Technology Interruptions in the Workplace

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics.

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Sheila Casey

1st September 2015

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Abstract

We now live in an always connected communication environment and as a result interruptions are becoming a pervasive element within the modern workplace. In recent years increased reliance on computer-mediated communications (CMC) have resulted in an expectation of constant availability and the immediate response to an interruption. These technology interruptions are becoming so frequent in the workplace that they decrease rather than increase productivity. Research has shown that interruptions can result in accidents and decrease productivity in domains as diverse as the cockpit, hospitals and the office.

The objective of this research is to investigate the impact of technology interruptions on the knowledge worker in a software development organisation and to understand the steps taken to reduce or minimise the effect constant interruptions can have on their workload or performance.

An online survey and semi-structured interviews were chosen as the most suitable strategy for answering the research question. The findings indicate that while performance is impacted by an overload of technology interruptions, few actions are taken to minimise or reduce the interruptions mostly because they are expected as part of the knowledge workers function.

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List of Abbreviations

CMC	Computer-Mediated Communication
COI	Cost of Interruption
CSO	Central Statistics Office
CSCW	Computer Supported Collaborative Work
EIM	Enterprise Instant Messaging
HCI	Human-Computer Interaction
ICT	Information and Communications Technology
IM	Instant Messaging
IMI	Instant Messaging Interruptions
IS	Information Systems
IT	Information Technology
RL	Resumption Lag
VOIP	Voice Over Internet Protocol

1 Introduction

1.1 Context and Background

We now live in an always connected communication environment and as a result interruptions are becoming a pervasive element within the modern workplace. In recent years increased reliance on computer-mediated communications (CMC) have resulted in an expectation of constant availability and procuring an immediate response. These technology interruptions are becoming so frequent in the workplace that they decrease rather than increase productivity (Karr-Wisniewski and Lu, 2010).

Research has shown that interruptions can result in accidents and decrease productivity in domains as diverse as the cockpit, hospitals and the office. While flying a simulator pilots had 53% more errors in their performance when interrupted than those who were not (Latorella, 1996 1998). One study reported that hospitals ascribed 43% of medication errors to distraction (Santell, 2005).

The original aim of open office design was to encourage face-to-face collaboration and employers will often foster and encourage collaboration with the purpose of resolving problems quickly and efficiently. In the contemporary workplace collaboration is now mostly through human-computer interaction (HCI) and while collaboration is viewed favourably in an organisation, negative aspects such as unwarranted interruptions that impact on productivity and performance must be taken into account. Workers need approximately four minutes to reorient themselves to a work task after an email interruption (Kessler, 2007).

Modern knowledge workers are faced with a multitude of communication mediums, typically email, instant messaging (IM) and voice over internet protocol (VOIP) via a desktop computer and/or a laptop. Knowledge workers also have at least one mobile phone facilitating voice communication, text messaging and email. Due to interdependencies of work activities interruptions can be expected and even though an employee might be overloaded they are still open to being interrupted (Hudson et al. 2002)

1.2 Research Question

The research question asks

"What kind of impact computer-mediated communications (CMC) in the form of interruptions can have on the knowledge worker" and

"If the knowledge worker themselves take any steps to minimise or reduce the effect constant interruptions can have on their workload or performance".

Some technology interruptions are directly generated (induced) by the technology such as system breakdowns and others are mediated by the technology itself such as instant messaging (IM) and email. Computer-mediated interruptions (CMC) are of a communicative nature and require further analysis to establish their content and context.

1.3 Research Interest and Beneficiaries

This study has important theoretical and practical implications. It will allow a better understanding of the negative and positive impacts of technology interruptions in the contemporary workplace. The study aims to demonstrate that not all interruptions are created equal and depending on the interruption, who is the initiator of the interruption and if there is a relation to the primary task in hand by the interrupted, that these are all contributing factors to the overall impact of the interruption. Addas and Pinsonneult (2015) develop propositions that link different IT interruption types to performance outcomes.

Managers can use the findings from this study to help identify the effects of technology interruptions they encounter in their organisations. Policies can be tailored to address the specific interruptions that need to be managed or dealt with. This study will benefit other researchers who are interested in further studies on the impact of technology interruptions.

1.4 The Scope of the Study

The target population of this study is an Irish based mid-sized software development company with its main offices in Dublin and New Delhi and other offices in London, Singapore, New York and Kuala Lumpur. The research involved a qualitative and quantitative approach. 150 employees were asked to complete an online survey

questionnaire and following the surveys, semi-structured interviews were carried out with five people. The target population sample is the researchers' place of employment.

1.5 Chapter Structure

This dissertation is structured as follows;

- Chapter 1: Introduction
  This chapter introduces the context and rationale for the study. It outlines the relevant background information to the research question and why that area is important. It outlines the scope of the research and who is likely to benefit from this study.

- Chapter 2: Literature Review
  This chapter presents the relevant research in the chosen area of technology interruptions in the workplace. As the secondary source of research data it explores the theoretical background to the research question.

- Chapter 3: Methodolgy and Fieldwork
  This chapter provides a brief overview of the research philosphies, methodologies and strategies available to the researcher. It explains the reason for the chosen research methodology as well as the merits and limitations of choosing such an approach.

- Chapter 4: Findings and Analysis
  This chapter analyses and interprets the data that was collected from the online questionaire and the subsequent face to face interviews. It reports what the research revealed and references it in context of the literature review.

- Chapter 5: Conclusions and Future Work
  This chapter concludes the dissertation by discussing the findings of the research and determining wheter the data collected has answered the research question. It contains recommendations for potential future research areas in the field.

2 Literature Review

2.1 Introduction

This dissertation investigates how pervasive technology interruptions are in the modern workplace and what is the impact of interruptions on knowledge workers. It looks at how knowledge workers react to interruptions and if they take any measures to screen out these interruptions during their working day. Technology interruptions can be frequent and have important impacts on work and performance.
This literature review will look at the published research in the following areas:

- Defining technology interruptions
- How has the modern workplace changed in relation to technology
- The positives and negatives of technology interruptions
- The impact and effect of technology interruptions on knowledge workers

2.2 Defining Technology Interruptions

An interruption is defined as an "externally generated, randomly occurring, discrete event that breaks continuity of cognitive focus on a primary task" Speier et al (1997) or as an "event within the notification system prompting transition of attention focus from a primary task to a notification" McCrickard et al (2003). Addas and Pinsonneault (2015) specifically define Information Technology (IT) interruptions as "IT based external events with a range of content that captures cognitive attention and breaks the continuity of an individual's primary task activities"

The main theme from these definitions is the break in focus on the task in hand. Technology interruptions are a subset of work interruptions where technology creates the interruption (e.g. system outage) or technology is the mediator of the interruption (e.g. email). They create more than 70 suspensions per day for office workers, with each needing between one minute (Jackson et al., 2003) and 24 minutes (Hemp, 2009) for primary task resumption.

Addas and Pinsonneault (2015) noted in their research that technology mediated interruptions typically have three technology features that can significantly influence attention:

1. **Multimodal notification alerts:** the technology interruption (e.g. email message) is often preceded by an initial alert notification that provided multimodal clues (e.g. sound, pop up, icon display in system tray). These alerts increase demands on attention and provide a trigger to switch to the interruption (Middleton, 2007).
2. **Parallelism:** allows individuals to manage multiple interaction threads simultaneously, which taxes attention. Dennis et al. (2008)
3. **Reviewability:** is the ability to review messages repeatedly after the alert occurrence reminds one of the interruption content and maintains attention on it. (Barley et al. 2008)

Interruptions come in many forms and have been ubiquitous in the office environment for years but there is a big difference in the modern office environment compared to the office of fifteen years ago where interruptions were mainly face-to-face or via the phone. In the modern workplace with the advances in technology we are confined by all the modern devices and software that cater for human-computer interactions (HCI). But what has this done for productivity, employee morale, collaboration and the many other facets of the modern workplace? Technology interruptions come in many forms and guises so in the context of this research and literature review, the two main areas focused on are technology-mediated interruptions that are self initiated or initiated by colleagues e.g. email or instant messaging and software application interruptions that a worker has little or no control over e.g. software update notification or application outage. The setting for such technology interruption is the workplace so social media interruptions for example Facebook, Twitter, Instagram are excluded and while it is acknowledged that they can be a valuable form of communication in some workplaces and indeed are absolutely necessary in other organisations, they don't contribute to this study.

1. **Technology mediated interruptions include:**

- Telephone (desk phone)
- Voice over IP (using Instant Messenger or Skype for example)
- Instant Messenger
- Email notifications

2. **Technology mediated Interruptions from software applications include:**

- Application outages
- System degradation
- Software update notifications

There have been a number of studies on the effects of interruptions. Speier et al (2003) applied distraction conflict theory to investigate the effect of frequency and content relevancy of interruptions to task performance and found that the negative impact of interruptions on complex tasks was more severe when the content of the disruption was dissimilar to the primary task. Gupta and Sharda (2008) used simulation modelling approach to suggest that a knowledge worker may lose 5 percent of their workday due to interruptions. Interruptions happen for a mutitude of reasons and regardless of the reason there are a number of known strategies for managing an interruption (McFarlane and Latorealla 2002):

- Immediate: Involves interrupting the person immediately regardless of what they are doing so that they stop what they are working on and immediately respond to the interruption.
- Scheduled: Involves restricting the interruption to a pre-arranged schedule for example sending a meeting notification 15 minutes before it starts.
- Negotiated: The interruption is announced but the user has control over when to deal with the interuption for example an email pop-up notification.
- Mediated: Indirectly interupting and requesting interaction.

2.3 How has the modern workplace changed in relation to technology

Today's modern office environment is very different to that of fifteen or twenty years ago. Previously face to face communication was predominant in the office and landline phones facilitated discussions and conference calls. With the growth of pervasive technology, Human-Computer Interaction (HCI) has facilitated the growth of interruptions in the modern workplace. The modern employee has email, instant messaging and voice over internet protocol (VOIP) on their desktop and or laptop. Also they will typically have at least one mobile device facilitating text messages, calls and emails. Employees are now connected in multiple ways through various devices and applications that all make demands on the employees' attention. While this can give an employee a greater degree of control over when and where they work, it also requires employees to be available to multiple channels of communication. This all leads to interrupted working days for the knowledge worker.

Wachman and Rose (2011) believe that employees have a degree of choice in how an interruption is managed and challenge the view that interruptions are disruptive to work

patterns. In their research they look at how employees utilise the many facets of communicative technology mediums such as the recordings of voice mail and storage of email to make a decision on when and how to respond to an interruption. They argue that it is impossible to separate the new communication media from the nature of the work itself. Different communication technologies make distinct forms of audio or visual appeals to alert employees to synchronous communications but the way an employee interprets these appeals can depend on organisational culture, job function, work priorities and status. Maintaining a high degree of availability and responsiveness to computer mediated communication (CMC) modes is significant for knowledge workers, not just because it forms part of their workday but also because the interaction with communication technologies is reflective of their identity as workers. One of their recommendations is that policies could be set at a macro level so that communication technologies better serve organisational goals.

2.4 The Positives and Negatives of Technology Interruptions

"Why work doesn't happen at work"

(Jason Fried, Software Developer, TED, 2010)

The literature review findings point mostly towards the negatives of modern computer mediated-communications (CMC). These often introduce frequent interruptions that can increase stress and lower productivity. Estimates suggest that technology enabled interruptions cost U.S. companies $650 billion per year in lost productivity (Spira and Feintuch 2005). This figure is based on the time employees spend on their email inbox and responding to instant messages. Indirect costs are harder to quantify but estimates suggest that employees need approximately four minutes to re-establish themselves to the original work task after an email interruption (Kessler, 2007).

Cohen (1980) found that unpredictable and uncontrollable interruptions induce personal stress that can negatively affect performance after interruptions. Interruptions can cause an initial decrease in how quickly people can perform post-interruption tasks (Gillie and Broadbent, 1989). People have natural abilities to adapt their behaviours to accommodate interruptions (McFarlane and Latorella 2002). The effects of interruptions can be mitigated when an organisations environment allows flexibility in task performance,

a variety of methods for responding to interruptions, specific training or both (Zijlstra and Roe, 1999). It is worth noting that this does not hold for complex or cognitively demanding tasks,

Analysis on instant message interruptions (IMI) in the workplace indicate that it is the inherent nature of instant messenger (IM) that results in the interruption i.e. it opens up a chat forum between two or more users to engage in computer-mediated communication (CMC) (Garrett & Danziger 2008). IM is often used when co-workers need to communicate and collaborate and as IM becomes more pervasive across the workplace the potential of being interrupted while working on a task increases. (Tang, 2007)

Mansi et al (2013) research findings indicate that there is a point where employees working on complex spatial tasks will begin to ignore IM communication and focus on their primary task. They also found that the increase in time to complete a task due to an IM interruption may counter balance the time saved in obtaining an important piece of information from a colleague or team member. Some companies strictly oppose the use of IM in the workplace but there are some benefits to it. This is what Olson & Olson (2003) mentions as the productivity paradox which states that the gains in productivity are not always assured when new computer or communication technologies like IM are introduced.

When workers are co-located it is usually easily to tell if colleagues are available for a chat but when colleagues are working remotely there is no natural source of such information. With IM, users can set their status (e.g. available, busy) so other colleagues can check or IM will also display the status if the user has stepped away or logged off (e.g. away, offline). Because senders are usually aware of the receiver's presence, a response is expected in a near-synchronous mode. This is rarely a problem with telephone calls or emails as the receiver can decide to process the interruption now or at a later stage.

Bafoutsou and Mentzas (2002) recognise instant messaging along with other collaborative technologies as one of the technologies that provide support for group work. Instant messaging has been used socially for communication purposes but its popularity as a more formal workplace tool has increased. Gartner (2007) predicted that IM would become the de facto tool for voice, video and text chat with 95 percent of workers in leading global organisations using it as their primary interface for real time communications by 2013. With the introduction of enterprise instant messaging (EIM)

organisations are able to brand their IM but most importantly EIM has an audit trail. In the event of litigation or quality control, companies have a record of what was communicated.

2.5 The impact and effect of technology interruptions on knowledge workers

The study by Gupta et al. (2013) looked at how the hierarchal level of the sender combined with the interruptive features of IM impacted on user performance and mental overload. Their results showed that messages from a supervisor or manager are given higher processing priority, resulting in smaller task time but greater perceived workload. Supervisors should consider other communication channels if an immediate response is not necessary. According to distraction theory, interruptions have been defined as externally generated, unpredictable events that break the continuity of cognitive focus on a primary task. Interruptions usually require immediate attention and use the same sensory channel as those used by the primary task (Speier et al 1997). A fundamental premise of distraction conflict theory is that attention conflicts will facilitate simple task performance and impair complex task performance (Baron 1986). But it is also recognised that the interruption may be relevant to the primary task and help complete the primary task sooner.

Collaboration within the workplace involves leveraging the collective strength of individuals within a company to address strategic and tactical business issues (Sykes 2010). Collaboration is generally viewed as positive in the workplace but the negative aspect of interruptions cannot be ignored. One of the aims of Sykes (2010) research was to identify methodologies that could be used to reduce the cost of interruptions and increase employee effectiveness and satisfaction. The quantitative case study took place in a software development company and the following types of interruptions were observed: phone, IM, email, face to face and distractions e.g. nearby conversations. One of the main findings was that Technical Leads/Senior Developers spent 71 percent of their daily activity dealing with interruptions. Some recommendations for reducing interruptions from the findings of the case study are as follows:

- Email: Turn off pop-ups especially if high concentration is required for long periods of time. Keep email messages short and to the point.
- Instant Messaging: Use only if necessary. Set the office equivalent of ‘back in ten minutes’, change the status to ‘Do not disturb’ as the cost of interruptions can be enormous for someone deep in thought while solving a critical problem.

- Quiet meeting rooms:
- Educate employees: Educate employees about the number and nature of interruptions that are occurring at all levels of the organisation.

