interaction and participant may take the initiative to open about the topic and can touch different aspects which are not thought by the researcher (Gibbs, 1997 cites in Kennedy, Elgesem, & Miguel, 2017). Face to face interviews constitutes the primary source of data collection and are also the foundation of final findings. As the purpose of this study is to seek participants view on a focused topic, semi-structured interviews with open-ended questions are done with employees in the organization to acquire as much qualitative data as possible.

Interview questions were designed to understand the user perception about information overload and how they are using AI to overcome this. Participation was voluntarily and based upon interviewees willingness. Meeting invitation request was sent by email to 12 individuals but finally, seven has accepted and gave consent for discussion. All participants were based in Stockholm and having different job title, position and years of experience.

3.3.1 Interview Process
Interviews are conducted in participants office as it was most convenient for them. All interviews are done during office hours and meeting invite was sent after finding free time slot from participant’s outlook calendar and after taking their consent for that time slot.

Total seven Interviews were conducted between 23rd March to 25th April. All interviewees were in English and audio was recorded for five as two interviewees were not comfortable with audio recordings. Hand notes were taken for these two participants who denied for audio recordings. Profile distribution and job role of all seven participants are summarised in table 1.

<table>
<thead>
<tr>
<th>Interviewee 1</th>
<th>productivity and collaboration manager</th>
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Table 1 Interviewee distribution
**Productivity and Collaboration manager:** Job role of productivity and collaboration manager is to create and ensure Stakeholder value and satisfaction through efficient collaboration tools. The main purpose of this role is to support, directly or indirectly via the unit resources and to understand and align to overall workspace Processes, Models and Strategies related to collaboration.

**Digital Workplace manager:** Main purpose of this role is to support, directly or indirectly via the unit resources and to understand and align to overall digital workspace Processes, Models and Strategies.

**Digital Workspace transformation manager:** Main purpose of this role is to support digital Workplace manager to formulate, align and existing ways of working with upcoming new tools and technologies.

**Manager, Sourcing:** The Sourcing Manager creates and secure Customer value and satisfaction through the efficient execution of the sourcing process, achieved by developing the Sourcing organization and driving operational efficiency in alignment with the sourcing Processes and Strategies. The Sourcing Manager also manages the respective units’ performance, working towards Sourcing targets, approved and aligned with relevant stakeholders, using approved strategies, processes and tools.

**Support specialist:** Support Engineer works to provide solutions to problems that have been reported by customers according to established processes and contracted Service Level Agreements. The Support Engineer has product, solutions knowledge and/or customer networks knowledge as well as knowledge of technology evolution of product/domain.

**Project Manager:** The Project Manager (PM) ensures that a Fulfilment Assignment Specification including products and/or services is delivered to the satisfaction of the customer. To do this, the PM details and clarifies the scope, time, and budget, and secures the necessary resources, and plans, and monitors all necessary activities.

Due to the limitation of time and scope of this study participants selection was based upon convenience sample. Interviewees were selected from different profiles to make sure that general opinion can be captured without individual or departmental influence.

Interviews were started with an introduction, background of research and explanation and purpose behind the research topic. Interviewees were asked for their consent if the full interview
can be recorded. The recording was started after getting their verbal consent and they were told that this recording will only be used for text analysis and confidentiality of interviewee will be protected. Every interviewee was clearly informed that the interview process is voluntary, and they can leave at any point during the whole interview process.

After giving an introduction about myself and the purpose of this research, the interview was started with a general question about them, their role in the organization and from how long they are working with the current organization. This helped interviewees to be more open and comfortable about sharing their thoughts freely. After understanding the background and role of the interviewer, specific questions related to information overload and the use of artificial intelligence were asked which are relevant to this research.

3.3.2 Semi-structured Interviews
In this study, interviews are used as a primary source of data collection from individuals about their experiences, knowledge and observation. Interview method selection depends on the amount of control, the researcher wants to have over the interaction (Harrell & Bradley, 2009). Interview method can be from unstructured to highly structured. Structured interviews are the most controlled type of interviews as questions are fixed and are asked in a specific order (Harrell & Bradley, 2009). Structured interviews are used to collect a large sample of data and to generalize the finding for a large population.

As the purpose of this study is to explore user-perceived factors of information overload, we wanted the hear more from the interviewees about their experiences. At the same time, we wanted to control the conversation to be related to the topic of the research. We wanted the interviewer to drive the conversation, so the semi-structured method adopted for this study.

3.4 Research settings
The observed organization is a leading provider of ICT (Information and Communication Technology) equipment and services to network operators and adjacent industries all around the world. The observed organization is one of the few offering end-to-end solutions for all major mobile communications standards. With more than 100,000 professionals and customers in 180 countries, observed organization combine global scale with technology and services leadership. Observed organization support networks that connect more than 40% of the world’s mobile traffic globally. The observed company offers digital workplace to its employee and defines its wanted position as

“Industry-recognized employee experience - giving back time by providing a modern user experience, enabling work from everywhere and creating workforce engagement”

Three important components of above-wanted positions are experience, enabling work from everywhere and workforce engagements which are described below

Experience: Creating a digitized experience with easy to use technology, improved experience in collaboration and by providing full mobility. CIO of the observed company believes that some small simple steps like Improving laptop functionality, enhancing Wi-Fi, reducing the number of required passwords can optimize time and enhance user experience a lot.
**Work from everywhere:** Every application available on the laptop should be customised to mobile phones to provide true mobility and work from everywhere.

**Engagements:** Engaging more with employees by making information more easily available on for example SharePoint, opening the lines of communication in for example Yammer, and building teams and groups for discussion and feedback.

### 3.5 Data Analysis method

This research followed a conventional qualitative method of data collection and analysis. Interviews were recorded for deep analysis and are used as an aid to develop the key concept and theme of the research. Qualitative research uses an inductive strategy which aims to examine the research questions in natural settings to get ideas and feelings of interviewees (Lichtman, 2014). Consequently, data analysis in qualitative research is also inductive in nature.

In a qualitative study like an interview, the text is so dense that all information cannot be used for analysis (Creswell, 2014). Most commonly used method for text analysis is Thematic analysis (Petty, Thomson and Stew, 2012). In this study we have used Lichtman Thematic analysis method to analyse, identify and then reporting these patterns within data. According to Lichtman (2014), the process of qualitative research is to drive meaningful concepts or themes from raw data.

Lichtman (2014) has mentioned six steps of thematic analysis which are referred to as 3 Cs (Codes, Categories and Concepts) of data analysis. Six steps in the thematic analysis of qualitative data are shown by Lichtman (2014, pp. 14) in figure 4.

**Initial coding:** Initial coding starts with a careful reading of responses and then summarising these ideas in own words, phrases or codes.

**Revisiting initial coding:** After summarising or coding each response, the next step in the thematic analysis is to remove redundant codes, renaming synonyms and make the codes consistence.

**Developing an initial list of categories:** The third step of Lichtman (2014) Thematic analysis is to find set and subsets of similar codes and define a suitable category for each subset.

**Modifying your initial list based on additional rereading:** Step 4 of thematic analysis is to revisit the categories identified under step 3 and exploring the possibility of combining similar categories into one set or subset. In this step, categories can also be ranked as per the importance of each category as per the number of occurrences in responses.

**Revisiting your categories and subcategories:** This step involves the removal of redundant categories and identifying critical factors as per the purpose of research.

**Moving from categories to concepts:** This final step of thematic analysis involves identifying key concepts that reflect the meaning of collected data.
Raw data were collected through a semi-structured interview process. As the first step of the analysis, recording of interviews was listened again and again and codes are assigned for each sentence. These codes are some important phrases used by respondents about digital workplace, information sharing, information overload, their perception and about artificial intelligence which are very relevant for this study. Coding was an iterative process and further refined with each reading until all interviews are coded.

After giving codes to all relevant text, codes are revisited to remove redundancy and categorising similar codes into the same categories. As a final step of the analysis, categories are converted to concepts.

3.6 Validity and reliability

The essence of qualitative research is to draw sense and recognize patterns among words to build up a meaningful picture without compromising its richness and dimensionality (Leung, 2015). Unlike quantitative research, qualitative research deals with non-numerical and is based upon human experience, their sense and subjectivity.

Validity in qualitative research means “appropriateness” of the tools, processes, and data (Leung, 2015). It can be achieved by making sure that the research question is valid for the desired outcome, right methodology and data analysis techniques are chosen for answering the research question.

In quantitative research, reliability refers to the exact replicability of the processes and the results (Leung, 2015). It means that the same result is achieved by repeating the same task with the same instruments in multiple instances. Due to diverse paradigms in qualitative research achieving reliability is a challenging task. In qualitative research, the terms Credibility, Neutrality or Confirmability, Consistency or Dependability and Applicability or Transferability
are equivalent to terms reliability and validity in quantitative research (Appleton, 1995; Hammarberg, Kirkman, Lacey, 2016).

**Credibility**: As per Sandelowski (1986, cites in Appleton, 1995 p.995), a qualitative study is considered as credible if it reveals accurate descriptions of individuals experiences and “that the people having that experience would immediately recognise it from those descriptions or interpretations as to their own”. The researcher defends its credibility or trustworthiness through practices such as the influence of the researcher on the research (reflexibility), to answer the research question by with different methods like interviews, observation and documentary analysis (triangulation) and by the detailed description of interpretation process (Hammarberg, Kirkman, Lacey, 2016). Findings from the data analysis were shared with participants to confirm if the findings are aligned with their experience to ascertain the credibility of the research.

**Neutrality**: Neutrality or confirmability refers to freedom from Bias in the research process (Sandelowski, 1986 as cites in Appleton, 1995). During the whole process of data collection and analysis, the researcher tried to remain neutral and not present own views. The neutrality of this study is ascertained by following all appropriate steps of data collection and analysis.

**Consistency**: Reliability is defined as the degree of consistency or dependability (Appleton, 1995). Purpose of qualitative research is to emphasise the uniqueness of the individual situation and the importance of human experience in that situation which may not be necessary consistence repeatable unlike in quantitative study. In qualitative research clarity and quality of the final report is the measure of consistency ((Lincoln & Guba 1985, Brink 1989, Powers & Knapp 199 as cites in Appleton,1995).

**Applicability**: Applicability or transferability refers to the generalization of findings on the same subject. Appleton (1995) argues that the descriptive interpretation of the analysis done on data should apply to other areas for a qualitative study to have applicability feature. To make sure the applicability of this study for external validity, the convenient sampling method was used, and interviewees were selected from different job profile, age and varied years of experience to seek the representation of diverse perspectives on the topic.

The researcher has taken all measures to be neutral and didn’t influence any discussion with the participant. To get clarity and consistency in the interview process, two pilot interviews were conducted with my fellow colleagues. A mobile phone was used to record five interviews and hand notes of two interviews were taken (due to no consent from participants for recording) to increase the reliability of the study. During the interview, participants were asked about their views and perception towards information overload and the role of artificial intelligence to minimise it. After data collection, themes were developed and refined by repeatedly referring to interview and questionnaire data to ascertain the applicability of the research. Then the conclusion and data analysis were shared with participants to get their opinions to align our findings with their experiences.

**3.7 Ethical consideration**

Following ethical consideration recommendations suggested by Creswell (2014) are used to anticipate and address all ethical issues during the research.
Obtain necessary permissions: Permission from concerned authorities of the observed organization is obtained on email. In the email; the purpose of the study, timing, required access to the site, tools and participants and expected outcome of the research was clearly mentioned. Permission from the participants are first asked by telephone call and after getting their nod, interview meeting request was sent to the interested participants.

Disclose the purpose of the study: Purpose of the study and research questions were clearly communicated to all willing participants to avoid any confusion on the purpose of study between researcher and participant.

Signing consent form: Participation in the interview process was voluntary and no one was pressurised to give the node to participate in the study. Consent for participants was obtained as acceptance of meeting request and consent form in appendix 4 got signed by participants before starting the interview.

Respect the privacy of participants: All participants were assured that their and organization identity will not be disclosed by any means in the study.

Keep raw data and other materials: Participants were informed that the recording of all interviews will be stored until the final submission and approval of the thesis by the supervisor. After this, all data will be deleted.

4 Empirical Results and Analysis

In this chapter, the empirical findings from the interview analysis are presented. This chapter concludes the detail description of five identified themes from interview data analysis.

4.1 Interview Empirical findings

Interview responses from the participants were listened again and again and Lichtman (2014) recommendations were followed to identify themes and concepts out of the responses from participants. Total thirty-two codes were extracted from the data which are presented in appendix 2. These codes then classified into twenty-one categories presented in appendix 3. These twenty-one categories finally grouped in below mentioned five themes out of which four themes are related to information overload while one is identified as relevant to second research question i.e. how observed organization is using artificial intelligence to overcome information overload.

1. **Information processing capabilities** are identified from slow system access and inefficient search function categories.

2. **Notification** is another theme identified from two categories named “ignoring notification” and “disabling notification”.

3. **Quality of information** is derived from categories which include document quality, duplicate information and irrelevant information.
4. **Ease of information sharing** contains the categories ease of device/platform use, multiple applications and platform, and access to information sharing tools from anywhere.

5. **Use of AI in reducing overload** contains the categories which include “AI as data analytics, AI in collaboration tools and AI in prediction”

### 4.1.1 Information processing capabilities

Information processing capabilities of the system used by employees was discussed by all participants and described as one of the main sources of information overload. Information processing capability here is considered as the time taken by a system to start and extract or filter the required information. Some of the participants mentioned that it is sometimes easier to access information from their smartphone than to access it from laptop due to easy handling and quick access even it has slower processing capability.