Research carried out by Solingen et al. (1998) about educating employees in relation to the negative effects of interruptions led to a 30 percent reduction of interruptions. The occurrence and handling of the interruption has an impact on time for planned activities but further time is lost recovering concentration (See Figure 2.1 Three phases of an interrupt. Solingen et al. 1998)

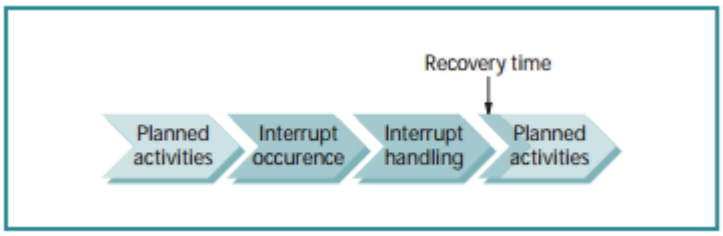

Figure 2.1 Three phases of an interrupt (Solingen et al. 1998)

2.5.1 Paradigms of Interruption Management

In their research of interruption management practices in everyday mobile phone use Grandhi and Jones (2009) looked at the paradigms of interruption management. Researchers adopt two distinct paradigms of interruption management depending on the goals:

1. Reduce negative impacts of interruptions
2. Harness the utility of interruptions

Interruption Impact Reduction Paradigm

Studies have looked at how interruptions affected task performance in relation to a number of variables such as the mode of interruption (Maglio and Campbell 2000), methods of an interruption (McFarlane and Latorella 2002), complexity of task being interrupted (Gillie and Broadbent, 1989) and relevance of interruption to current task (McFarlane and Latorella 2002). All these studies were consistent in their findings in that interruptions do have an impact on task performance.

Interruption Value Evaluation Paradigm

This paradigm is based on the view that not all interruptions are negative. The goal of interruption management in this paradigm is how to optimise individuals' decision making process about how to respond to interruptions (Grandhi and Jones 2009). This was supported in their findings "people prefer to deal with interruptions by making deliberate response decisions".

2.5.2 Cognitive load

"Cognitive load is an indicator of the degree of working memory utilised when the user is performing a task" (Yen and Chen, 2007).

The cost of interruption (COI) is a subjective measure of price a user would pay to remain undisturbed while working on a computer based task. This may include various kinds of alerts disrupting a user in various contexts (Horvitz et al, 2004). Resumption Lag (RL) is defined as the times it takes to resume the primary task after completing the interrupting task. The resumption lag can be measured as the time taken from closing the interrupting task to the first keyboard or mouse action in the primary task in direction of the task goal (Iqbal and Bailey, 2005).

The cost of interruption can be indirectly measured from the resumption lag. A greater resumption implies a greater cost of interruption (Horvitz and Apacible, 2003). There is a strong correlation between cognitive load and cost of interruption. Therefore it is important to access the cognitive load on the user while they are working on a task in order to decide whether or not to interrupt the user (Iqbal and Bailey, 2005).

Research has shown that if a user is interrupted during a high cognitive load task by being forced to switch tasks (e.g. to read a message, perform the interruption task) then the cost of interruption can be very high (Iqbal and Bailey, 2005). Studies have also shown that human work efficiency drops significantly in noisy environments because of the negative effects on concentration (Zaheeruddin and Garima, 2006).

3 Methodology and Fieldwork

3.1 Introduction

This chapter will provide a review of the research philosophies, associated methodologies and strategies considered as part of this research. It provides the rationale for the methods chosen and why they were the most appropriate for this study. It also details the lessons learned by going through this process.

3.2 Research Philosophies

Saunders et al (2009, p.107) explains that a research philisophy "relates to the development of knowledge and the nature of that knowledge" and is also put more simply as "developing knowledge in a particular field". There are many research philosophies that can be adopted when planning to conduct any research but according to Saunders (2007), the philisophy adopted contains important assumptions about the way the researcher views the world. A knowledge and understanding of all the research philispohies helps researchers decide on the most appropriate research strategy.

This section briefly discusses the four philosphies that are accepted in research of business and the natural sciences and which were considered as part of this research project:

1. Positisivism
2. Interpretivism
3. Realism
4. Pragmatism

3.2.1 Positisivism

Positivism can be determined as a position that applies natural science methods to the study of social reality (Bryman, 2012). Only accurate knowledge acquired through observation, including measurement, is credible. Research methods consist of experiment, observation and survey techniques. According to Saunders (2009), an important component of the research is that it is undertaken in a value-free way. The assumption is that 'the researcher is independent of and neither affects or is affected by the subject of the research' (Remenyi et al., 1998; Saunders et al., 2009). The emphasis

of the positivist researcher is on quantifiable observations that lend themselves to statistical analysis.

3.2.2 Interpretivism

An interpretivism position places emphasis on understanding differences between humans in order to interpret social roles (Saunders et al., 2009). It requires the application of critical thinking to the data and analysis provided, in order to form an opinion. The researcher needs to make sense of the subjective meanings expressed about the phenomenon being studied (Saunders et al., p. 163).

3.2.3 Realism

Realism relates to scientific enquiry. According to Saunder et al (2009) the philisopy of realism is that there is a reality quite independent of the mind. Realism is similar to posititisivism in that is assumes a scientific approach to the development of knowledge. It also takes the view that there is an external independent reality, separate from the individuals perceptions. (Bryman and Bell, 2011)

There are two types of realism: direct realism and critical realism. Direct realism says that "what you see is what you get: what we expereince through our senses portrays the world accurately" (Saunder et al., 2009, p114).
Critical realists argue that what we experience are sensations, the images of the things in the real world, not the things directly.

3.2.4 Pragmatism

Pragmatism is not dedicated to any one method of reality or philosophy. The pragmatic paradigm places 'the research question' as central and applies all approaches to understanding the question (Creswell, 2003, p.11). Pragmatists are of the view that it is possible to work with both research paradigms (qualitative and quantitative). A mixed methods approach describes when both quantitative and qualitative data collection and analysis techniques are used (Saunders et al., 2009). Quantitative methods are concerned with the numeric representation of data. Qualitative usually refers to the written or spoken word rather than numbers and can be a product of all research strategies (Saunders et al., 2009). It can also include visual methods like reports, photographs and video (Bryman and Bell, 2011). In the view of Tashkakkori and Teddlie (1998), the researcher should "study what interests you and is of value to you, study in the different

ways in which you deem appropriate, and use the results in ways that can bring about positive consequences within your value system".

Table 3.1 Comparison of four research philosophies in management research (Saunders et al., 2009, p119)

	Positivism	Realism	Interpretivism	Pragmatism
Ontology: *the researcher's view of the nature of reality or being*	External, objective and independent of social actors	Is objective. Exists independently of human thoughts and beliefs or knowledge of their existence (realist), but is interpreted through social conditioning (critical realist)	Socially constructed, subjective, may change, multiple	External, multiple, view chosen to best enable answering of research question
Epistemology: *the researcher's view regarding what constitutes acceptable knowledge*	Only observable phenomena can provide credible data, facts. Focus on causality and law like generalisations, reducing phenomena to simplest elements	Observable phenomena provide credible data, facts. Insufficient data means inaccuracies in sensations (direct realism). Alternatively, phenomena create sensations which are open to misinterpretation (critical realism). Focus on explaining within a context or contexts	Subjective meanings and social phenomena. Focus upon the details of situation, a reality behind these details, subjective meanings motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data
Axiology: *the researcher's view of the role of values in research*	Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	Research is value laden; the researcher is biased by world views, cultural experiences and upbringing. These will impact on the research	Research is value bound, the researcher is part of what is being researched, cannot be separated and so will be subjective	Values play a large role in interpreting results, the researcher adopting both objective and subjective points of view
Data collection techniques most often used	Highly structured, large samples, measurement, quantitative, but can use qualitative	Methods chosen must fit the subject matter, quantitative or qualitative	Small samples, in-depth investigations, qualitative	Mixed or multiple method designs, quantitative and qualitative

3.3 Research Strategy

The research strategy is defined as a plan of action to achieve a goal (Saunders et al., 2012, p.173). A pragmatic research approach was adopted for this research to allow for both quantitative and qualitative data collection.

Two research methods were chosen:

1. Online Survey
2. Semi structured interviews

3.4 Time Horizon

There are typically two time horizons to consider:

1. A Cross-sectional study involves research being conducted over a short period of time and represents a snapshot of a particular phenomena being investigated at a particular time. (Saunders et. al., 2009, p155)
2. A Longitudinal study tends to observe a phenomenon over a longer period of time tracking the development or changes to it.

3.5 Sample Population

The sample population being targeted were knowledge workers in technological organisations. As it was impractical to collect data on all or even a number of technological organisations, the researchers own organisation was chosen as this is a global software development company in the domain of financial services. As the survey was being conducted online it was available to a global audience.

3.6 Online Survey

An online survey was chosen as one of the methods of gathering primary data. Survey research involves collecting information from a sample of individuals through their response to various questions. According to Dillman (2009) the main aim of survey research is to accurately estimate the percentage of the population that has a specific attribute by collecting data from a sample of the total population. Online surveys provide a cost effective efficient way and convenient way of collecting data from a large number of respondents over a large geographical region. Response rates to online surveys are generally low; they can be difficult to design and they limit the number of questions that can be asked by the researcher (Saunders et al., 2009).

There are two types of survey questions typically used in survey research:

1. Open-ended questions allow respondents to freely answer the question as they want without limiting their response (Dillman et al. 2009).
2. Closed-ended questions provide respondents with a list of answer choices from which they must choose to answer the question (Dillman et al. 2009).

3.6.1 Survey Design

A mixed method, cross-sectional design was used to create an online questionnaire containing both quantitative and qualitative type questions. The survey consisted of 21 questions and was divided into three sections:

1. Technology Interruptions
2. Measure of Technology Interruptions
3. Participant Demographics

The question types were mainly multiple choice questions where either a single answer only could be selected or where multiple answer choices could be made. As the questionnaire used a series of statements, Dillman (2000) suggests that the same order of response categories should be used to avoid confusing the respondent. Both negative and positive statements were used to ensure that the respondent read each one carefully before deciding on which rating applied. The survey questionnaire used the Likert five point rating scale for a number of questions with a rating scale as follows:

- Strongly Disagree
- Disagree
- Neither Agree nor Disagree
- Agree
- Strongly Agree

The questionnaire was created using the popular online survey tool 'SurveyMonkey' (www.surveymonkey.com).

Previous research studies have indicated that long questionnaires can have a negative correlation on participation and response quality (Sahlqvist et al., 2011). The distributed online questionnaire had 21 questions and would take no longer than ten minutes to complete.

3.6.2 Piloting the Survey

Piloting the survey is required to perfect the different elements that constitute a questionnaire or survey (Andrews et al., 2003). Prior to distributing the survey to all participants, a pilot group of five participants from a sample population were selected to complete the survey and provide feedback on the structure, content and timing. An email was sent to the five participants with a link to a test version of the online survey which was created using SurveyMonkey. Feedback on a couple of questions meant that they were re-worded as they were deemed to be ambiguous. Piloting of the survey also confirmed that it could be completed in ten minutes. Once the feedback from piloting the survey was incorporated it was ready to be distributed to the target population.

3.6.3 Survey Issuance

Ethics approval was sought and granted so the survey could be distributed. As per the Ethics guidelines, approval also had to be sought from HR to approve the issuance of the survey and the use of the company's global email distribution list to send the survey to all employees. In accordance with ethics guidelines, the online survey detailed the participation information sheet and informed consent form which outlined the background to and procedures of the research. The beginning of the survey also outlined what was meant by 'technology interruptions' in the context of the survey so that there was no ambiguity as to what was being asked.

Research has indicated that the timing of a survey distribution should also be taken into consideration when sending out a survey. Quinn (2009) found that Wednesday was the optimal day of the week so the email for the survey questionnaire was sent on a Wednesday. The survey was open for a period of two weeks. A reminder email was sent after the first week and a final reminder email was sent the day before the survey closed.

3.7 Interview

A semi-structured interview was designed to gather qualitative data from the sample population. The format chosen was to be semi-structured rather than informal.

3.7.1 Interview Execution and Analysis

Five interviews were conducted with knowledge workers from the organisation as part of this research. Participants were invited to attend face-to-face interviews. The interviews took between 20 and 30 minutes each. All participants were advised they could withdraw from the interview process, without penalty, at any time.

Saunders et al., (2009) indicates that credibility can be promoted by supplying information to interviewees prior to the interview. As the interviews took place after the survey participants were familiar with the reasons behind the research. As per the ethical guidelines, participants were provided with the information sheet in advance of the interview and the informed consent form which was signed by each interviewee on the day. Participants were informed that the interviews would be recorded and agreement was sought for this to be done.

Interviews were manually transcribed from the recording with each document given a pseudonym to preserve anonymity. These recordings will be destroyed upon completion of the research in September 2015.

3.8 Ethics Approval

Any data collection for academic research will have ethical implications. There can be issues in relation to corporate permission, informed consent, confidentiality and privacy, copyright and intellectual property rights. Ethical approval is required before any studies involving human participants can commence.

When the design of the online survey questionnaire was finalised and the list of interview questions completed, an application for ethics approval was submitted to the School of Computer Science and Statistics (SCSS) Research Ethics Committee on the 17th May 2015 for approval to carry out the research. Following a number of updates recommended by the Research Ethics Committee approval was granted. Some of the recommendations included the following:

- Include a statement saying that permission from the organisation had been sought
- State that a possible conflict of interest may arise
- Include a statement of the researchers responsibility on the HR informed consent form

3.9 Limitations of Methodology and Lessons Learned

The semi-structured interviews took approximately 30 minutes but the duration was expected to be longer. The questions were designed to be open ended but answers did need some probing to get any real level of detail beyond what the scope of the surveys had already provided.

There is also the concern of the inability of the researcher to eliminate bias as she is currently an employee of the organisation where the surveys and interviews are being conducted.

3.10 Summary

This chapter investigated various methods that can be used to obtain the best results when conducting research. An online survey questionnaire and a number of face-to-face semi-structured interviews within a software development organisation were chosen for this study. The study is cross-sectional in nature and uses mixed methods data collection techniques.

4 Findings and Analysis

4.1 Introduction

This chapter presents the findings of the online survey and the semi structured interviews of knowledge workers in a software development organisation. It explains how the data was prepared, analysed and interpreted.

4.2 Profile of the Organisation

The online survey and interviews were conducted on a global software development organisation. The organisation is an Irish company with its main offices in Dublin and New Delhi and other offices in Singapore, Kuala Lumpur, London and New York. The company develops software for financial services companies with customers based all over the world.

4.3 Data Preparation

The online survey was conducted on SurveyMonkey and once the survey was closed the data was initially reviewed online. All data was then extracted to Microsoft Excel in coded numerical format and actual answer test format. Using SurveyMonkey's analytical tools, the demographic information was used to cross tabulate and compare responses.

4.4 Survey Findings

There were 64 responses to the survey. Of the 64 respondents, all accepted the terms and conditions and all submitted their responses at the end of the survey. This resulted in a sample set of 64 respondents that were included in the analysis.

The survey consisted of 21 questions and was divided into three sections:

1. Participant Demographics
   Respondents were asked five demographic questions related to their age, gender, locations and level of IT expertise.
2. Technology Interruptions
   What mediums were most frequently used within the organisation and if respondents agreed or disagreed with some statements that were taken from the literature review.

3. Measure of Technology Interruptions
   How knowledge workers were impacted by the interruptions and what measure they took if any to minimise the interruptions.

4.4.1 Gender

For the gender question, three respondents skipped this question so of the remaining 61 respondents 70.5% were male and 29.5% were female.

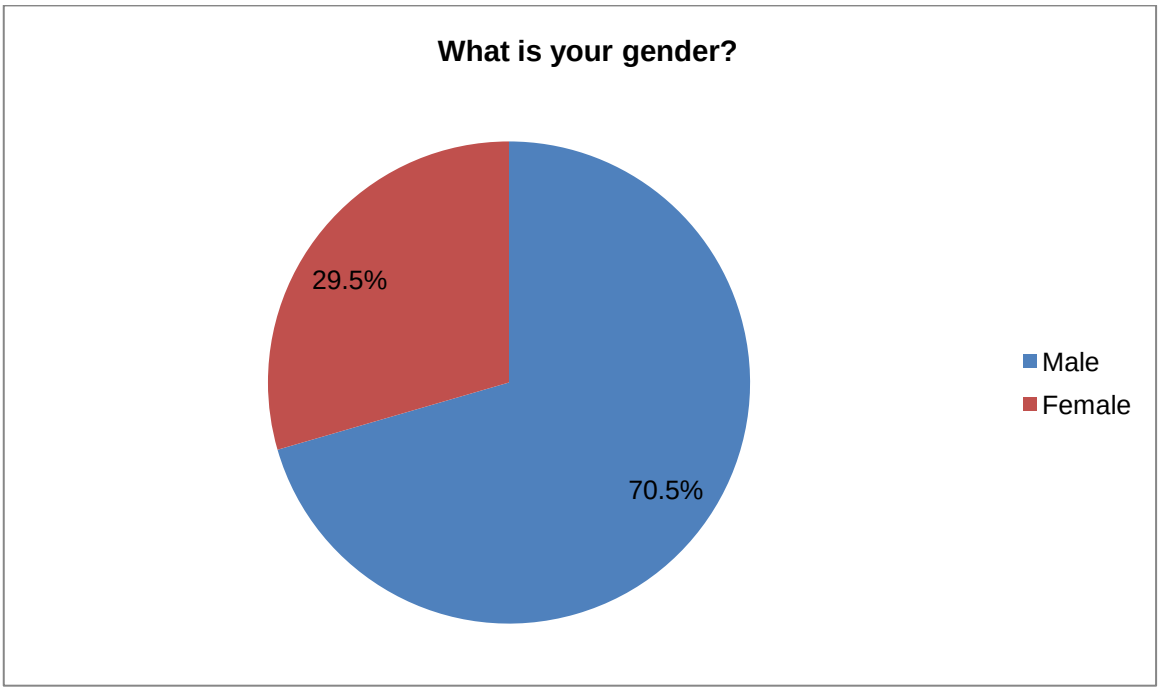

FIGURE 4.1 Responses to gender question

4.4.2 Age Category

For the age breakdown, three respondents skipped this question so of the remaining 61 respondents 56% were in the 25 to 34 age bracket with 33% in the 35 to 44 age bracket. From the chart in Figure 4.2, 89% of respondents range in age from 25 to 44.

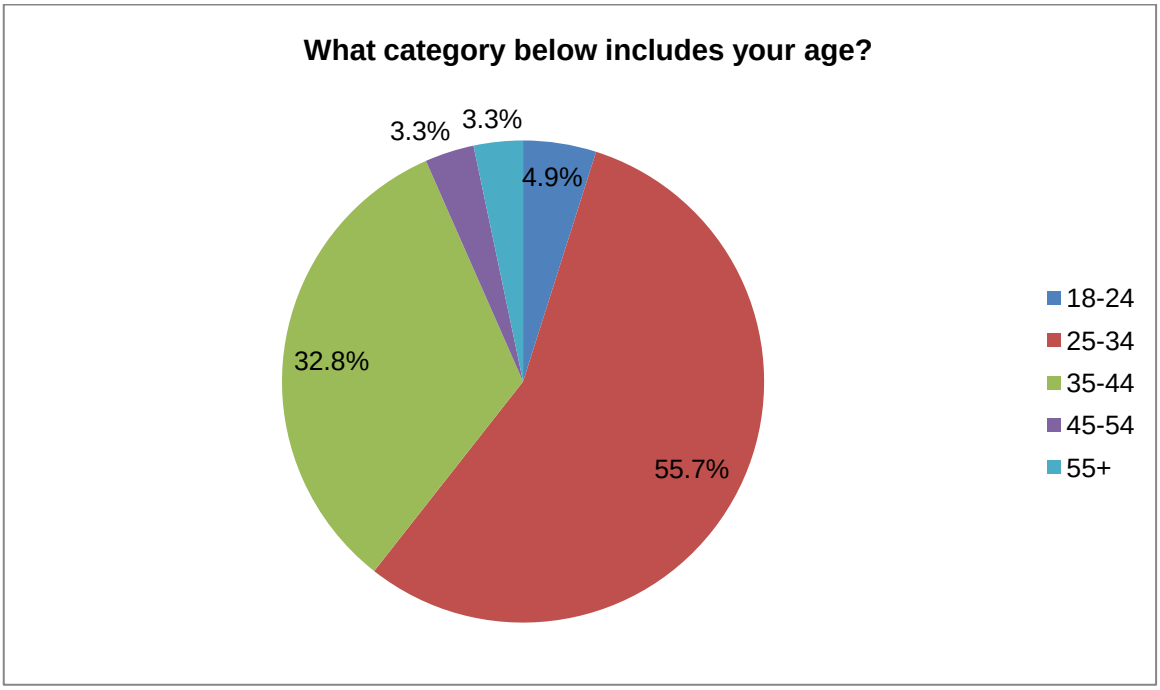

FIGURE 4.2 Responses to age category

4.4.3 Location

For the breakdown on location, nine respondents skipped this question so of the remaining 55 individuals, 57% were from Ireland and 36% were from India.

TABLE 4.1 Breakdown of locations

In what country do you currently reside? (N = 55)	Frequency	Frequency %
Ireland	31	57%
India	20	36%
USA	3	5%
Switzerland	1	2%
Total	**55**	**100.00%**

4.4.4 IT Expertise

To establish a level of IT expertise, two questions were asked in relation to how a respondent rated their technical level of IT and also on a day to day basis how much interaction they have with IT. For the question on IT expertise, three respondents skipped this question so of the remaining 61 individuals, 66% rated themselves as having a good level of IT expertise. The full breakdown is displayed in Figure 4.1

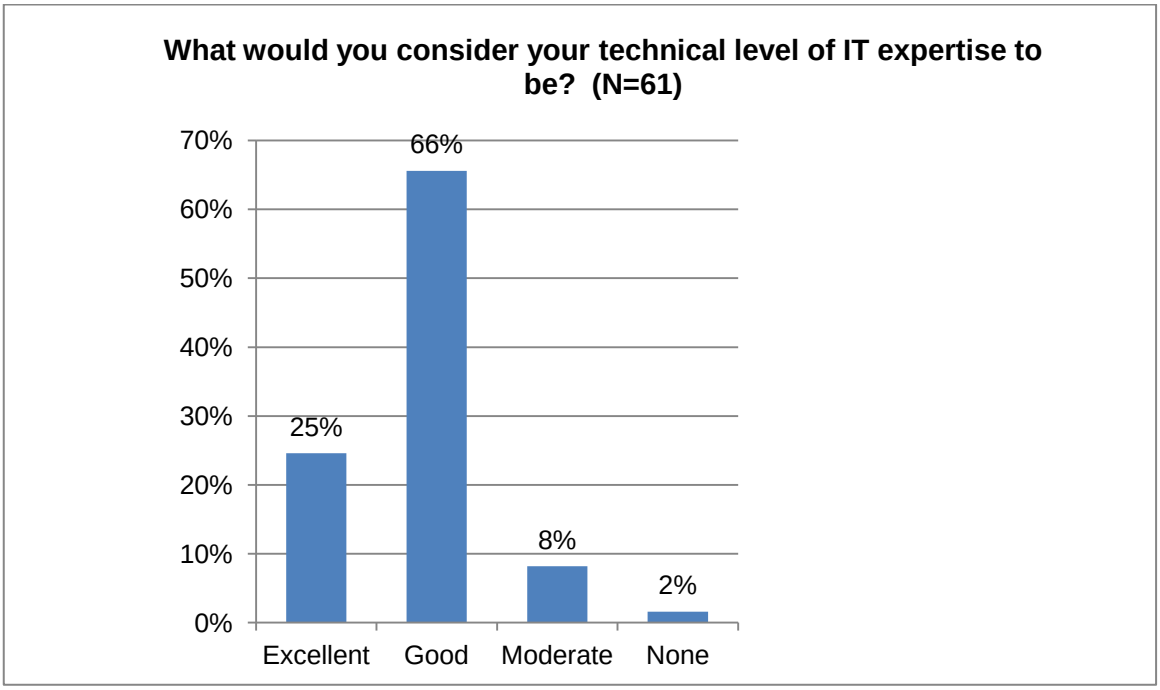

FIGURE 4.3 Technical level of IT expertise

For the question on how confident respondents are with technology on an everyday basis, 4 skipped this question so of the remaining 60 responses 53% rated themselves as being 'Somewhat confident' and 34% rated themselves as being 'Very confident'. The full breakdown is displayed in Figure 4.2

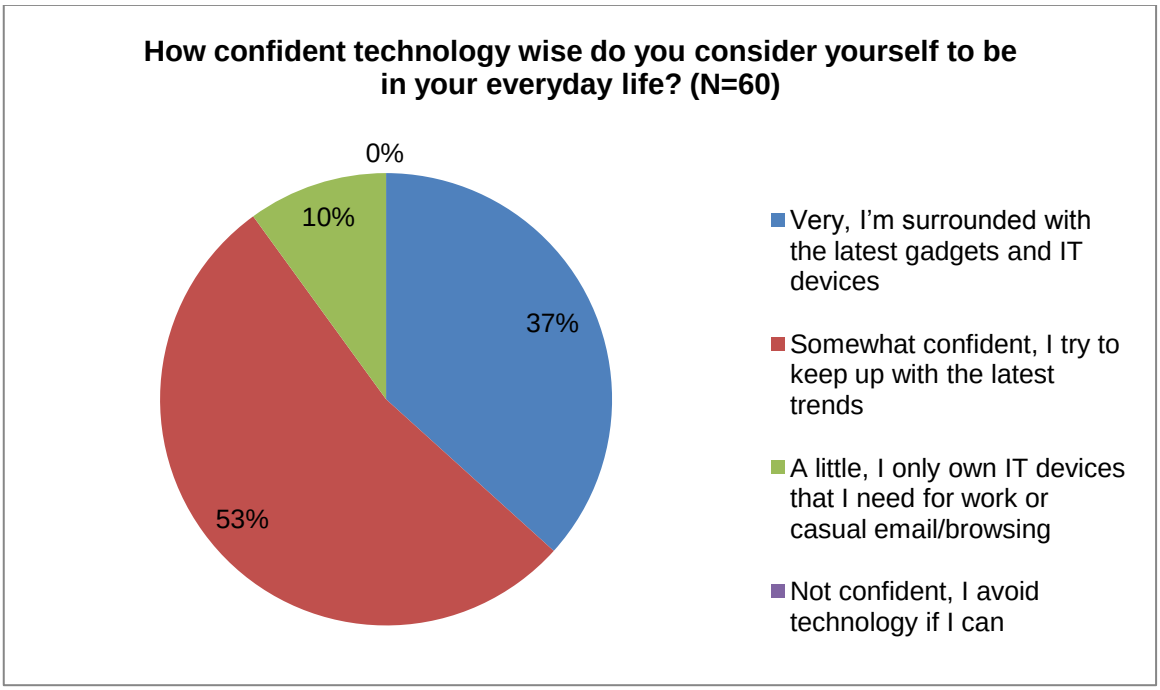

FIGURE 4.4 Technical confidence in everyday life

Over half of the respondents are in the 25 to 35 age group and combined with the next age category, 88% put themselves in the 25–44 age group. Over 70% of the respondents are male which is typical of a software development organisation. Over half the respondents are from Ireland, with the majority of all others from India. IT expertise and "technical confidence" rated at a "Good" level.

4.4.5 Medium of Technology Interruptions

A number of questions were asked in relation to technology interruptions as to what medium is used and how they are viewed in the workplace. Respondents were asked to rank the most frequent technology interruptions that they would initiate to interrupt a colleague. This would give the relative importance of a series of interruption mediums when contacting a colleague. All survey respondents answered this question.

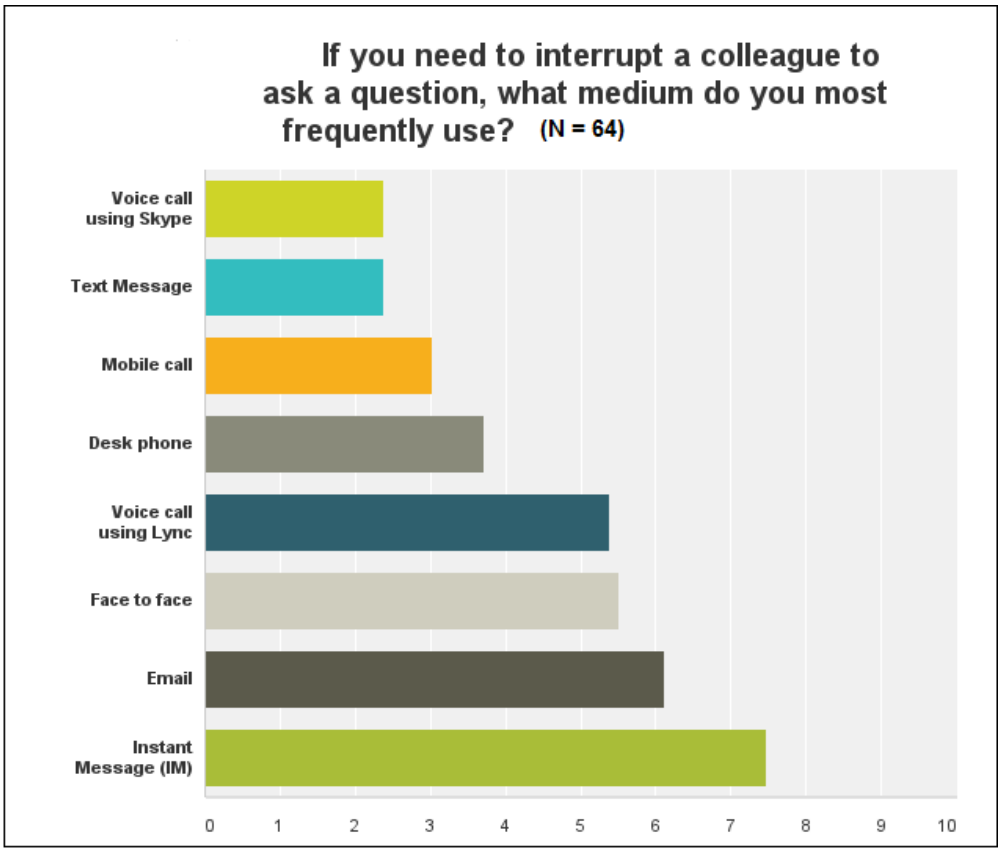

FIGURE 4.5 Medium of technology interruption most frequently used

On analysing the results, Instant Message (IM) was ranked the most frequent technology tool used when interrupting a colleague with email being the second choice. From the breakdown of the results in Table 4.1, 72% of respondents ranked IM as the technology tool of choice when contacting a colleague. Only 6% ranked email as number one but

surprising 16% ranked 'face to face' as their method of interrupting a colleague. This is similar to the research carried out. In a study conducted by Cameron and Webster (2004) to investigate why employees choose IM over another communication medium they found the following main themes to be the reasons:

- Critical mass: IM is deployed on all employee workstations across the organisation and all employees use it.
- Symbolic cues: IM suggests an informal tone. It's also used to get attention and suggests a quick response is required.
- Media richness: Overall IM is not considered to be a media rich medium but is effective for instant feedback.

This question required the respondents to rank the technology mediums so a further breakdown of the responses with average score can be seen in Table 4.1

TABLE 4.2 Further breakdown to show ranking and average score

	1	2	3	4	5	6	7	8	Total	Score
Instant Message (IM)	**71.88%** 46	**15.63%** 10	**7.81%** 5	**1.56%** 1	**0.00%** 0	**3.13%** 2	**0.00%** 0	**0.00%** 0	64	7.48
Email	**6.25%** 4	**34.38%** 22	**34.38%** 22	**17.19%** 11	**4.69%** 3	**3.13%** 2	**0.00%** 0	**0.00%** 0	64	6.11
Face to face	**15.63%** 10	**23.44%** 15	**25.00%** 16	**10.94%** 7	**9.38%** 6	**1.56%** 1	**1.56%** 1	**12.50%** 8	64	5.52
Voice call using Lync	**3.13%** 2	**15.63%** 10	**20.31%** 13	**43.75%** 28	**12.50%** 8	**3.13%** 2	**1.56%** 1	**0.00%** 0	64	5.38
Desk phone	**0.00%** 0	**7.81%** 5	**10.94%** 7	**14.06%** 9	**25.00%** 16	**10.94%** 7	**17.19%** 11	**14.06%** 9	64	3.72
Mobile call	**3.13%** 2	**0.00%** 0	**0.00%** 0	**7.81%** 5	**15.63%** 10	**39.06%** 25	**25.00%** 16	**9.38%** 6	64	3.03
Text Message	**0.00%** 0	**3.13%** 2	**1.56%** 1	**3.13%** 2	**12.50%** 8	**14.06%** 9	**34.38%** 22	**31.25%** 20	64	2.39
Voice call using Skype	**0.00%** 0	**0.00%** 0	**0.00%** 0	**1.56%** 1	**20.31%** 13	**25.00%** 16	**20.31%** 13	**32.81%** 21	64	2.38

From the analysis of question one it's clear that IM is the technology tool most employees will use to interrupt a colleague and this finding is backed up by the research literature.