Participant 2 states that most of the applications are web-based which are very slow and are inefficient in searching and filtering the required information. Getting irrelevant information after waiting contributes toward fatigue and information overload as this information may not fulfill required needs. This is evident from the below interview excerpts from participant 2

> “Many of the applications we are forced to use for information access are using web-based interfaces. These interfaces are poor and most of the time is spent waiting. Web-based Internal search engine is inaccurate and doesn’t filter relevant information”

Participant 6 shares the same views as mentioned by participants 2 about the limitation of information access tools to filter out relevant information. In his/her words

> “Searching Information on the internal portal is not efficient, it does not necessarily search for approved documents or latest versions of the same documents to identify whether the Information is relevant or not”

Participant 3 says that it is not the processing capacity of the system that is slow and creating information overload, it is individual processing capacity to absorb and filter out the required information from the result which is provided by the system. In own words of participant 3

> “It takes the whole day for me to filter out required and valid information from the result obtained by the organization’s internal search engine in a few minutes. My own processing capacity is limited compared to the system of application I am using so we need to find some magical ways to augment human brain processing capacity”

From the analysis of all responses, it is clearly understood that slow processing power to access the required information makes the whole process cumbersome and contribute to information overload. Users feel overloaded with Information when either connection is slow, or application used to Access the required Information is difficult to Access.

As participants 3 mentioned, not only the processing capacity of the system but also the processing power of the brain is an important factor. Brain processing power is limited so
systems and application in an organization must be efficient and fast to process the information to overcome information overload.

4.1.2 Notification
Many of the respondents answered that notification management from different applications are not efficient and significantly contributes to information overload. Below is part of the response from participants 4

“Notifications control is the main contributor to avoid information overload. I normally use two ways to control notification, one is to disable or enable notification as per my priority and other is to ignore notification which is not related to my requirement. At the same time, I agree that it is not the perfect way to handle information overload as most of information sharing tools do not give freedom to filter specific topic or content”

Participant 5 thinks that notification is not effective tools to combat information overload rather it increases the interruption. Below is the response from participant 5

“I want notifications more intelligent to control information rather than informing that a new message arrived, or a new document is uploaded on intranet or Yammer. I do not find any way to control incoming information rather than to ignore notifications.”

Participant 3 says

“I am feeling overloaded due to many applications I am forced to use. I must keep my outlook always open to getting notified for any incoming email, using skype to communicate with colleagues, always updating and receiving information on Jira for projects I am working on, keeping an eye on my internal Wiki product page and getting notifications from knowledge sharing portals”

Participants mentioned that it’s not just the incoming e-mail, an instant message from collaboration tool or RSS feeds which contributes to information overload, it is also the notifications from these applications that contribute equally. Notifications compelled the user to go out and read the message and cause disruption in other planned activity. Users do not want to disable notifications completely to make sure that s/he is not missing any important message but at the same time, they do not want to be distracted by information inflow.

4.1.3 Quality of information
All respondents mentioned that quality of information greatly influences information overload. Participants 1 states that

“Individuals don’t always know how to use Document manager in the right way templates. Standards and Information about “best practices” are not available and not easy to find when needed. I am too impatient to use the search functionality which means you often recreate the wheel”

Participant 3 also mentioned that the same documents with the different title also contribute information overload

“Due to different collaboration tool which sometimes is centric to a particular department, same documents are available on different portals, many times every portal may have different versions and difficult to locate and confirm latest version”
Participant 7 also points towards document quality which contributes towards information overload

“I feel much overloaded when I receive emails which are not related to me or not related to my interest in the product or process. Moreover, I also feel that sometimes I want to connect with the author of information to have more discussion but most of the times it is difficult to locate the original author and it becomes more difficult to assess quality and validity of documents”

From the interview text, it is evident that observed organization has more focus on digital workplace, tools and trying to make information sharing easier. Quality of information is something which is not well thought, and one is of the reason of information overload. Information exists everywhere to serve the needs of a department or organization or even individuals, but no one is accountable to maintain the quality of documents or information shared on different platforms.

4.1.4 Ease of information sharing
All the participants observed that ease of information sharing from anywhere also flood the information on various platforms and causing overload. Participant 3 states that

“With a new mobility solution in the organization, it became so easy to access any communication tool from a mobile or any other device. This also makes easier to access and share the information which in fact increased the information flow on different platforms. Due to this avalanche of information, it is cumbersome and difficult for me to keep an eye on useful information”

Below statement from participant 5 also supports the same

“The IT work environment is evolved and now designed for people to be mobile. Everyone can access documents from home or even from the coffee shop. The only requirement is to have a good internet connection and a smartphone and moreover, a smartphone is always ON unlike laptop which takes 15 minutes to get turn on. This makes very easy to access and share any information from anywhere on any platform”

From the analysis of responses, it is also noted that multiple information sharing tools are another factor which influences information overload by making it easy to share information. Some of the participants’ complaint that multiple applications circulate duplicate information with the same or different title which needs a lot of time to filter and find the relevant information. Participant 2 mentioned that the observed organization has different tools for various type of communication which is sometimes difficult to understand for everyone. Below are excerpts from participant 1

“More than 3 communication tools are maintained by the organization for a different purpose. For example, Yammer to broadcast any Information across a small group or across an organization, Microsoft team, email & Skype for business for one to one or one to many communications. People use email as the first medium to broadcast information across the group or organization while the same information is broadcasted through Yammer later in one or another form”

Circulation of the same information through the same of different communication tool adds to the quantity of information which sometimes needs more time to filter out and find relevant information.
Participant 7 also states that

“*We have many collaboration and communication tools, but the problem starts when they do not talk to each other. These different collaborations and sharing tools are not integrated with each other and the same information normally circulate on different applications*”

One of the users complained about the addition of new applications every time which change the content management process and users are forced to move them with all documents. Participant 5 states

“*We are really fast on adopting new technologies and ways of working towards them, but the sometimes-unnecessary introduction of immature applications disrupts the information-sharing mechanism. I have seen three different document management systems implemented in last one year and users were forced to move from one to another. These multiple tools and fast-changing document management system adds unnecessary information and sometimes destroy the quality*”

Individual preference to have separate web page also contributes to multiple information access tools as pointed out by participant 6

“I feel we need a uniform policy across the organization about information sharing. Due to the absence of clear guidelines, there is no common portal for Information Access. Each unit/department has its own collaboration site created by department head which creates confusion about the valid information among users”

Quantity of information is a primary source of information overload which is visible from all the discussions with participants. Increase in the number of tools which are accessible for anywhere and anytime contributes an exponential increase in information quantity. So the introduction of many tools to make it easier to share information adds information overload in two dimensions. One is, it forces users to use new immature tools (as per participants 5) which reduce the quality of information; secondly, it encourages users to share more information or sometimes duplicates information which in turn increase information quantity but negatively affects the information quality.

### 4.1.5 AI as an overload reducing tool

All participants agree that observed organization is putting efforts and implementing artificial intelligence to reduce information overload. Participant 2 has mentioned that

“I am seeing the use of AI in our meeting tools in terms of plugins that tracks background noise level and automatically mutes anyone who has more noise. Meeting tool facilitates notes taking facility and automatically send only the link of notes to all participants so that only interested participants open the link and full information is not circulated to everyone.”

Participant 4 has mentioned that AI is helping to reduce information overload by automatically filtering emails based upon the reading behaviour. Below are some excerpts from the statement

“I can see that special plugins are installed by IT in outlook which observes my reading behaviour and classifies emails in two folders. One is known as a focussed email which needs my attention while another folder is known as unimportant. These AI plugins continuously learns with my reading behaviour and
Participant 3 mentioned that artificial intelligence is helping in outlining the right training based upon his/her job role and interest. It reduces the time and effort to filter right training from a catalogue of thousands of training under the academy.