4.4.6 Instant Messenger (IM) Status

Participants were asked if they acknowledged and respected the status set on IM when considering interrupting a colleague. From the pie chart breakdown in Figure 4.4, interestingly 61% responded that only sometimes did they respect the status and 33% always respected the status. Only a third of respondents would not interrupt a colleague if their IM status was set to 'busy' for example. A small 6% ignore the status completely and interrupt a colleague regardless.

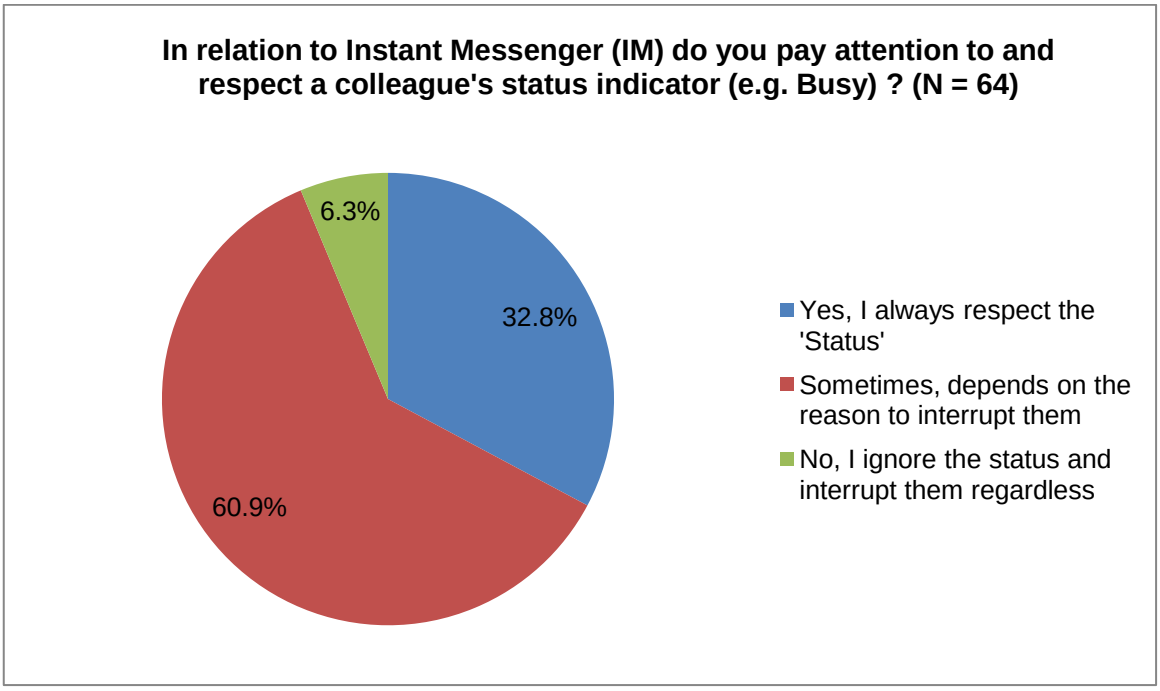

FIGURE 4.6 Instant Messenger Statuses

4.4.7 Technology Interruptions Experienced

Respondents were asked how many interruptions they experienced in an average working day. 37% advised that they were interrupted up to ten times a day and at the higher end of the spectrum 9% said they were interrupted over 40 times.

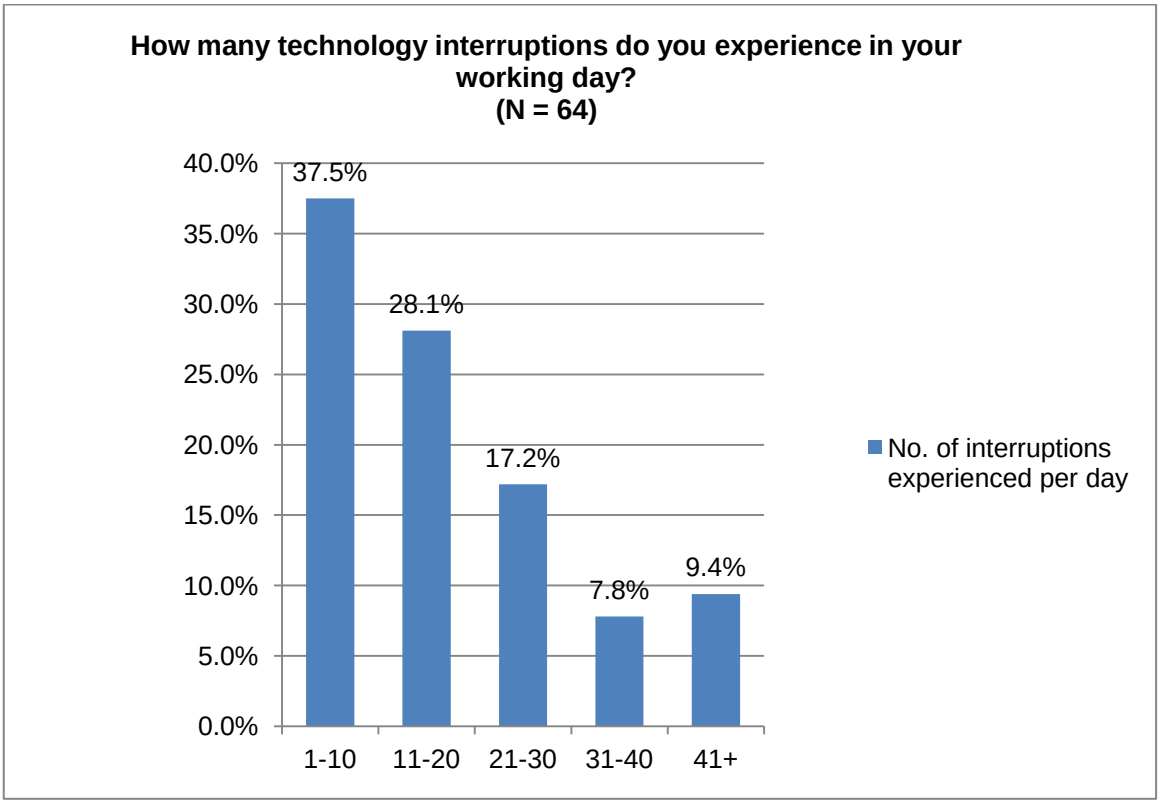

FIGURE 4.7 How many technology interruptions are experienced

Respondents were then asked to relate the number of interruptions they received to their collaborative work environment i.e. interruptions from colleagues that were related to a project or task they were working on or could contribute to. 47% indicated that 75% of interruptions were related to a project they were working on but 37% indicated that only 50% related to a project they were working on. See Table 4.2 for the complete breakdown.

TABLE 4.3 Percentage of interruptions experienced that relate to collaboration

Percentage of interruptions experienced that relate to collaboration (N= 64)	No. of Responses	No. of Responses %
75%	30	46.88%
50%	24	37.50%
Less than 25%	9	14.06%
100%	1	1.56%
Total	**64**	**100%**

4.4.8 Technology Interruptions Initiated

Respondents were then asked how many interruptions that they actually initiated during their working day. 57% said that they would initiate up to ten interruptions and only 5% said they initiate 31 or more interruptions.

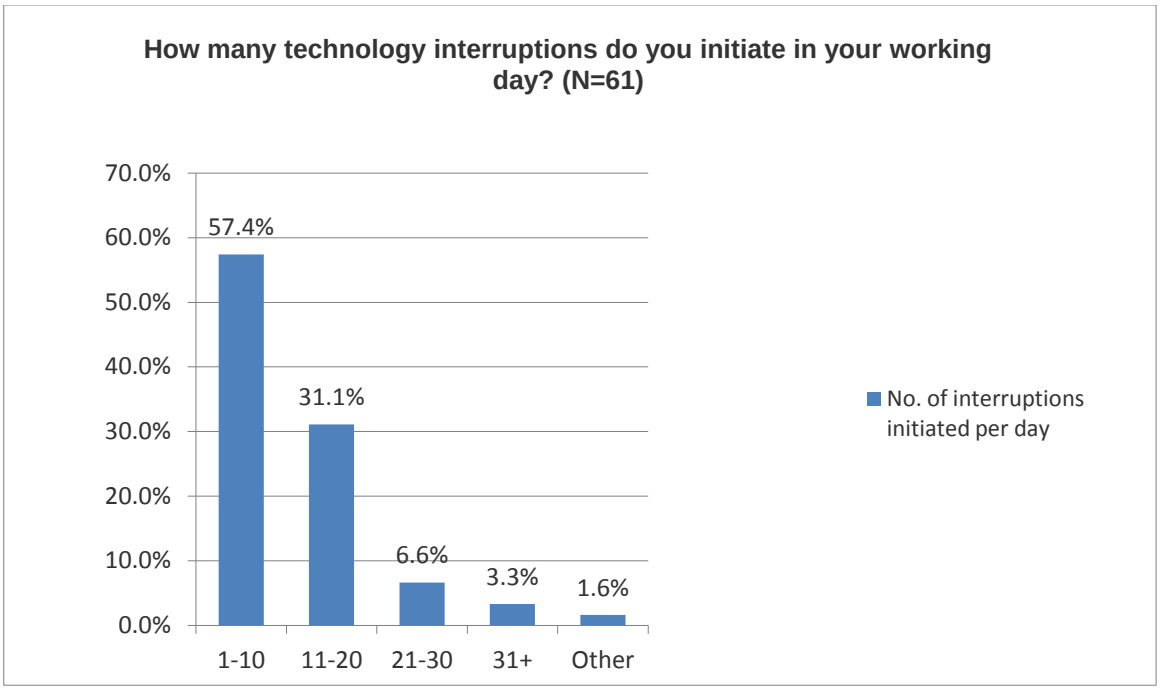

FIGURE 4.8 User initiated technology interruptions in a working day

Table 4.3 gives the breakdown of how many user initiated interruptions relate to the collaborative environment. 46% indicated that 75% of interruptions that they initiated related to the collaborative work environment. And 10% indicated that all the interruptions they initiated were work related.

TABLE 4.4 Percentage of user initiated interruptions that relate to collaboration

Percentage of interruptions initiated that relate to collaboration (n=61)	No. of Responses	No. of Responses %
75%	28	45.90%
50%	15	24.59%
Less than 25%	12	19.67%
100%	6	9.84%
Total	**61**	100.00%

4.4.9 Response to Technology Interruptions

Respondents were asked to rate their agreement level with a number of statements. A 5-point Likert rating scale was applied with weights ranging from 1-5; 1 being 'Strongly Disagree' up to 5 which is 'Strongly Agree'.

When asked if they have the necessary technology tools to do their job, 53% agreed that they seldom have problems and 15% strongly agreed. 10% disagreed or strongly disagreed. Although quite low, this response should warrant more of an investigation as to what exactly the issues are and why 10% of respondents did not agree that they had the necessary technology tools to do their job.

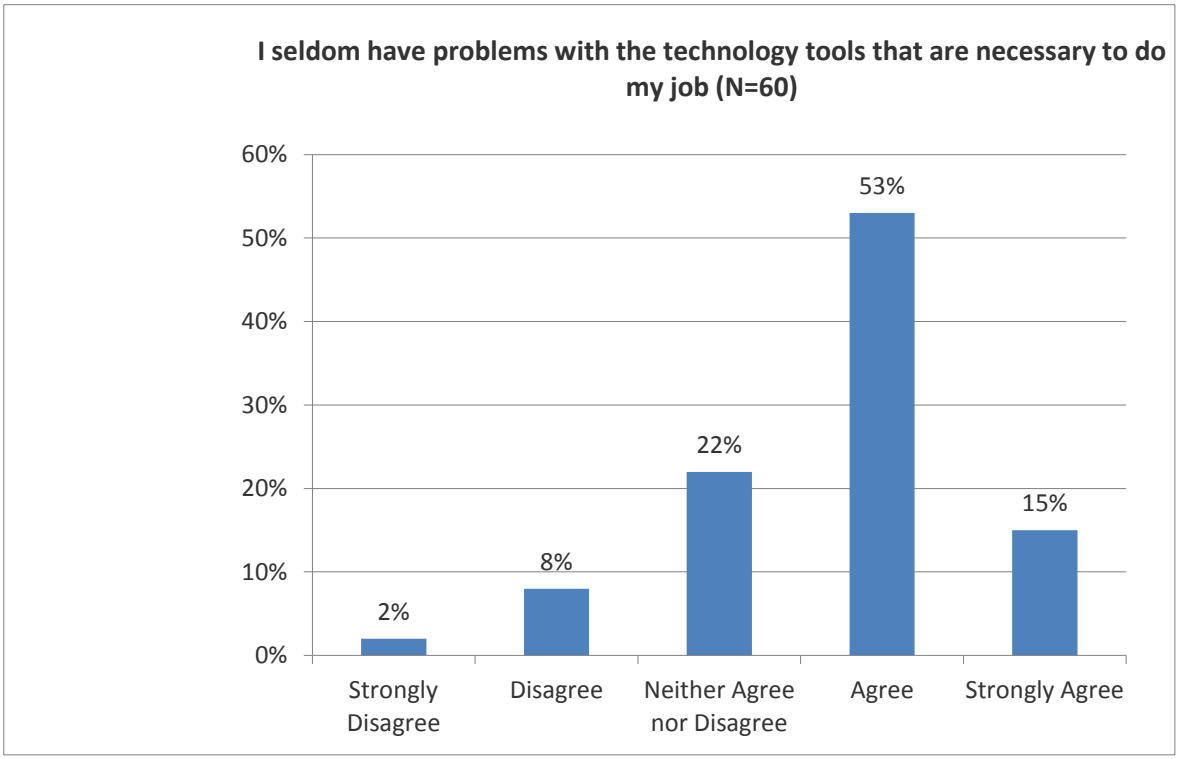

FIGURE 4.9 Technology tools available to do the job

Respondents were asked if they the type of interruption affected their response to it (e.g. an IM versus a system outage), 75% agreed or strongly agreed that the type of interruptions did impact their response to it. 22% were undecided.