“Recently I have observed that I am getting the information only about the product or document change which I have accessed earlier. I am not receiving notification for all the changes happening across the organization in the product and documents. This is happening due to embedding artificial intelligence in the document management system which is tracking the interest of users. Notification about the latest versions only sent to the users who have opened it in last few months. This is helping me a lot in reducing the overload of notifications and unnecessary emails which I used to receive”

Participant 1 has mentioned

“I was amazed a few days back when I got outlook notification to turn ON my out of office auto-response as I was travelling on a business trip. Outlook took the data from my travel management system and learnt that I will be travelling on particular dates. My travel management tool started sending me weather, currency and political update for the destination country. Instant messenger changed the location automatically so that all my colleagues are updated with my current time zone. Due to this intelligence in the tool, I need not worry for information search as accurate and relevant information start flowing just after raising travel request”

Even all participants are aware of the efforts the organization is putting in artificial intelligence and agreeing that it is helping them to reduce information overload, but everyone was not able to provide instance or example how it is implemented in existing tools or system. Some participants talked about how artificial intelligence embedded in email management, travel tool and training applications and meeting tools is helping them to reduce information overload.

5 Discussions on findings

In this Chapter relevance of five identified themes during data analysis are discussed thoroughly in connection with existing literature. This section ends with the discussion on how these identified themes answer to the two research questions.

5.1 Themes in relation to literature

5.1.1 Information processing capabilities

Information overload occurs when the amount of input information to a system exceeds its processing capacity (Rodriguez, Gummadi and Schoelkopf, 2014). The outcome of the interview analysis finds that information processing capabilities of the system impact information overload in a great way. Nelson (1994 cites in Jackson and Farzaneh, 2012, p.6) states that information overload is the inability of the user to extract the required information from a huge quantity of information for one of the many reasons. If the system is too slow and inefficient to search relevant information, the user is normally negatively impacted and adds more burden on the user
to sort out wanted information from all available documents. Time constraint is another factor which is also directly related to information overload. As found by Schick et al. (1990 cites in Jackson and Farzaneh, 2012, p.7) slow processing capability of the system shorten the time to complete the task and increase information overload for the user. Allowing more time to complete the task may lessen information overload.

Findings from interview data analysis are aligned with the theoretical framework by Jackson and Farzaneh (2012) discussed in section 3 that increasing the processing capability of a system can decrease the information overload. Same can also be achieved by increasing the available time of the user to complete the task.

5.1.2 Notification

Notification is a random event that is generated externally and breaks the continuity of cognitive focus on the primary task (Speier, Valacich and Vessey, 1999). This notification is generated by an external event or person and is beyond the control of the user. Outlook and other web-based collaboration tools are designed in such a way that they send an immediate notification to users about the new email or new activity added to the tool. Speier, Valacich and Vessey (1999) argue that these notifications and interruptions decrease efficiency and increase time to solve the problem. Interruption due to notification can increase the information overload in two ways, first, it takes away the time from ongoing work and the second, the user may miss the important information relevant for decision making. Laptops, smartphones and tablets constantly get notifications, messages and alerts. This alert or notification bombardment creates digital overload and makes it difficult for the user to focus (Rosen and Samuel, 2015). Speier, Valacich and Vessey (1999) found that the interruption caused by digital tools has a harmful effect on decision making power as user share cognitive resources between multiple tasks.

Most of the participants mentioned that the number of collaboration and information sharing tools can increase the information overflow, but notification control can help to reduce interruptions if not the overflow.

5.1.3 Quality of information

One of the findings from all the discussions with participants is that the increasing information quantity, risk the quality of information which is a major source of information overload. Jackson and Farzaneh (2012) have defined the quality of information as the degree of information which meets the user requirement. It is difficult to measure the information quality dimension, but high quality and well-structured information are easy to process by both system and individual.

Ackoff (1967, cites in Jackson and Farzaneh, 2012) noted that the increase in irrelevant information causes information overload. Kirsh (2000, cites in Jackson and Farzaneh, 2012) showed that exponential growth in the amount of information results in only linear growth in the quality of information. As shown in figure 2, Ireland (1997) in research has concluded that information quantity increases the efficiency of an individual to a certain point. After reaching at one stage user struggle to process the information while further increase in quantity increase frustration and exhaustion so the quality of information is more important to quantity to overcome information overload issue.
5.1.4  Ease of information sharing
One of the themes derived from interview analysis is that easiness of information sharing helps increase the quantity of information which in turn result in increasing information overload. Jackson and Farzaneh (2012) find that pushing information by means of email or any other medium has huge potential for disruption. Easier to push information helps increasing information overload by interrupting as users have little or no control over pushed information.

All participants stated that the increasing number of collaboration tools and web interfaces for information sharing like Wiki and internal knowledge sharing tools are causing information avalanche and increasing information quantity available. Jackson and Farzaneh (2012) support this observation with a statement that information quantity is a traditional source of information overload. Huge quantity of information supplied or requested is a prime reason for information overload. The ever-increasing number of information sharing tools and easy accessibility of these tools from anywhere and anytime is increasing quantity of information. Nelson (1994, cites in Jackson and Farzaneh, 2012) states that higher the volume of available information, higher the probability of increasing information overload.

Use of many tools in the digital workplace gives rise to multitasking and eventually add technostress (D’Arcy, Gupta and Tarafdar, 2014). The author then argues that technostress is also one reason for techno overload which is a combination of information overload and IT-enabled multitasking. Cross & Gray (2013) has termed the overload due to many interfaces and collaboration tool as collaboration overload. Collaboration overload happens when a user spends more time on collaboration tools to seek information or interacting with others for decision making. As tools for interaction and collaboration increases, it also increasing information quantity and interaction time which eventually limits time for information processing. Limitation of information processing time results in information overload.

5.1.5  AI as an overload reducing tool
Artificial Intelligence (AI) has the potential to improve productivity, efficiency and accuracy across an organization. Analysis from text and recording shows that observed organization has started using artificial intelligence in the collaboration tools to make it easier to sort out or filter relevant information. The positive impact is also seen, and participants were very excited to discuss the different areas where artificial intelligence is helping users to reduce information overload.

Artificial intelligence is slowly entering all the workplaces. Outlook, Gmail, and most other major e-mail tools allow setting rules and filters to ensure that only the most important messages reach you right away, less urgent messages directed into other folders automatically (Rosen and Samuel, 2015). Technology and AI are helping users to find data easily what they are looking for. Technology also helps users to control and access knowledge in ways to make it meaningful (Collie, 2005). Collie (2005) argues that in today’s workplace users who do suffer information overload are a victim of "technology underload"—an inability to use available tools efficiently.

Organization are using some tools known as robotic process automation to monitor workflows and processes and making intelligent suggestions about how things could be done more effectively or efficiently (Marr, 2019). These tools learn to perform repetitive tasks like
arranging meetings and measure how much time the user is spending on a task and suggest what part can be completed by machine.

5.2 Themes Connected with the research question
Themes identified has answered both the following research question

- What is the employee perceived factors causing information overload in today’s advanced digital workplace?

- How artificial intelligence helping users to reduce information overload inside the organization.

The first question is answered by the first four themes which are related to perceived factors responsible for information overload in today’s digital workplace. The first theme related to the first research question is the processing capacity of the system. Users experiencing that slow intranet search engine and data processing capacity is one of the factors for information overload. This is the outcome even though the system in today’s world is fast enough to handle big data, but ever-growing information quantity that needs to be processed is constantly challenging the processing ability of the system. As the processing capacity of a human is limited and cannot process all information, they are dependent on computers and machine to process and filter give the amount of information. Thus slow processing power of machines adds to information overload.

The second theme related to the first research question is about notification. Most of the participants mentioned that notification from different collaboration tools creates interruption which in turn increase the information overload due to limited available time to complete a specific task. Most of the users do not disable the notifications from important tools like email and instant messaging tools as they do not want to miss any important information. There are some tools which do not allow a user to disable notifications while some tools allow notifying only required subset of information from all pushed data. It is also observed that disabling and customizing notification depends upon individual interest, effort and knowledge. A user with thorough knowledge of the tools can apply many filters only to receive relevant notifications and information while a normal user can be overburdened with the information which is irrelevant for this user but may be relevant for others.

Quality of information is the third theme identified from interview text analysis which is another perceived factor of information overload. Information overload is not only because of the huge amount of information but also exist because of the poor quality of information. Poor quality of information can be because of

- Non-Simplified or unfiltered information
- Not explained clearly
- Has factual errors or inconsistencies
- Duplicate Information

All users have mentioned at least one reason out of above mentioned three for poor information quality.
Ease of sharing is equally mentioned by participants as a factor for information overload. All users mentioned that today’s digital workplace has made it easy for every user to push information from anywhere to anyone in the organization with almost zero cost. This ease of information sharing has increased information flow within an organization which in turn increased information overload on users.

As described in section 3, the theoretical model suggested by Jackson and Farzaneh (2012) has divided all factors of information overload in two categories which are Intrinsic factor and extraneous factors. As per the suggested theoretical model, intrinsic factors are fundamental elements causing information overload. Extraneous factors have an indirect effect on information overload but directly affect intrinsic factors. Table 2 shows the comparison between all the factors suggested by Jackson and Farzaneh (2012) and found from the empirical analysis of the interview text.

<table>
<thead>
<tr>
<th>Information Overload Factors</th>
<th>Identified by Jackson and Farzaneh (2012)</th>
<th>Findings from this research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic Factors</td>
<td>Quantity of Information</td>
<td>Ease of Information sharing</td>
</tr>
<tr>
<td></td>
<td>Information Processing capacity</td>
<td>Processing capacity of a system</td>
</tr>
<tr>
<td></td>
<td>Available time</td>
<td>Notifications</td>
</tr>
<tr>
<td>Extraneous Factors</td>
<td>Information Characteristics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information Quality</td>
<td>Quality of Information</td>
</tr>
<tr>
<td></td>
<td>Task and Process parameters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Personal factors</td>
<td></td>
</tr>
</tbody>
</table>

Ease of information sharing is mapped to the quantity of information as after giving it a deeper thought, it was concluded that participants think the easiness of sharing information and availability of different tool in the workplace gives rise to the quantity of information, so ease of information sharing is directly related to the quantity of information. We also observed that Notification cause interruption which in turn reduce the available time to process the extracted information from the organization. So notification is directly related to available time. In summary, we found that all intrinsic factors suggested by Jackson and Farzaneh (2012) are also found relevant in this research.

Quality of information is the only one which is a common extrinsic factor in Jackson and Farzaneh (2012) and our study. We have not talked about the processes and nature of work in our interviews, so it is difficult to relate anything here. Personal factors may be one of the information overload factors but were not considered in this research.

The second research question was about how the observed organization is using artificial intelligence to reduce information overload. This is answered by the last theme identified from all the responses. Participants mentioned the embedded artificial intelligence in digital tools used by various groups. Predicting and suggesting text while typing an email in outlook is one of the
many mentioned features using machine learning. Predicting, measuring and suggesting the best
time to complete a process is made possible through robotic process automation. As mentioned
in section 2.4, Stone et. al (2016) has identified two major application of AI in the workplace
which are creating a collaborating system and crowdsourcing. Interview analysis shows that
observed organization has already started the use of artificial intelligence in the collaborating
system while the use of crowdsourcing was never mentioned by any of the participants. One of
the participants also mentioned that the observed organization is using artificial intelligence in
tavel booking tool to remind about all scheduled meeting during his/her travel. This helps the
user to choose travel time cautiously according to an already defined schedule.

6 Conclusion, Contribution and Future research

In this chapter conclusion of this study is presented. This section concludes with two important
topics which talk about the reflections and the future research that can be carried out further in
this area.

6.1 Conclusion
Aim of the study was to identify different factors of information overload perceived by users of
the digital workplace and how the observed organization is utilizing artificial intelligence to
overcome information overload. This study has three main components, Digital workplace,
information overload and artificial intelligence. Information overload is an undesirable condition
in any organization and occurs when the information to be processed exceeds the information
processing capacity. Information processing capacity can be because of individual own
limitation, system’s processing power or even it can be a limitation of resources in the
organization. With the concept of digital workplace different collaboration and communication
capabilities provided by the organization to enable employees to access and share greater
quantities of information at a faster pace. However, an increased number of tools at the digital
workplace has generated more information which in turn created information overload and
multitasking issues in the organization. Overuse of digital tools, collaboration and digital
interaction among employees generated an unintended outcome of collaboration overload. As
outlined by Rosen and Samuel (2015), artificial intelligence is designed to make information
processing automatic and easier and as productive as possible to decrease information overload.
Tools with artificial intelligence have the capacity to sort and limit the information one receives
and streamline the work of reading, responding to, and sharing.

Two research question which is answered with this study are

- What is the employee perceived factors causing information overload in today’s
advanced digital workplace?

- How artificial intelligence helping users to reduce information overload inside the
organization.

As the aim of the study was to capture user experience, their perception and opinion so
qualitative research method was best suited and hence selected for this study. Total seven users
were interviewed and to ensure the applicability of this study for external validity, the convenient sampling method was used, and interviewees were selected from different job profile, age and varied years of experience to seek representation from diverse perspectives on the topic. Lichtman Thematic analysis method is used for data analysis and total thirty-two codes were extracted from the data. These codes then classified into twenty-one categories and finally these categories are grouped in five themes out of which four themes are related to information overload while one is identified as relevant to second research question i.e. how observed organization is using artificial intelligence to overcome information overload. Five identified themes are

1. Information processing capabilities
2. Notification
3. Quality of information
4. Ease of information sharing
5. Use of AI in reducing overload

The first theme (Information processing capabilities) answer my first research question. Even though the system in today’s world is fast enough to handle and process huge information, participants complained about slow intranet search engine and data processing capacity of the system. Increase of quantity of information flow is constantly challenging the computational power of systems. Due to limited human brain capacity, we need more and more power in our machines to process and filter ever-increasing information flow thus slow processing power of machines contributes to information overload. Users feel overloaded with Information when either connection is slow, or application used to Access the required Information is difficult to Access.