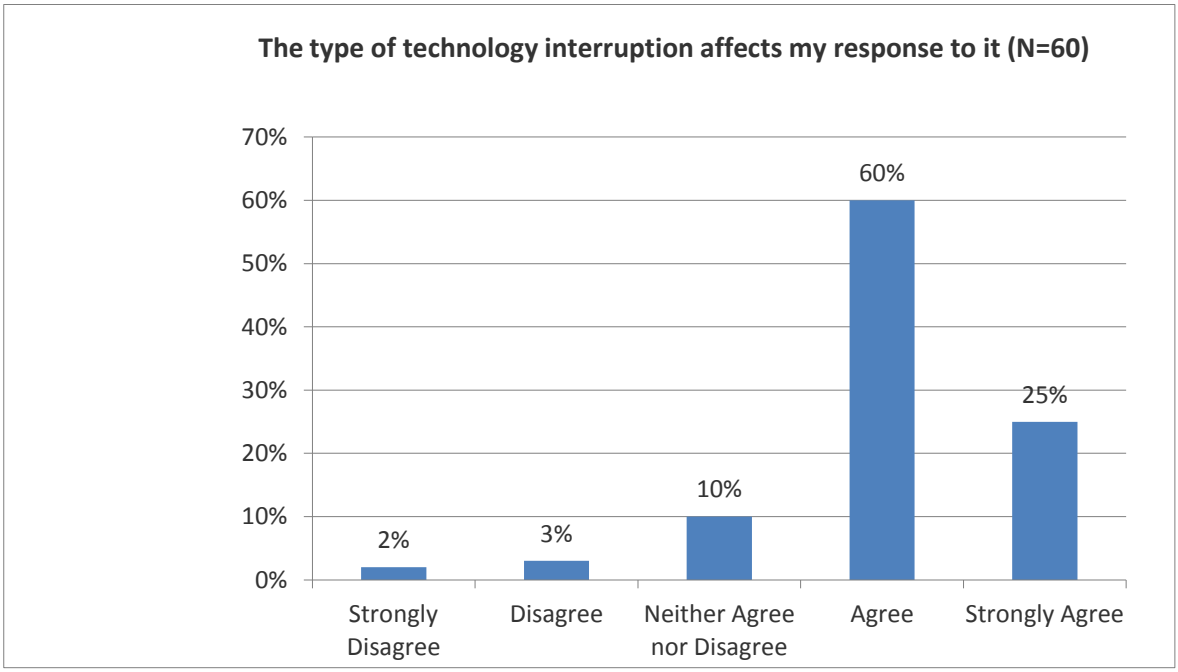

FIGURE 4.10 The type of technology interruption affects the users response to it

Respondents were asked if the initiator of an interruption was likely to have an impact on how quickly they would respond to it. Using the 5 point Likert scale 77% agreed/strongly agreed that this would impact on their response. The study by Gupta et al. (2013) looked at how the hierarchal level of the sender combined with the interruptive features of IM impacted on user performance and mental overload. Their results showed that messages from a supervisor or manager are given higher processing priority, resulting in smaller task time but greater perceived workload. Supervisors and managers should consider other communication channels if an immediate response is not necessary.

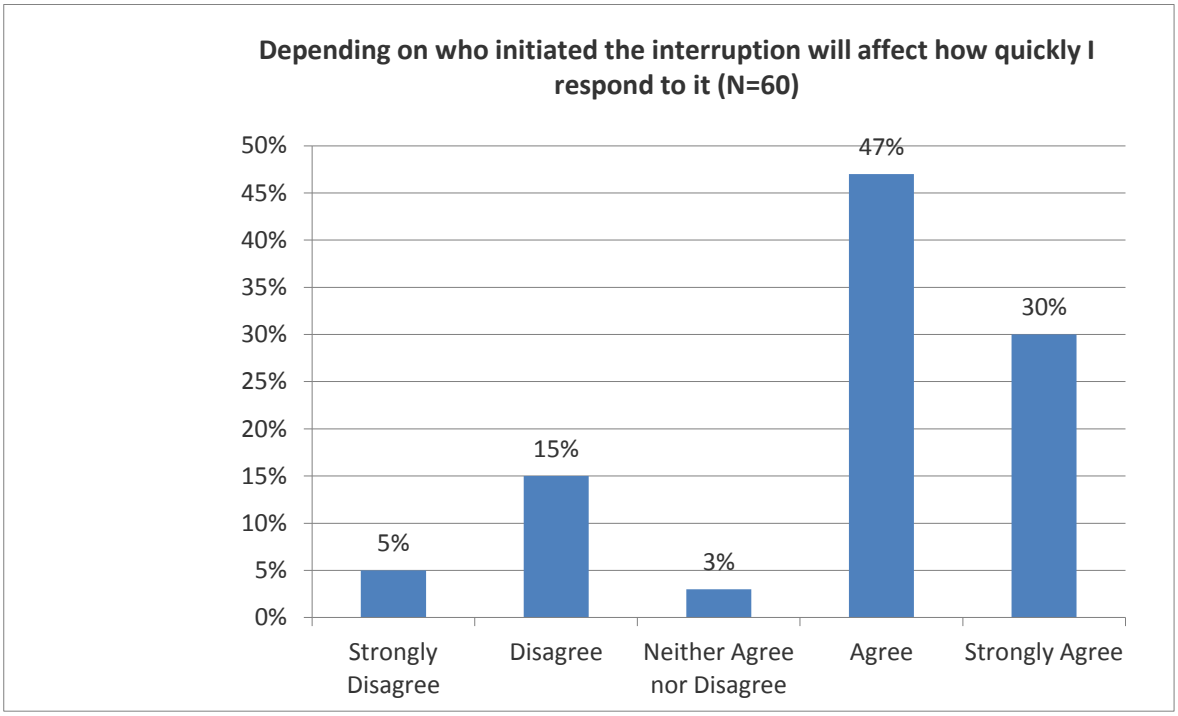

FIGURE 4.11 'Who' initiates the interruption impacts how quickly the user responds

4.4.10 Advantages of Technology Interruptions

Respondents were provided with a number of advantages from the literature review that technology interruptions can contribute to the working day and were asked to select all that applied. 'Facilitates collaboration among colleagues' came out on top with 87% selecting it the most number of times. "Accomplish tasks more effectively" and "Share information easily" scored the same with 77%. "They can be an unplanned but welcome break" was 36%.

Of the survey respondents and interviews some comments on the advantages as follows:

"I can use the technology to discreetly check on the status of others (i.e. in/out of office) without necessarily disturbing them",

"Allows for answers to urgent queries",

"Good for sharing knowledge",

"Helps to complete tasks in a quicker timeframe",

"Allows the owner of a task to easily seek input and expertise from the relevant department".

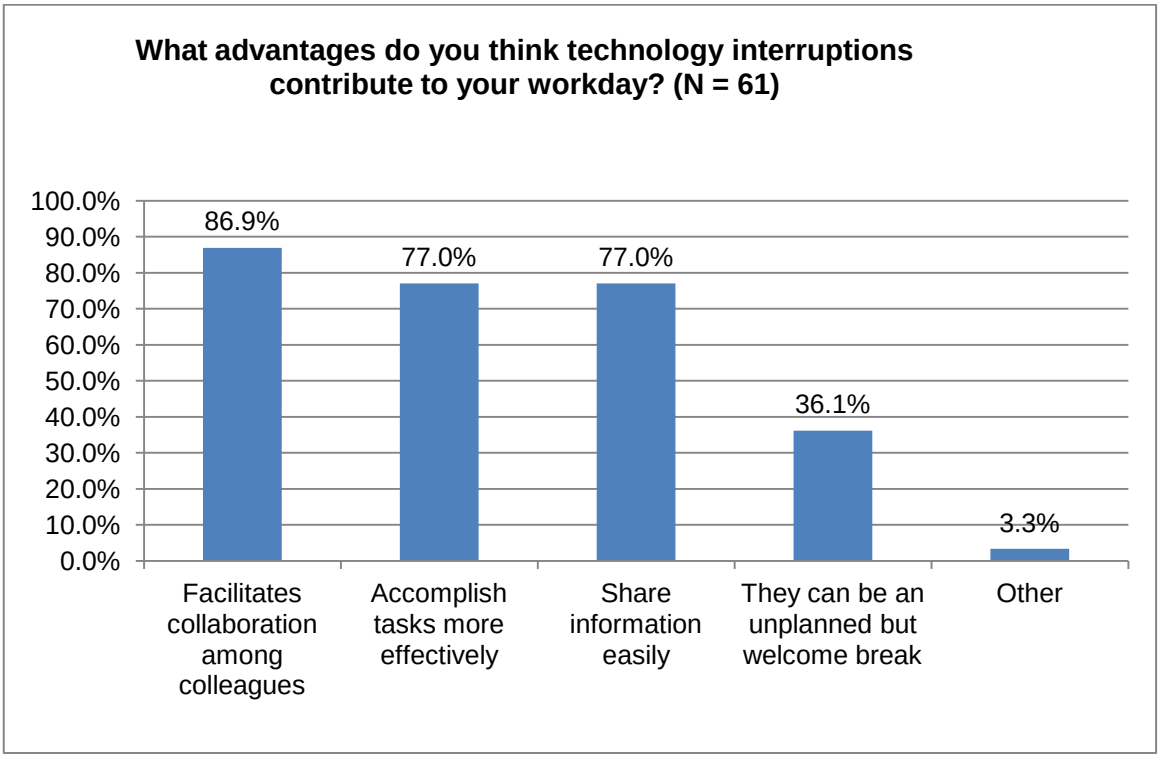

FIGURE 4.12 Advantages of technology interruptions

4.4.11 Disadvantages of Technology Interruptions

Respondents were presented with a number of disadvantages of technology interruptions and asked to select all that applied. 97% selected "They cause a delay in resuming the task you were working on". This is borne out in the existing research literature so is unsurprising. Technology interruptions create more than 70 suspensions per day for office workers, with each needing between one minute (Jackson et al., 2003) and 24 minutes (Hemp, 2009) for primary task resumption.

Of the survey respondents and interviews some comments on the disadvantages as follows:

"Too many disruptions make it difficult to concentrate on a task, frequent breaks in workflow are bad, it reduces efficiency and decreases productivity",

"They restrict others working it out for themselves",

"People can't see that you are busy or with someone because you status may be green (available) and become impatient that they have not received an instant response",

"People have more view on your activity and whereabouts when not directly working with you",

"You can be inundated with queries",

"It slows productivity and can cause frustration",

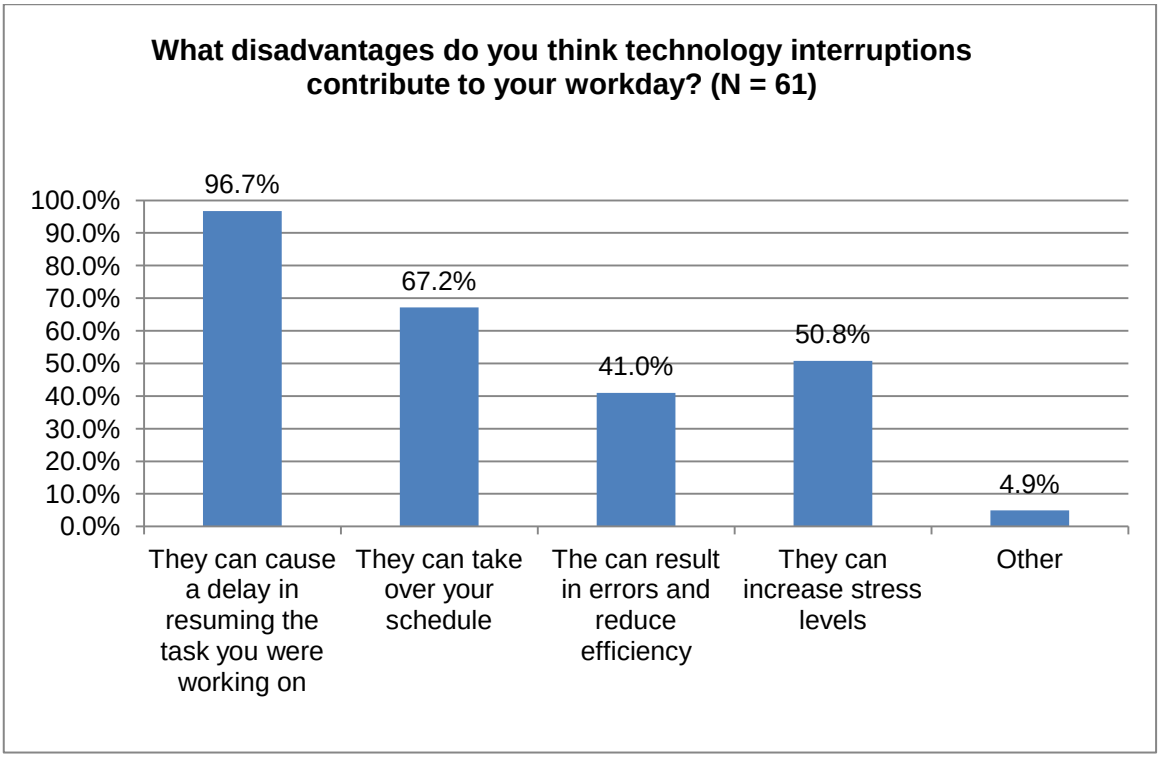

FIGURE 4.13 Disadvantages of technology interruptions

4.4.12 Measure the Impact of Technology Interruptions

Section three of the survey is to measure the impact of technology interruptions and if employees address these impacts.

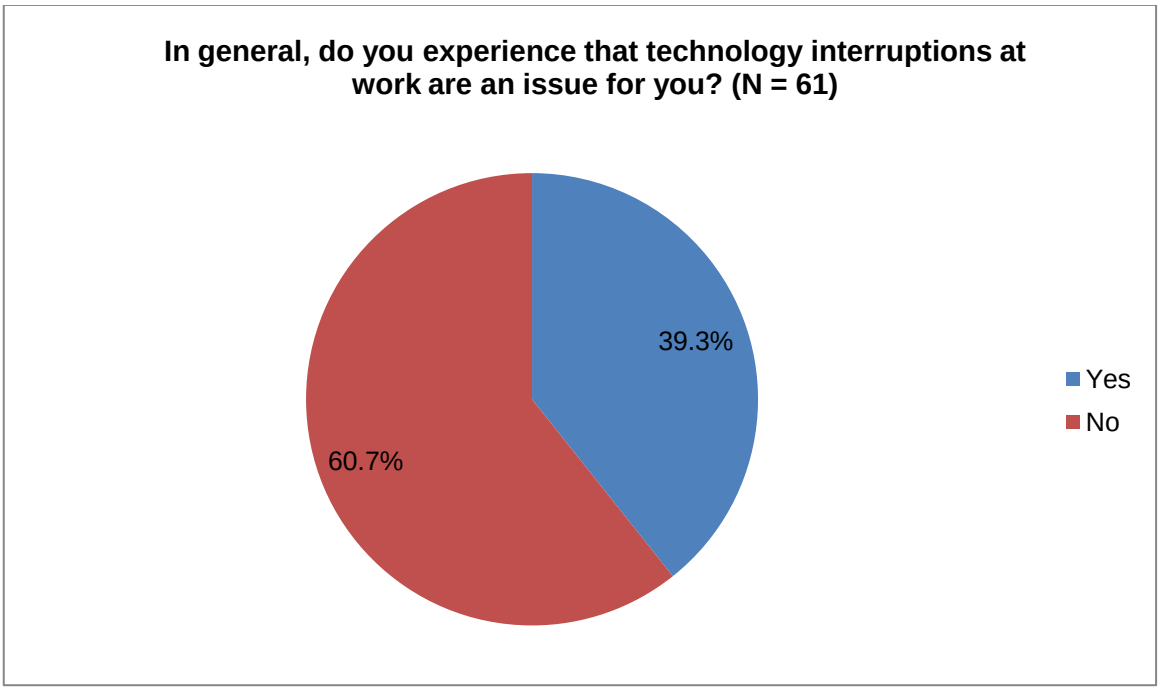

FIGURE 4.14 Are technology interruptions an issue at work

Respondents were asked if technology interruptions were an issue at work and 39% of the 61 respondents indicated that they were not. This is surprising given that the main disadvantage in Figure 4.11 was that they can "cause a delay in resuming the task you were working on". It's possible though that the 'delay' is considered to be an inevitable part of the interruption so in general the interruption is not an issue. Due to interdependencies of work activities interruptions can be expected and even though an employee might be overloaded they are still open to being interrupted (Hudson et al. 2002)

The next question generated the most comments of all the open ended questions on the survey and goes somewhat to explain the Yes (39%)/No (61%) breakdown.

For the 61% that don't consider technology interruptions to be an issue, another question was asked of respondents to comment on 'Why' the interruptions were not an issue. The following is a sample of the 32 comments received: (See Appendix H for the remaining comments). These comments all have a common theme and that is that interruptions are

an inevitable part of most contemporary organisations especially an openly collaborative software development environment.

“I treat them as part of my work”,

“They are essential for communication to get work completed”,

“Because as a support worker it is a vital part of the job”,

“It makes my life easier when I am stuck in my work and needs help from someone”,

“They are necessary to look into some urgent issue which might have come up”,

“It depends on the type and cause of interruption. For example if the interruption is for a critical production issue then it is fine”.

“I'm here to help and would prefer to be interrupted than have people doing the wrong thing. If I am being interrupted unnecessarily I will point the person in the right direction and advise how to minimise avoidable interrupts”,

“I do not receive as many technology interruptions as my other colleagues do. 75% of the interruptions I receive are useful for my work”.

“It increases the time I am spending on a certain defect”,

“Part of the work”,

“Part of everyday working”,

“They allow a collaborative environment across multiple locations”,

“While mildly annoying, the interruption is most likely needed”,

“Because it helps more than causing interruptions. Everyone is usually available over Lync (IM) and delivers a quicker response than if you would need to meet the person face to face”,

“In general they are not an issue. My view is that the advantages slightly outweigh the disadvantages especially when the core of your team is in a different country”,

"Helps in getting quick answers/information via Lync (IM). SMS to complete my work instead waiting for email responses and sending reminders. People tend to respond faster on messages",

"As it increase knowledge also. And it helps in your work also sometimes",

4.4.13 Employee impact of Technology Interruptions

Respondents were asked to rate their agreement level with a number of statements. A 5-point Likert rating scale was applied with weights ranging from 1-5; 1 being 'Strongly Disagree' up to 5 which is 'Strongly Agree'.

When respondents were asked about the impact of technology interruptions, 39% 'neither agreed nor disagreed' with switching back to what they were doing prior to being interrupted. The literature indicates that it can take between 1 and 24 minutes to reorient yourself to the primary task you were working on prior to being interrupted. 28% disagreed and 27% were on the other side of the scale and agreed so it's possible that respondents were ambiguous this question.

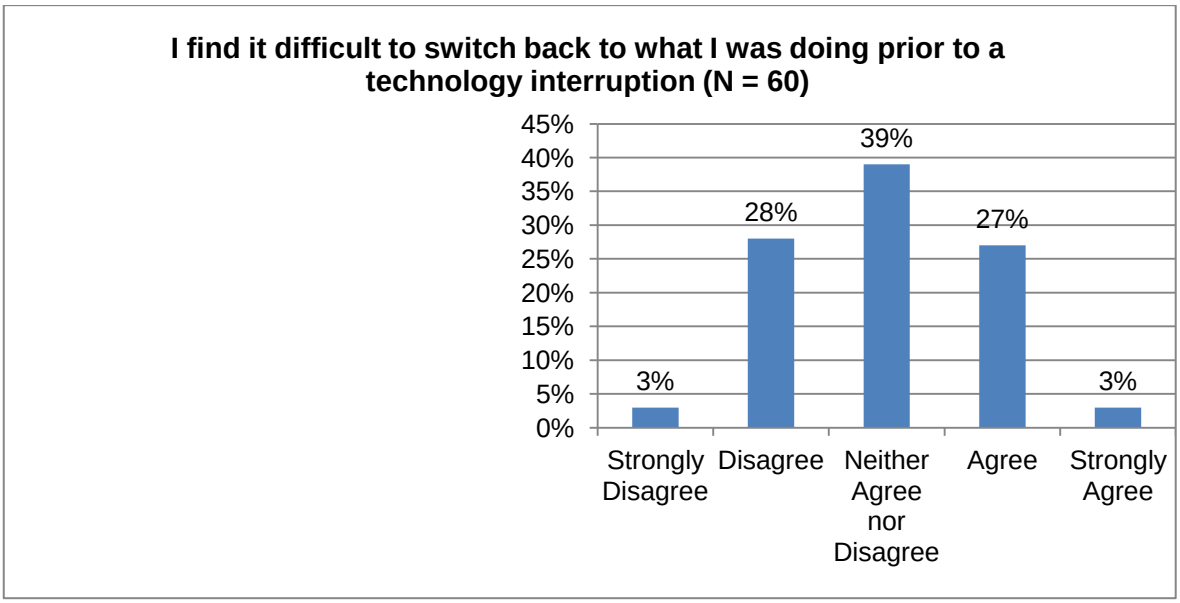

FIGURE 4.15 Primary task resumption

58% agreed and 22% strongly agreed that interruptions that the respondent had no control over would negatively impact on their work performance.

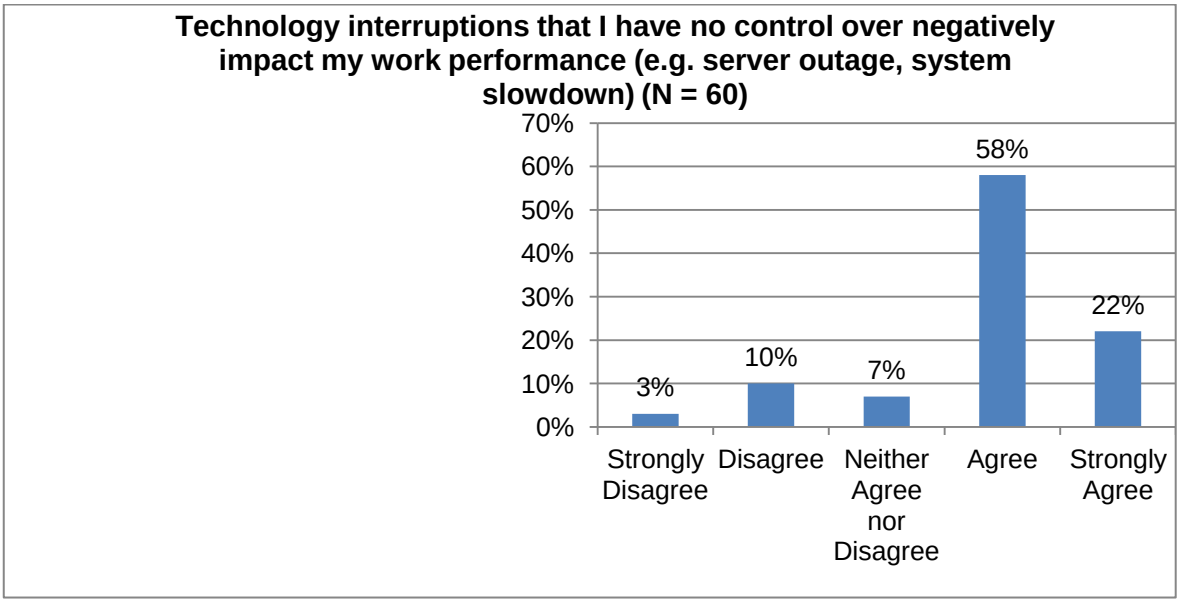

FIGURE 4.16 Impact of interruptions

35% neither agreed nor disagreed on having control over the inflow of information. Though 33% did agree that they had control while 27% disagreed.

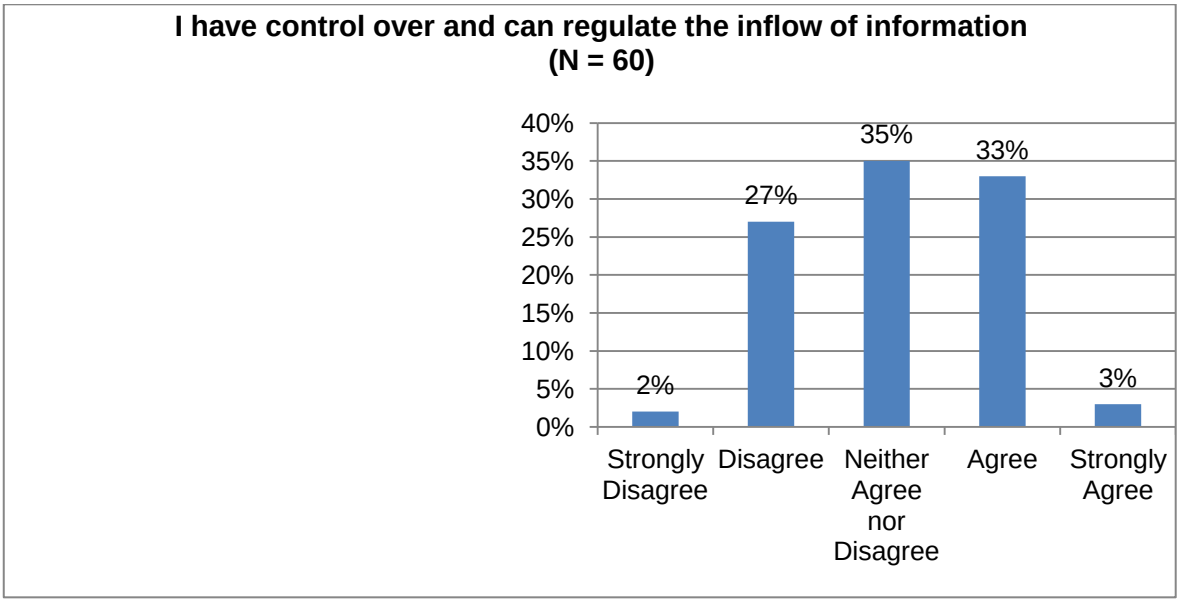

FIGURE 4.17 Control of inflow of information

As technology interruptions are a part of the contemporary workplace, it's interesting to see that 47% of respondents can refrain from having to immediately check and respond to incoming interruptions. Respondents may be focused on the primary task which may well

be complex so will delay checking and responding until a more suitable and convenient time.

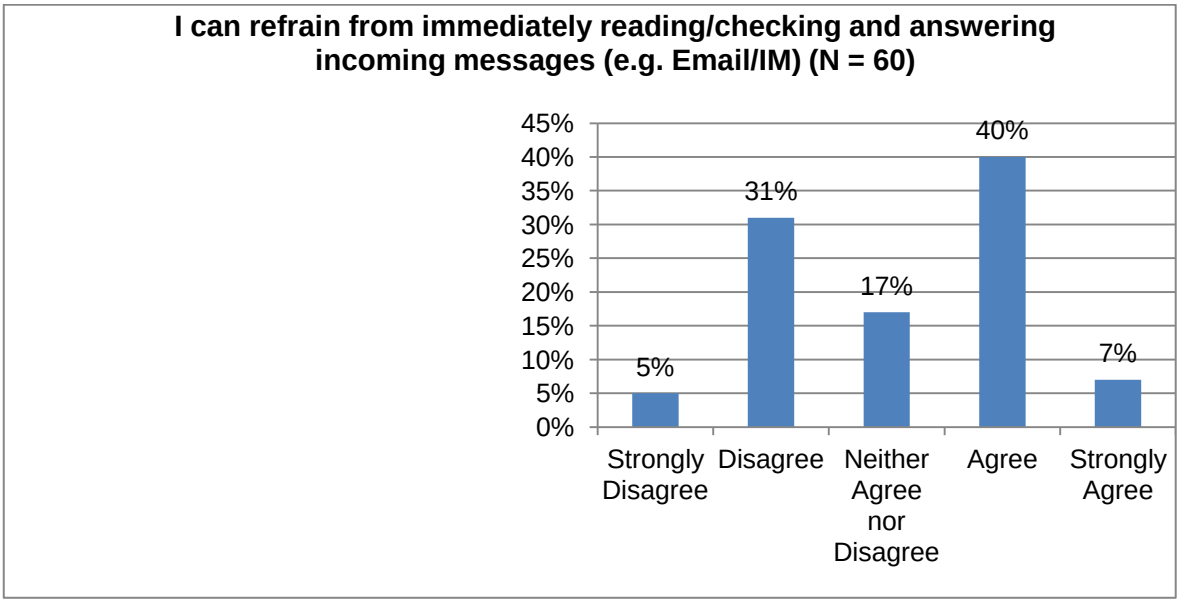

FIGURE 4.18 Refrain from responding to interruptions

76% agree that they can quickly respond to a work related query via an interruption. This is as a result of the collaborative and knowledge sharing environment that exists within the organisation.

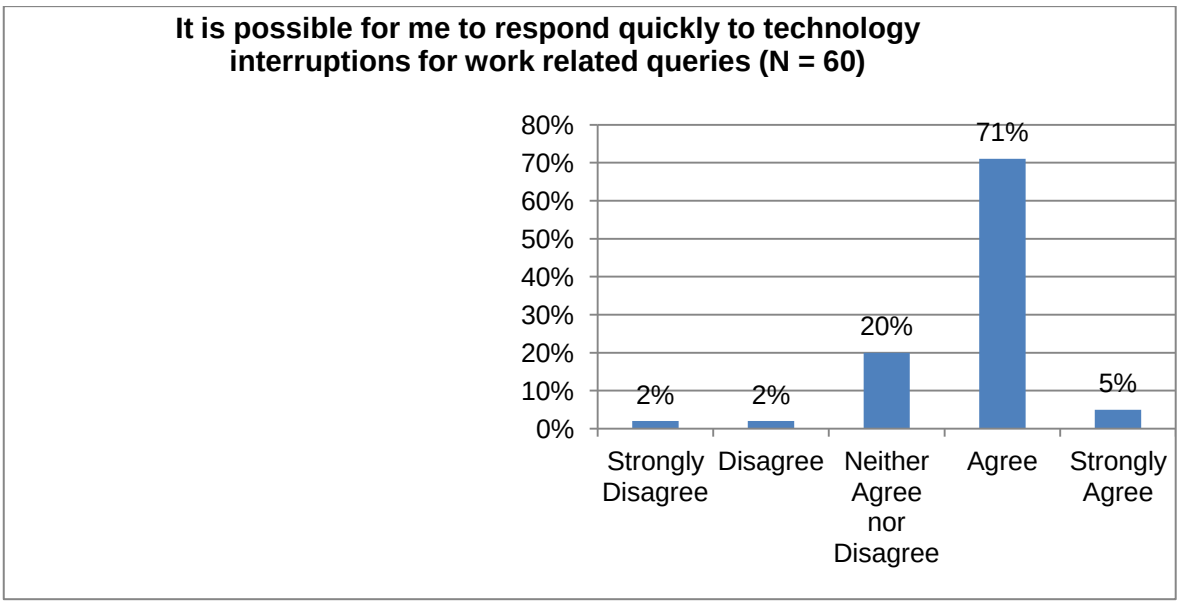

FIGURE 4.19 Response times to interruptions

4.4.14 Management of Technology Interruptions

Respondents were asked if they attempt to manage the interruptions themselves by using the technology tools or their time in a manner that allows them to have a degree of control over the interruptions. 84% indicated that they use the status on Instant Messenger (IM) and set it to 'Away' or 'Do not Disturb'. 40% of respondents choose to turn off email pop-ups preferring instead to check email periodically at a convenient time. 34% log out of IM so colleagues that are not in your immediate vicinity do not know if you available.

When interviewees were asked if colleagues should be available at all times the consensus was that at least one person should be available from each team at all times but not everybody with that team or department had to be available at all times.

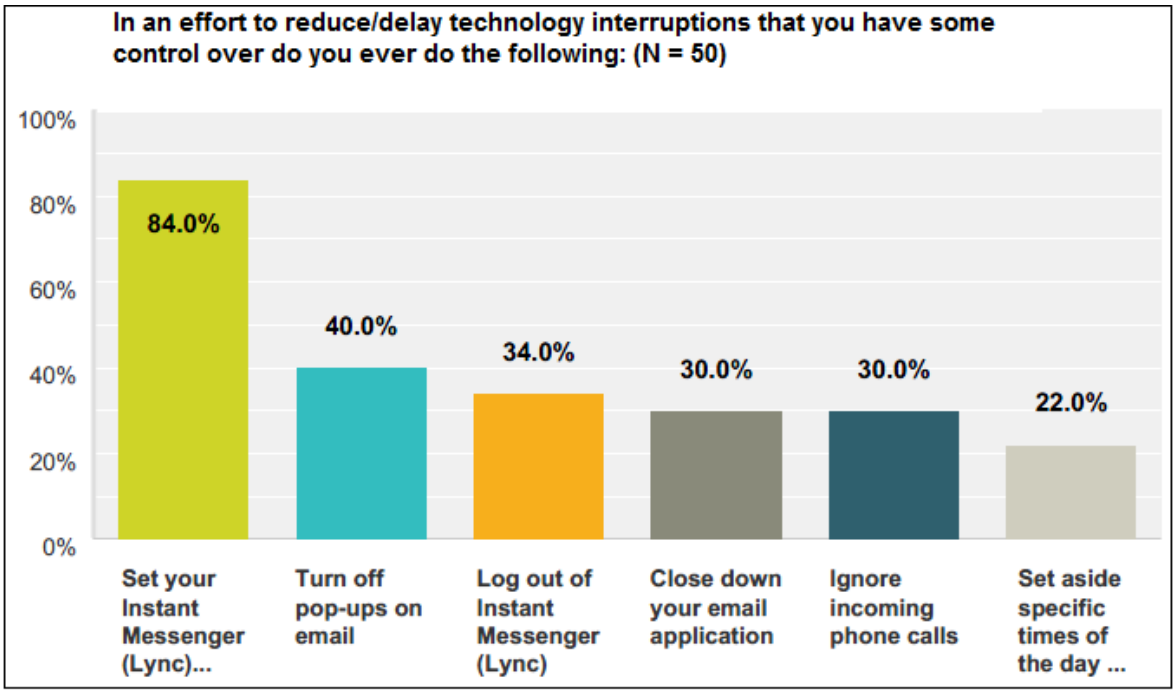

FIGURE 4.20 Manage technology interruptions that you have some control over

Table 4.5 displays a breakdown of the responses.