Second identified theme related to the first research question is notification. Every participant has an opinion that the notification from different collaboration tools create interruption and distract the user from the primary task which needs more focus. Most of the tools provide the customised setting for notification while many of them also allow disabling notification but without the thorough knowledge of the tools, user can be overburdened with the information which is irrelevant for one but maybe relevant for others. Disabling and customizing notification depends upon individual interest, effort and knowledge.

Quality of information is the third theme identified from interview text analysis which another perceived factor of information overload is and answer the first research question. Quality of information is something which is not well controlled in the organization. Information exists everywhere to serve the needs of a department or organization or even individuals, but no one is accountable to maintain the quality of documents. Wit increase of information quantity, ensuring the quality of information plays an important role to combat information overload.

The fourth theme, ease of information sharing also answer the first research question which was equally mentioned by participants as a factor for information overload. The observed organization has its focus on digital workplace, tools and trying to make information sharing easier which is helping to increase the information quantity. Quantity of information is the primary and traditional source of information overload as it needs more processing power to filter and process the information and put big constraints on both human and machines.
Second research question about the use of artificial intelligence is answered by the fifth theme which is “use of AI in is reducing overload”. Interview analysis shows that observed organization has already started the use of artificial intelligence in a collaborating system. Using artificial intelligence in travel booking tool to remind about all scheduled meeting during his/her travel, features in meeting tools to mute the mic after detecting background noise and auto sending of MoM links to all participants are some highlights of AI use to reduce information overload. This helps the user to choose travel time cautiously according to an already defined schedule. Document management tool in the observed organization is learning from reading behaviour of the user and providing update information about the documents which were opened by the user in last few months to make sure that user does not miss any important update which helps him/her to avoid using outdated information.

In this study, we find out how a knowledge-intensive organization is managing the information flow and how artificial intelligence is used to reduce information overload from the users of the digital workplace. Despite having clear information-sharing model and tools, employees still use email heavily, and it's like "augmented memory": Users like to search email for old information. An email thread is used to start the discussion and involve the right people. When new tools are introduced, users are directed to use specific tools for a particular purpose, usage of other tools like Skype and Yammer increased as expected. Interview data analysis shows that an increase in usage of different tools contributes to information overload due to an increase in ease of information sharing. It is visible that the function of all introduced IT tools in the organisations' emphasis more on providing fast access to volumes of information rather than providing access to quality and useful information. Organization’s information sharing vision as discussed in section 5.2 also talks about the availability of all information to everyone but talks little about the quality and usefulness of that information.

6.2 Contribution of the study
This study contributes to the field of information overload in the digital workplace environment and usage of artificial intelligence to reduce information overload. Aim of the research was to identify the factors responsible for information overload and what are the different artificial intelligence technologies observed organization is using to overcome this overload.

Information overload is a well-known phenomenon and researchers from the different field have identified the related factors based upon their interpretation and their respective field of specialization like psychology, information system, organizational studies, social structure and accounting (Jackson and Farzaneh, 2012). Most of the studies have examined the effect of information overload or multi-tasking on productivity. There are also some studies which examine the productivity impact of the organization due to the introduction of different technologies at the workplace. In this study, we examined the user-perceived factors of information overload in a knowledge-based technology-focused organization and how the observed organization is using artificial intelligence to overcome this overload. This study also shed light on the experience with digital workplace and different tools they are using in their daily work. Result of this study shows that the implementation of high technology tools, ease of information sharing and freedom to work anywhere and anytime is having a negative impact on information overload. Some tools with artificial intelligence like outlook, travel management and
meeting organising tools helping users to reduce information overload while the tools which need manual configuration are dependent on individual skills and do not help much.

This study helps us to understand the need for intelligent tools at the digital workplace to manage and filter the required information to reduce information overload. The tools which can learn the user behaviour and can act automatically without manual interference augment with human intelligence and plays a vital role in reducing the overload. Even every participant was not aware of the features which are inbuilt inside the tool but over time can sense that they are getting right and accurate information.

Finally, this study shows that despite all technological advancement at the workplace, information overload is still a problem and should be a priority for an organization to address. We have seen some good feedback of the tools with embedded intelligence which motivates the organization to explore the use of artificial intelligence more to make information processing easier and more accessible to the right recipient.

6.3 Reflections
This study gave me an opportunity to read more about the topic which is very interesting and has great value for the organization. Being in the technology industry and a heavy user of digital workplace this topic of information overload and artificial intelligence always fascinates me. The journey of this study was not so smooth, but challenges are always there to overcome.

There was plenty of literature available to understand the theoretical background of information overload and even I became the victim of information overload during the period of study. Researchers from the different field have done the research on information overload and presented their findings which are related to their respective field of specialization. It was difficult to identify exact literature which was specifically related to information overload in a digital organization but finally, I managed to identify some relevant literature which is listed in references. Artificial intelligence is a relatively new topic and most of the researches are targeted towards operation automation and industrial applications. This was an exact opposite situation with artificial intelligence compared to information overload.

It was the first time I was doing any research as part of academic activity and was worried about the empirical data collection. Getting approval from the observed organization went smoother than I expected. At the initial phase, I was wondering if I will get a positive response from the selected twelve participants to have more than 30-minute interview. To my pleasant surprise I got a positive response from all but finally managed with seven interviews due to other travel and other personal commitments from the other five. Interviews were very interactive, and users participated with full enthusiasm. They were very excited to talk about the topic which they always face in their daily work. I gave me an opportunity to understand their viewpoints and vast experience about how they handle vast information.

As an engineer, I always analyzed numbers and it was the first time I was working with text. There are many techniques available for text analysis, but I found Lichtman thematic analysis more appropriate in my case and provide me with the techniques to handle and analyze the text. Selection of interpretive method gave me the chance to analyse the user perspective of information overload and how it can be overcome with the use of artificial intelligence.
6.4 Future Research
This study has been taken in a very technologically advanced organization that is investing heavily on artificial intelligence technologies and its use cases. Information overload is a global phenomenon and the same study should be carried out in the organization which are more advanced in using artificial intelligence tools to learn more about the usage of this technology to overcome information overload.

Despite all challenges, it is certain that we have an unlimited amount of information which was scarce/exclusive/expensive in the past. Artificial intelligence may be one answer to information overload but despite being a widely discussed topic, measuring information overload is always a challenge. With artificial intelligence, it is believed that everything can be automated, not only physical work but also the information processing, conclusions, judgement, decisions and even decisions. Organizations and users need to concentrate to codify moral and ethical judgments. Advanced Analytics combined with Machine Learning and Artificial Intelligence is emerging more and more at the workplace and in decision making. The office may be full of intelligent robots, working in symbiosis with people, where the line between human and artificial will blur. With the fast pace of changing technology, to determine how to make organization so efficient that the user of the workplace can quickly adapt to a world of automation in information processing is a future research question. More studies need to be done on how we can enhance the abilities of users so that they can sustain in an organization that is technologically shifting at least 3-4 times in a typical human lifespan.

7 References


8 Appendices

Appendix 1: Interview Guide

Preamble:

This study is a part of a master’s thesis in information systems at Linnaeus University. Purpose of this study is to assess the information overload situation in an organization and how it is managed with the use of technologies. Purpose of this interview is to understand your views and opinions, as a user and consumer of information in this organization. I have identified three factors and the purpose of my interview is to receive an input from managers in order
to understand if these factors are present within your organization and if you, or your employees have experienced these factors.