TABLE 4.5 Manage technology interruptions that you have some control over

In an effort to reduce/delay interruptions that you have some control over do you ever do the following? (N = 50)	No. of Respondents Selected	No. of Respondents Selected %
Set your IM to status to 'Do not Disturb' or 'Away'	42	84%
Turn off pop-ups on email	20	40%
Log out of Instant Messenger	17	34%
Close down your email application	15	30%
Ignore incoming phone calls	15	30%
Set aside specific times of the day to reply to emails/return calls	11	22%

Respondents were also given the option to add Comments and seven people choose to do so. Five advised that they never did anything to manage or reduce interruptions and "respond according to the situation". The other two comments were as follows:

"I sometimes set my status to 'Do not Disturb', but very rarely. I never set it to 'Away'",

"Set an "Out of Office" on my email application for when I am in important meetings. Add certain spam senders to "ignore".

4.4.15 Impact of Technology Interruptions on workday

Respondents were asked about the impact of interruptions on the workday and not surprisingly 81% indicated that they have a detrimental impact on productivity. 53% indicated that they impact on stress, restless and anxiety. 34% felt that they compromised quality of work and 28% indicated that they impacted on their job satisfaction.

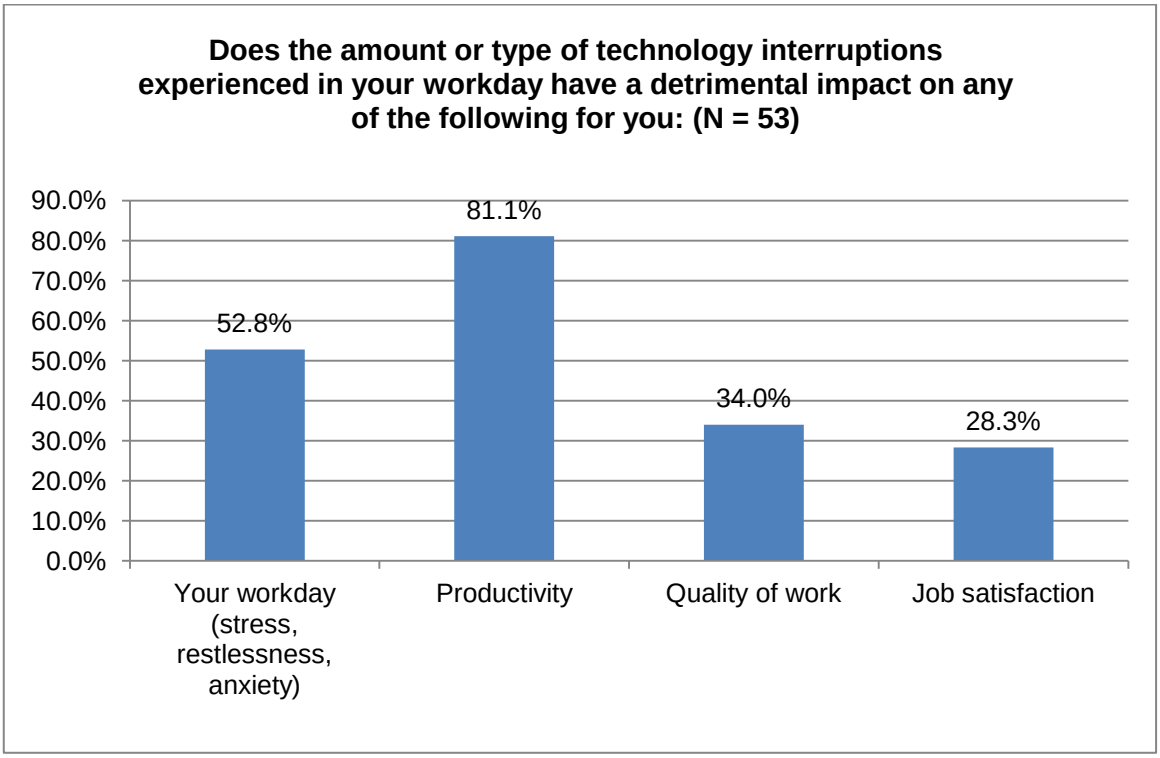

FIGURE 4.21 Impact of technology interruptions experienced in your workday

Three respondents commented on this question:

“No I don’t think so”,

“It can have an impact on productivity but I try to control this impact as much as possible”,

“Stress - depends on how busy I am or how close to a deadline I am”.

5 Conclusions and Future Work

5.1 Introduction

The main objective of this research is to determine “What kind of impact computer-mediated communications (CMC) in the form of interruptions can have on the knowledge worker” and “If the knowledge worker themselves take any steps to minimise or reduce the effect constant interruptions can have on their workload or performance”.
This chapter looks at the conclusions of the research undertaken in this study and makes recommendations to address these. It describes the limitations of the research and assesses the need for further studies into this area of research.

5.2 Conclusions

Subjective opinions formed an important aspect of this research from which conclusions were drawn. The findings are based on the 64 respondents of the online survey and the five semi-structured interviews. It is worth noting that of the 64 survey respondents, 70% were male and 89% fall into the 35-44 age category.
Not surprisingly Instant Messenger (IM) is the most frequent technology medium used to interrupt a colleague. IM was originally intended to allow home internet users converse with family and friends (Goldsborough, 2001). But as more and more organisations began installing IM software they realised the tools potential to support informal communication. The survey finding indicates that while IM may be the medium of choice for interruptions, only 33% actually acknowledge or respect the Status as set on IM. So while one of the reasons from the literature review as to why IM is so prevalent in organisations was because of its informal nature, have we gone so informal that we will ‘virtually’ barge in on our colleagues to get attention?

One of the surprising findings was that 61% don’t consider technology interruptions to be an issue even though 97% agreed that the main disadvantage is that they can cause a delay in resuming the primary task they were working on prior to the interruption. Interruptions are an inevitable part of most contemporary organisations especially an openly collaborative software development environment.

This research set out to find if there was a dependency between performance, well-being and job satisfaction of knowledge workers, and the amount of technology interruptions

that impact on their working day. And if so, what actions if any do workers take to limit or reduce these interruptions. The results indicate that performance, well-being and job satisfaction are all impacted by the number of technology interruptions experienced in the working day. The tone of the interview participants indicated a certain amount of frustration in relation to the frequency of the computer-mediated interruptions. An action on the part of workers to reduce the interruptions was limited due to the need "to be seen to be available". And doing things like logging out of IM, only delayed the interruption as other methods such as email were then used if the worker was not 'visible' on IM.

5.3 Recommendations

The following recommendations emerge from this research:

- Management should implement policies to manage the timing of interruptions. If somebody is working on a complex task the interruptions should only be permissible when critical points in the task have been closed out or addressed.
- Feedback at the peak of a colleague's engagement in a task could improve performance.
- Research has shown that some people are more interruptible than others and the interruption has little or no impact. Others perceive the interruption as having a negative impact on their performance; they may need to structure their work to allow for inevitable interruptions or build some 'quiet time' into their day to respond to interruptions at their own pace.
- Although quite low, the response of 10% could warrant more of an investigation as to what exactly the issues are where people disagreed that they had the necessary technology tools to do their job.
- In a field experiment, Perlow (1997,1999) found that by implementing a 'quiet time' (an agreement among colleagues to not interrupt each other during designated hours), software developers completed their projects on time.
- The study by Gupta et al. (2013) looked at how the hierarchal level of the sender combined with the interruptive features of IM impacted on user performance and mental overload. Their results showed that messages from a supervisor or manager are given higher processing priority, resulting in smaller task time but

greater perceived workload. Supervisors and managers should consider other communication channels if an immediate response is not necessary.

5.4 Limitations of the Research

This research has limitations that open up opportunities for further research in this area. The methods used are subject to self-perceived notions and biases as opposed to experimentally obtained data. Non IT interruptions (e.g. face-to-face) and IT distractions created by the environment can be compared with IT interruptions and how their impacts compare to those of related events.

It is not possible to generalise the findings of the research due to a number of constraints:

- Convenience sampling is subject to sampling bias and influence and is not representative of the population. A probability sampling method should be used in further studies to ensure that results can be generalised to the entire population.
- One of the methods used was an online survey and these tend to have a low response rate (Sauermann and Roach, 2013).
- The online survey and interviews were conducted in a software development organisation which is open to a collaborative work environment and this would not fully represent knowledge workers across all types of organisations.

5.5 Future Research Opportunities

An experimental approach could be taken in a larger research project with additional resources. A period of observation of knowledge workers by the researcher may prove to yield additional data although participants may respond differently to the interruption (e.g. ignore it) if the researcher is physically present (Yin, 2009). Asking participants to keep a diary or log of technology interruptions is another method that has yielded good results in various studies.

5.6 Summary

The objectives of this research was to investigate “What kind of impact computer-mediated communications (CMC) in the form of interruptions can have on the knowledge worker” and “If the knowledge worker themselves take any steps to minimise or reduce the effect constant interruptions can have on their workload or performance”.

The conclusions have demonstrated that the research objectives have been met successfully and the findings are relevant to the research questions. The findings also demonstrate the employers should implement policies to manage the overload of technology interruptions.

This study has also provided data and recommendations for employers and managers to look at organisational policies that would mitigate against poor performance and worker anxiety as a result of overload of technology interruptions.

6 References

Addas, S. and Pinsonneault A. 2015. "The many faces of information technology interruptions: a taxonomy and preliminary investigation of their performance effects." Information Systems Journal 25(3):231-273.

Bafoutsou, G., Mentzas, G. 2002. “Review and functional classification of collaborative Systems”, International Journal of Information Management 22 (4).

Barley, S.R., Meyerson, D.E. & Grodal, S. 2011. “E-mail as a source and symbol of stress”. Organization Science, 22, 887–906.

Baron, R. S., 1986. “Distraction–conflict theory: progress and problems”, Advances in Experimental Social Psychology, Academic Press,NewYork.

Basoglu, K. A., Fuller M. A. & Sweeney J. T. 2009. "Investigating the effects of computer mediated interruptions: An analysis of task characteristics and interruption frequency on financial performance." International Journal of Accounting Information Systems 10(4):177-189.

Beaudry, A., & Pinsonneault, A. 2005. “Understanding user responses to information technology: A coping model of user adaptation”. MIS Quarterly, 29(3), 493-524.

Bryman, A. and Bell, E., 2011. “Business Research Methods”. 3rd ed. Cambridge: Oxford University Press.

Cameron, A. F., & Webster, J. 2005. "Unintended consequences of emerging communication technologies: Instant Messaging in the workplace." Computers in Human Behavior 21(1):85-103.

Cohen, S. 1980. “After effects of stress on human performance and social behavior: A review of research and theory”. Psychological Bulletin, 88(1), 82–108.

Creswell, John W. 1994. “Research Design: Qualitative and Quantitative Approaches”, Sage: Thousand Oaks.

Creswell, J. W. 2013. “Research design: Qualitative, quantitative, and mixed methods approaches”, Sage: Thousand Oaks.

Dennis, A.R., Fuller, R.M. & Valacich, J.S. 2008. “Media, tasks, and communication processes: a theory of media synchronicity”. MIS Quarterly, 32, 575–600.

Dillman, D. A., Smyth, J. D. & Christian, L. M. 2009. “Internet, mail, and mixed-mode surveys: The tailored design method”. Hoboken. NJ: Wiley.

Donmez, B., Matson, Z, Savan, B., Farahani, E., Photiadis, D. & Dafoe, J. 2014. "Interruption management and office norms: Technology adoption lessons from a product commercialization study." International Journal of Information Management 34(6):741-750.

Du, H., Lehmann, C. M. & Willson, V.L. 2014. "Technology-Facilitated Contribution Behavior: An Experimental Investigation." Behavioral Research in Accounting 26(2):97-130.

Fried, J. 2010. “Why work doesn’t happen at work” [Online] Transcript available: http://www.ted.com/talks/jason_fried_why_work_doesn_t_happen_at_work/transcript?language=en, [Accessed 8th December 2014]

Galesic, M. and Bosnjak, M., 2009. “Effects of Questionnaire Length on Participation and Indicators of Response Quality in a Web Survey”. Public Opinion Quarterly 73(2), 349–360.

Gartner, 2007. “Gartner predicts instant messaging will be de facto tool for voice, video and text chat by the end of 2011 [Online] Available: http://www.gartner.com/newsroom/id/507731, [Accessed 21st March 2015]

Garrett, R. K., & Danziger, J. N. 2008. “Im = interruption management? Instant messaging and disruption in the workplace”. Journal of Computer-Mediated Communication, 13, 23–42.

Gill, John and Johnson, Phil 1997., “Research Methods for Managers”, 2nd edition, London: Chapman.

Gillie, T., Broadbent, D.E., 1989. “What makes interruptions disruptive? A study of length, similarity, and complexity”. Psychological Research 50, 243–250.

Grandhi, S., & Jones, Q. 2010. "Technology-mediated interruption management." International Journal of Human-Computer Studies 68(5):288-306.

Gupta, A., Sharda, R. S. 2008. “Simulator for Interruptions and Message Overload in Network Environments”, International Journal of Simulation and Process Modeling 4 (3/4).

Gupta, A., Li, H., & Sharda, R. 2013. "Should I send this message? Understanding the impact of interruptions, social hierarchy and perceived task complexity on user performance and perceived workload." Decision Support Systems 55(1):135-145.

Hemp, P. 2009. “Death by information overload”. Harvard Business Review, 87, 82–82.

Horvitz, E., & Apacible, J. 2003. “Learning and reasoning about interruption”. In Paper presented at the ICMI

Horvitz, E., Koch, P., & Apacible, J. 2004. “Busybody: Creating and fielding personalized models of the cost of interruption”. In Paper presented at the CSCW’04.

Iqbal, S., & Bailey, B. 2005. !Investigating the effectiveness of mental workload as a predictor of opportune moments for interruption”. In Paper presented at the CHI 2005.

Jackson, T.2, Dawson, R. & Wilson, D. 2003. “Reducing the effect of email interruptions on employees”. International Journal of Information Management, 23, 55–65.

Karr-Wisniewski, P., & Lu, Y. 2010. “When more is too much: Operationalizing technology overload and exploring its impact on knowledge worker productivity”.Computers in Human Behavior, 26(5), 1061–1072.

Latorella, K. A. 1996. “Investigating interruptions: An example from the flight deck”. Paper presented at the Human Factors and Ergonomics Society 40th Annual Meeting, 249-253.

Latorella, K. A. 1998. “Effects of modality on interrupted flight deck performance: implications for data link”. Paper presented at the Human Factors and Ergonomics Society 42nd Annual Meeting, 87-91.

Kessler, M. 2007. “Fridays go from casual to e-mail free”. USA Today.

Maglio, P.P., Campbell, C.S., 2000. “Tradeoffs in displaying peripheral information, Proceedings of the CHI 2000 conference on Human factors in computing systems”. ACM Press, New York pp. 241–248.

Mansi, G., & Levy, Y. 2013. "Do instant messaging interruptions help or hinder knowledge workers’ task performance?" International Journal of Information Management 33(3):591-596.

McCrickard, D.S., Chewar, C.M., Somervell, J.P., Ndiwalana, A. 2003. “A model for notification systems evaluation—assessing user goals for multitasking activity”. ACM Transactions on Computer–Human Interaction 10 (4), 312–338.