This interview is being recorded for analysis purpose at a later stage to capture and understand your views, however, be assured that recording and your identity will remain confidential. Any information brought forth will only be used to create an analysis of the mentioned topic. All information will remain anonymous, with no identifying information being associated with the data.

Company and individual identifiers will not be published in any manner.

Questions:

Background/Demographic:

1. From how long you are working in an organization?
2. Please describe your role in the organization? [confirm applicability]

Digital workplace tools

3. What are the tools you are using in day to day work to collaborate and share information?
4. Do you think you have the right tools to access required information outside the organization?
5. Do you use any filtering mechanism or tool to identify relevant information?

Information overload:

6. Describe how you access information within your organization.
7. What is your experience with the information you receive from different mediums in the organization?
8. How you normally regulate the incoming information flow.
9. Describe the most common ways you use to send out information to your colleagues within your organization?
10. Do you experience any changes in handling the information today compared to how it was handled earlier?
11. Do you know how your organization is making sure that too much or irrelevant information is not flowing around the employees to combat information overload?

Use of Artificial Intelligence (AI):

12. How do you see the role of AI in today’s digital workplace?
13. Do you think if AI can play any role to combat information overload?
14. If Yes, how your organization is using AI to address information overload challenge.

Other
Do you have any questions about this interview or regarding the study?
Do you have anything you might want to add to the interview that you feel I’ve missed in the questions?
Appendix 2: Text to Codes

<table>
<thead>
<tr>
<th>Interview Text</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is much easier to use a smartphone than a laptop for information access</td>
<td>A smartphone is easier to use</td>
</tr>
<tr>
<td>and control</td>
<td></td>
</tr>
<tr>
<td>AI is used in apps for training to filter out the training based upon our</td>
<td>Drafting personal training (AI)</td>
</tr>
<tr>
<td>profile, interest and job requirement</td>
<td></td>
</tr>
<tr>
<td>The IT work environment is designed for people to be mobile, so everyone</td>
<td>Easier to access and share information anytime</td>
</tr>
<tr>
<td>has information access all the time.</td>
<td></td>
</tr>
<tr>
<td>I can disable the notification to any incoming mails where I am in cc</td>
<td>Disabling email notification</td>
</tr>
<tr>
<td>I do not find any way to control incoming information rather than to ignore</td>
<td>ignoring the emails/information</td>
</tr>
<tr>
<td>I like information sharing but it is important for people to understand that</td>
<td>Information can be noise</td>
</tr>
<tr>
<td>some information can be noise for someone</td>
<td></td>
</tr>
<tr>
<td>AI should extensible used in knowledge sharing to filter out the recent</td>
<td>AI should be used in KS</td>
</tr>
<tr>
<td>product changes and distribute information to relevant stakeholders</td>
<td></td>
</tr>
<tr>
<td>Individuals don’t always know how to use Document manager in the right way</td>
<td>Lack of knowledge</td>
</tr>
<tr>
<td>products, standards and Information about “best practices” are not</td>
<td></td>
</tr>
<tr>
<td>available and easy to find when needed and I am too impatient to use the</td>
<td></td>
</tr>
<tr>
<td>search functionality which means you often recreate the wheel</td>
<td></td>
</tr>
<tr>
<td>Better Access without a VPN is needed in today’s Multi-device world.</td>
<td>Multidevice world</td>
</tr>
<tr>
<td>Especially needed for collaboration and social sharing</td>
<td></td>
</tr>
<tr>
<td>Many of the applications we are forced to use for administration are using</td>
<td>Multiple interfaces with poor quality</td>
</tr>
<tr>
<td>web-based interfaces. These interfaces are poor and most of the time is</td>
<td></td>
</tr>
<tr>
<td>spent waiting. Make it possible to work off-line and then &quot;submit&quot; time</td>
<td>Use of AI to manage travel</td>
</tr>
<tr>
<td>report, travel report etc. when getting Access</td>
<td></td>
</tr>
<tr>
<td>AI can be used to sync my meetings with my travel plan. If I have last time</td>
<td></td>
</tr>
<tr>
<td>minute travel plan, it should automatically cancel of remind me to cancel</td>
<td></td>
</tr>
<tr>
<td>F2F meeting based upon my location information.</td>
<td></td>
</tr>
<tr>
<td>There is generally a one size fits all approach to IT</td>
<td>same IT tools for all</td>
</tr>
<tr>
<td>Accessing applications consume a lot of my time. This decreases my productivity</td>
<td>many applications with the same information</td>
</tr>
<tr>
<td>as these applications abnormally have the same information</td>
<td></td>
</tr>
<tr>
<td>There is no common portal for Information Access. Each unit/department</td>
<td>Lack of common information-sharing platform</td>
</tr>
<tr>
<td>has its own collaboration site created by a department head</td>
<td></td>
</tr>
<tr>
<td>More than 3 communication tools are maintained by the organization for a</td>
<td>many collaboration tools</td>
</tr>
<tr>
<td>different purpose. For example, Yammer to broadcast any Information across a</td>
<td></td>
</tr>
<tr>
<td>small group or across an organization, Microsoft team &amp; Skype for business</td>
<td></td>
</tr>
<tr>
<td>for one to one or one to many communications</td>
<td></td>
</tr>
<tr>
<td>Problem</td>
<td>Solution</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Same documents are available on different portals, many times every portal may have different versions and difficult to locate and confirm the latest version</td>
<td>The same information in different versions</td>
</tr>
<tr>
<td>Information about the product or process does not have a contact person name and difficult to assess the quality of documents</td>
<td>Lack of document quality</td>
</tr>
<tr>
<td>Users receive an email which is not related to them or their interest.</td>
<td>slow access adds information overload</td>
</tr>
<tr>
<td>Users feel overloaded with Information when either connection is slow, or application used to Access the required Information is difficult to Access</td>
<td>slow access adds information overload</td>
</tr>
<tr>
<td>Different available collaboration and sharing applications are not integrated with each other and the same Information normally circulate on different applications with or without the same title</td>
<td>the same information from multiple sources</td>
</tr>
<tr>
<td>Being in the fast technology changing industry, products and processes are dynamic and changes quickly, sometimes even before establishing existing product and process</td>
<td>the dynamic industry makes old information irrelevant</td>
</tr>
<tr>
<td>Access to Information about customers, financials and competitors is poor and little possibility to find and reuse various documents and presentation</td>
<td>Poor document quality to reuse it</td>
</tr>
<tr>
<td>Some of the users complain adding of new applications every time which change content management process and users are forced to move them with all documents</td>
<td>New application every day</td>
</tr>
<tr>
<td>Searching Information on the internal portal is not efficient, it does not necessarily search for approved documents or latest versions of the same documents to identify whether the Information is relevant or not</td>
<td>efficient search management</td>
</tr>
<tr>
<td>A lot of content on the intranet but hard to find when needed</td>
<td>efficient search management</td>
</tr>
<tr>
<td>AI has already had a profound impact in more subtle ways. Weather forecasts, email spam filtering, Google search predictions, and voice recognition are some examples</td>
<td>Use of AI in predictions</td>
</tr>
<tr>
<td>The biggest benefit from AI will be gained from automation of decisions in (business) processes</td>
<td>AI in decision automation</td>
</tr>
<tr>
<td>A lot of what people are calling “artificial intelligence” is really data analytics</td>
<td>AI as data analytics</td>
</tr>
<tr>
<td>Artificial intelligence is a set of technologies that try to imitate or augment human intelligence</td>
<td>AI imitates human intelligence</td>
</tr>
<tr>
<td>I’m sometimes paralyzed by the choices. It is becoming harder for us to stay on top of the onslaught—e-mails, messages, appointments, alerts. Augmented intelligence offers the possibility of winnowing an increasing number of inputs and options in a way that humans can’t manage without a helping hand</td>
<td>AI is helping hand</td>
</tr>
</tbody>
</table>
Communication and collaboration tools... such tools might one day be better than meeting and collaborating in person. Some examples would be virtual reality meetings or even just a tool (this one already exists as a Google Hangouts plugin) that tracks how much each person in a meeting has talked and automatically mutes anyone who is talking too much until they acknowledge

Appendix 3: Codes to Themes

<table>
<thead>
<tr>
<th>Codes</th>
<th>Categories</th>
<th>Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>slow access add information overload</td>
<td>Slow system access</td>
<td>Information Processing capabilities</td>
</tr>
<tr>
<td>slow access add information overload</td>
<td>Slow system access</td>
<td>Information Processing capabilities</td>
</tr>
<tr>
<td>efficient search management</td>
<td>Search function</td>
<td>Information Processing capabilities</td>
</tr>
<tr>
<td>efficient search management</td>
<td>Search function</td>
<td>Information Processing capabilities</td>
</tr>
<tr>
<td>many applications with the same information</td>
<td>Multiple applications or platforms</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>Lack of common information-sharing platform</td>
<td>Multiple applications or platforms</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>many collaboration tools</td>
<td>Multiple applications or platforms</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>New application every day</td>
<td>Multiple applications or platforms</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>Lack of knowledge of using tools</td>
<td>Limited knowledge</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>same IT tools for all</td>
<td>Limited knowledge</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>Information can be noise</td>
<td>Information Noise</td>
<td>Quality of information</td>
</tr>
<tr>
<td>Multiple interfaces with poor quality</td>
<td>Poor Quality</td>
<td>Quality of information</td>
</tr>
<tr>
<td>The same information in different versions</td>
<td>Information duplication</td>
<td>Quality of information</td>
</tr>
<tr>
<td>Lack of document quality</td>
<td>Information quality</td>
<td>Quality of information</td>
</tr>
<tr>
<td>the same information from multiple sources</td>
<td>Information duplication</td>
<td>Quality of information</td>
</tr>
<tr>
<td>the dynamic industry makes old information irrelevant</td>
<td>Irrelevant information</td>
<td>Quality of information</td>
</tr>
<tr>
<td>Poor document quality to reuse it</td>
<td>Document Quality</td>
<td>Quality of information</td>
</tr>
<tr>
<td>ignoring the emails/information</td>
<td>Ignoring notification</td>
<td>Notification</td>
</tr>
<tr>
<td>A smartphone is easier to use</td>
<td>Ease of use</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>Easier to access and share information anytime</td>
<td>Ease of information sharing</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>Multidevice world</td>
<td>Ease of information sharing</td>
<td>Ease of information sharing</td>
</tr>
<tr>
<td>Disabling email notification</td>
<td>Disable notification</td>
<td>Notification</td>
</tr>
<tr>
<td>Use of AI in collaboration tools</td>
<td>Collaboration tool and AI</td>
<td>Use of AI in reducing overload</td>
</tr>
<tr>
<td>AI in decision automation</td>
<td>AI is decision making</td>
<td>Use of AI in reducing overload</td>
</tr>
<tr>
<td>AI is helping hand</td>
<td>AI is decision making</td>
<td>Use of AI in reducing overload</td>
</tr>
<tr>
<td>Use of AI to manage travel</td>
<td>AI in travel management</td>
<td>Use of AI in reducing overload</td>
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<td>---------------------------</td>
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</tr>
<tr>
<td>Drafting personal training (AI)</td>
<td>AI in training</td>
<td>Use of AI in reducing overload</td>
</tr>
<tr>
<td>AI should be used in KS</td>
<td>AI in training</td>
<td>Use of AI in reducing overload</td>
</tr>
<tr>
<td>Use of AI in predictions</td>
<td>AI in prediction</td>
<td>Use of AI in reducing overload</td>
</tr>
<tr>
<td>Al imitates human intelligence</td>
<td>AI complement to human intelligence</td>
<td>Use of AI in reducing overload</td>
</tr>
<tr>
<td>Al as data analytics</td>
<td>AI as Analytics</td>
<td>Use of AI in reducing overload</td>
</tr>
</tbody>
</table>

Appendix 4: Informed Consent Form

**TITLE OF STUDY**

Information overload: User perspective and application of artificial intelligence

**PRINCIPAL INVESTIGATOR**

Naresh Kumar, Master Program in Information Systems, Linnaeus University

**PURPOSE OF STUDY**

Purpose of this study is to explore the employee’s perception about the factors causing information overload due to increase in information flow from all directions and how an organization is using automation supported with artificial intelligence to reduce unnecessary information flow.

**STUDY PROCEDURES**

For the investigation, it is necessary to conduct oral interviews with 7 users of the digital workplace and collaboration tools. After collecting the interview text, data analysis and the conclusions will be the next step to complete the study.

Each interview is expected to be 30-minute-long and the duration of the full study is 3 months.

For analysis purpose at a later stage, a full discussion will be voice recorded in mobile phone.

**RISKS**

This survey does not include information that could pose a risk for any of the participants. All data gathered from the participants will be strictly and solely in order to conduct this study and will not be given or published anywhere other than for the purpose of this research work. In addition, participants during the recording process of the interview will give different names to protect their intellectual property rights.

You may decline to answer any or all questions and you may terminate your involvement at any time if you choose.

**BENEFITS**

Firstly the purpose of this study to investigate user-perceived factors of information overload and how the organization is using artificial intelligence to overcome this challenge of information overload. This study will encourage organizations to explore the usage of artificial technologies to overcome a very old problem of information overload. A copy of the final report will be given to all the participants to see the analysis and conclusion.
CONFIDENTIALITY

For the purposes of this research study, your comments will not be anonymous. Every effort will be made by the researcher to preserve your confidentiality including the following:

- Assigning code names for participants that will be used on all research notes and documents
- Keeping notes, interview transcriptions, and any other identifying participant information in a locked file cabinet in the personal possession of the researcher.

Participant data will be kept confidential.

CONTACT INFORMATION

If you have questions at any time about this study, or you experience adverse effects as the result of participating in this study, you may contact the researcher whose contact information is provided on the first page.

VOLUNTARY PARTICIPATION

Your participation in this study is voluntary. It is up to you to decide whether to take part in this study. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the researcher. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

CONSENT

I have read, and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

Participant's signature ______________________________ Date __________

Investigator's signature _____________________________ Date __________