McFarlane, D.C. 2002. “Comparison of four primary methods for coordinating the interruption of people in human–computer interaction”, Human Computer Interaction 17, 63-63.

McFarlane, D.C., Latorella, K.A., 2002. “The scope and importance of human interruption in human–computer interaction design”. Human– Computer Interaction 17 (1), 1–61.

Middleton, C.A. 2007. “Illusions of balance and control in an always-on environment: a case study of BlackBerry users”. Journal of Media & Cultural Studies, 21,165–178.

Olson, G. M. & J. S. Olson. 2003. "Human-computer interaction: psychological aspects of the human use of computing." Annual Review of Psychology, 54:491-516.

Osterman, 2005. Osterman Research. Executive Summary: “Enterprise Instant Messaging Trends, 2005–2008”, [Online] Available: http://www.ostermanresearch.com/execsum/or_im05es.pdf, [Accessed 21st March 2015]

Ragu-Nathan, T. S., Tu, Q., & Tarafdar, M. 2010. "Impact of Technostress on End-User Satisfaction and Performance." Journal of Management Information Systems 27(3):303-334.

Rennecker, J. & Godwin L. 2005. "Delays and interruptions: A self-perpetuating paradox of communication technology use." Information and Organization 15(3):247-266.
Rivera, A. J. 2014. "A socio-technical systems approach to studying interruptions: understanding the interrupter's perspective." Appl Ergon 45(3):747-756.

Rosen, L. D., Mark Carrier L., & Cheever N. A. 2013. "Facebook and texting made me do it: Media-induced task-switching while studying." Computers in Human Behavior 29(3):948-958.

Sauermann, H., & Roach, M. 2013. “Increasing Web Survey Response Rates in Innovation Research: An Experimental Study of Static and Dynamic Contact Design Features”. Research Policy. 42(1):273-286.

Speier, C., Valacich, J.S., Vessey, I., 1997. “The effects of task interruption and information presentation on individual decision making”. In: Kumar, K., DeGross, J.I. (Eds.), Proceedings of the XVIII International Conference on Information Systems. Association for Information Systems, Atlanta, pp. 21–36.

Solingen, R., Berghout, E., & Latum, F. 1998. “Interrupts: Just a minute never is”. IEEE Software, 15, 97–103.

Spira, J. B., & Feintuch, J. B. (2005). “The cost of not paying attention: How interruptions impact knowledge worker productivity”. Basex.

Sykes, E. R. 2011. "Interruptions in the workplace: A case study to reduce their effects." International Journal of Information Management 31(4):385-394.

Tang, J. C. 2007. “Approaching and leave-taking: Negotiating contact in computermediated communication”. ACM Transactions on Computer-Human Interaction, 14(1), 1–26.

Tashakkori, A., & Teddlie, C. 1998. “Mixed methodology: combining qualitative and quantitative approaches”. Thousand Oaks, CA: Sage.

Wajcman, J. and Rose E. 2011. "Constant Connectivity: Rethinking Interruptions at Work." Organization Studies 32(7):941-961.

Yin, R.K. 2009. “Case Study Research, Design and Methods”. Sage Publications, Newbury, CA.

Yin, B., & Chen, F. 2007. “Towards automatic cognitive load measurement from speech analysis”. In J. Jacko (Ed.), HCI 2007 (pp. 1011–1020). Berlin: Springer-Verlag.

Zaheeruddin, & Garima. 2006.” A neuro-fuzzy approach for prediction of human work efficiency in noisy environment”. Applied Soft Computing, 6, 283–294.

Zijlstra, F. R. H., & Roe, R. A. 1999. “Temporal factors in mental work: Effects of interrupted activities”. Journal of Occupational and Organizational Psychology, 72, 163–185.

7 Appendices

7.1 Appendix A - Ethics Approval Documentation

Patients

School of Computer Science and Statistics
Research Ethical Application Form

Details of the Research Project Proposal must be submitted as a separate document to include the following information:

1. Title of project
2. Purpose of project including academic rationale
3. Brief description of methods and measurements to be used
4. Participants - recruitment methods, number, age, gender, exclusion/inclusion criteria, including statistical justification for numbers of participants
5. Debriefing arrangements
6. A clear concise statement of the ethical considerations raised by the project and how you intend to deal with them
7. Cite any relevant legislation relevant to the project with the method of compliance e.g. Data Protection Act etc.

Part C

I confirm that the materials I have submitted provided a complete and accurate account of the research I propose to conduct in this context, including my assessment of the ethical ramifications.

Signed: Leila Corey Date: 29/05/2015
Lead Researcher/student in case of project work

There is an obligation on the lead researcher to bring to the attention of the SCSS Research Ethics Committee any issues with ethical implications not clearly covered above.

Part D

If external or other TCD Ethics Committee approval has been received, please complete below.

External/TCD ethical approval has been received and no further ethical approval is required from the School's Research Ethical Committee. I have attached a copy of the external ethical approval for the School's Research Unit.

Signed: ..... Date: .....
Lead Researcher/student in case of project work

Part E

If the research is proposed by an undergraduate or postgraduate student, please have the below section completed.

I confirm, as an academic supervisor of this proposed research that the documents at hand are complete (i.e. each item on
the submission checklist is accounted for) and are in a form that is suitable for review by the SCSS Research Ethics Committ

Signed: . Date:
.....15/5/15.....
Supervisor

7.2 Appendix B – Information Sheet For Survey

TRINITY COLLEGE DUBLIN
INFORMATIONSHEETFORSURVEYPARTICIPANTS

Title of project: Technology Interruptions in the workplace

Researcher: Sheila Casey, School of Computer Science and Statistics, Trinity College Dublin.

BACKGROUND OF RESEARCH: An interruption is a randomly occurring, discrete event that breaks the continuity of cognitive focus on a primary task and typically requires immediate attention and demands action. Constant connectivity afforded by modern technology exposes us to continuous technology interruptions in the workplace. The purpose of this research aims to explore how pervasive technology interruptions are in the workplace and the impact of such interruptions.

PROCEDURES OF THIS STUDY: This research will be conducted via an anonymous online survey.

CONFLICTS OF INTEREST: I would like to declare a potential conflict of interests in that a number of participants completing this survey are colleagues of mine. The information provided is strictly confidential and all responses will be used solely for the purpose of this research.

PARTICIPATION:

- The time taken to complete the online survey will be no more than 10 minutes. Participation is voluntary. You may withdraw at any time and for any reason without penalty. You also have the right to omit individual responses without penalty.
- All information collected through the online survey and published or presented thereafter is completely anonymous and is not traceable to respondents.
- I am required to inform you that, in the extremely unlikely event that illicit activity is reported I will be obliged to report it to appropriate authorities.
- Please do not name third parties in any open text field of the questionnaire. Any such replies will be anonymised.

In order to assist with debriefing after completing the survey, I have provided some links at the end for participants who are interesting in learning more about how to minimize technology interruption in the workplace.
Should participants wish to view the research findings from this study, an electronic copy of this dissertation is available on request from me at the end of this study.
Permission from HR has been sought and granted to allow the distribution of this survey to the organizations employees.

7.3 Appendix C – Informed Consent For Survey

TRINITY COLLEGE DUBLIN
INFORMEDCONSENTFORM FOR SURVEY

Title of project: Technology Interruptions in the workplace

Researcher: Sheila Casey, School of Computer Science and Statistics, Trinity College Dublin.

BACKGROUND OF RESEARCH: An interruption is a randomly occurring, discrete event that breaks the continuity of cognitive focus on a primary task and typically requires immediate attention and demands action. Constant connectivity afforded by modern technology exposes us to continuous technology interruptions in the workplace. The purpose of this research aims to explore how pervasive technology interruptions are in the workplace and the impact of such interruptions.

PROCEDURES OF THIS STUDY: This research will be conducted via an anonymous online survey.

PUBLICATION: This dissertation is to be submitted to the School of Computer Science and Statistics of Trinity College Dublin in partial fulfilment of the requirements for the degree of Masters of Science in Management of Information Systems. Individual results will be aggregated anonymously and research reported on aggregate results.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- Since this research involves viewing materials via a computer monitor I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHER CONTACT DETAILS: ***caseys4@tcd.ie***

PARTICIPATION: If you wish to participate, click 'Next' below. If you do not wish to participate, click 'Exit this survey' at the upper right corner of your web browser. By clicking 'Next', you consent that you are willing to answer the questions in this survey.

7.4 Appendix D – Survey Questions

Technology enabled interruptions in the workplace include: Instant Message (IM), Email, desk phone, mobile, Skype, Server outage, application slowness, internet/wifi outage, workstation issues, software updates.

1. If you need to interrupt a colleague to ask a question, what medium do you most frequently use?
Please rank all relevant categories from 1 (most frequent) to 8 (least frequent)

- Instant Message (IM)
- Email
- Desk phone
- Voice call using Lync
- Voice call using Skype
- Mobile call
- Text Message
- Face to face

2. In relation to Instant Messenger (Lync) do you pay attention to and respect a colleagues status indicator (e.g. Busy)

- Yes, I always respect the 'Status'
- Sometimes, depends on the reason to interrupt them
- No, I ignore the status and interrupt them regardless

3. How many technology interruptions do you think you experience in any given working day? (Technology interruptions include: Instant Message (IM), Email, desk phone, mobile, Skype, Server outage, application slowness, internet/wifi outage, workstation issues, software updates.)

- 1-10
- 11-20
- 21-30
- 31-40
- 41+

Other (please specify):

4. Based on your answer to the previous question, how many of these technology interruptions do you believe relate to your collaborative work environment?

- ◯ Less than 25%
- ◯ 50%
- ◯ 75%
- ◯ 100%

Other (please specify):

5. How many technology interruptions do you think you initiate on a given workday?

- ◯ 1-10
- ◯ 11-20
- ◯ 21-30
- ◯ 31+
- ◯ Other (please specify):

6. Based on your answer to the previous question, how many of these self initiated technology interruptions do you believe relate to your collaborative work environment?

- ◯ Less than 25%
- ◯ 50%
- ◯ 75%
- ◯ 100%

Other (please specify)

7. Please rate your agreement level with the following questions using the associated scale:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. I seldom have problems with the technology tools that are necessary to do my job	◯	◯	◯	◯	◯
b. The type of technology interruption affects my response to it (e.g. an IM versus Email)	◯	◯	◯	◯	◯
c. Depending on who initiated the technology interruption will affect how quickly I respond to it	◯	◯	◯	◯	◯

8. What advantages do you think technology interruptions contribute to your workday? (Please select all that apply and specify any other advantages that you think are applicable):

- [ ] Facilitates collaboration among colleagues
- [ ] Accomplish tasks more effectively
- [ ] Share information easily
- [ ] They can be an unplanned but welcome break
- [ ] Other (please specify):

9. What disadvantages do you think technology interruptions contribute to your workday? (Please select all that apply and specify any other disadvantages that you think are applicable):

- [ ] They can cause a delay in resuming the task you were working on
- [ ] They can take over your schedule
- [ ] The can result in errors and reduce efficiency
- [ ] They can increase stress levels
- [ ] Other (please specify):

10. In general, do you experience that technology interruptions at work are an issue for you?

- ○ Yes
- ○ No

11. If you answered 'No' to the previous question, can you briefly explain why you feel technology interruptions are not an issue for you?

12. Please rate your agreement level with the following questions using the associated scale:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
a. I find it difficult to switch back to what I was doing prior to a technology interruption	○	○	○	○	○
b. Technology interruptions that I have no control over negatively impact my work performance (e.g. server outage, system slowdown)	○	○	○	○	○
c. I have control over and can regulate the inflow of information	○	○	○	○	○
d. I can refrain from immediately reading/checking and answering incoming messages (e.g. Email/IM)	○	○	○	○	○
e. It is possible for me to respond quickly to technology interruptions for work related queries	○	○	○	○	○

13. In an effort to reduce/delay technology interruptions that you have some control over do you ever do the following (Please select all that apply):

- ☐ Turn off pop-ups on email
- ☐ Close down your email application
- ☐ Set your Instant Messenger (Lync) status to 'Do not Disturb' or 'Away'
- ☐ Log out of Instant Messenger (Lync)
- ☐ Ignore incoming phone calls
- ☐ Set aside specific times of the day to reply to emails/return calls

Other (please specify)

14. Does the amount or type of technology interruptions experienced in your workday have a detrimental impact on any of the following for you (Please select all that apply):

- ☐ Your workday (stress, restlessness, anxiety)
- ☐ Productivity
- ☐ Quality of work
- ☐ Job satisfaction

Other (please specify)

15. What is your gender?

- Male
- Female

16. What category below includes your age?

- 18-24
- 25-34
- 35-44
- 45-54
- 55+

17. In what country do you currently reside?

18. Would you consider your technical level of IT expertise to be:

- Excellent
- Good
- Moderate
- None

19. How confident technology wise do you consider yourself to be in your everyday life:

- ◯ Very, I'm surrounded with the latest gadgets and IT devices
- ◯ Somewhat confident, I try to keep up with the latest trends
- ◯ A little, I only own IT devices that I need for work or casual email/browsing
- ◯ Not confident, I avoid technology if I can

20. Please add any comments that you may have in relation to anything in this survey:

21. Do you wish to submit your responses?

- ◯ Submit
- ◯ Exit without submitting

7.5 Appendix E – Information Sheet For Interview

TRINITY COLLEGE DUBLIN
INFORMATIONSHEETFOR INTERVIEWPARTICIPANTS

Title of project: Technology Interruptions in the workplace

Researcher: Sheila Casey, School of Computer Science and Statistics, Trinity College Dublin.

BACKGROUND OF RESEARCH: An interruption is a randomly occurring, discrete event that breaks the continuity of cognitive focus on a primary task and typically requires immediate attention and demands action. Constant connectivity afforded by modern technology exposes us to continuous technology interruptions in the workplace. The purpose of this research aims to explore how pervasive technology interruptions are in the workplace and the impact of such interruptions.

PROCEDURES OF THIS STUDY: This research will be conducted via face to face interviews.

CONFLICTS OF INTEREST: I would like to declare a potential conflict of interests in that the participants that will be interviewed are colleagues of mine. The information provided is strictly confidential and all responses will be used solely for the purpose of this research.

PARTICIPATION: The time taken to participate in the interview will be no more than 20 minutes. Participation is voluntary. You may withdraw at any time and for any reason without penalty. You also have the right to omit individual responses without penalty. On request, participants will be debriefed at the end of their interview.

The interview will consist of a series of questions relating to technology interruptions in the workplace. The interview will be recorded on an audio recording device for transcription and analysis by the researcher. The participant may opt out of the recording at any time without penalty. No recordings will be made available to anyone other than the researcher and the recordings will not be replayed in any public presentation of research.

The anonymity of the participant will be preserved in analysis, publication and presentation of resulting data and findings. In the extremely unlikely event that illicit activity is reported I will be obliged to report it to appropriate authorities.
Permission from HR has been sought and granted to allow for employee interviews of the organisation.

7.6 Appendix F – Informed Consent For Interview

TRINITY COLLEGE DUBLIN
INFORMEDCONSENTFORM FOR INTERVIEW

Title of project: Technology Interruptions in the workplace
Researcher: Sheila Casey, School of Computer Science and Statistics, Trinity College Dublin.

BACKGROUND OF RESEARCH: An interruption is a randomly occurring, discrete event that breaks the continuity of cognitive focus on a primary task and typically requires immediate attention and demands action. Constant connectivity afforded by modern technology exposes us to continuous technology interruptions in the workplace. The purpose of this research aims to explore how pervasive technology interruptions are in the workplace and the impact of such interruptions.

PROCEDURES OF THIS STUDY: This research will be conducted via face to face interviews.

PUBLICATION: This dissertation is to be submitted to the School of Computer Science and Statistics of Trinity College Dublin in partial fulfilment of the requirements for the degree of Masters of Science in Management of Information Systems. Individual results will be aggregated anonymously and research reported on aggregate results.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above) without penalty.
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I have received a copy of this agreement.

PARTICIPANTS NAME:

PARTICIPANTS SIGNATURE: DATE:

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHER CONTACT DETAILS: ***caseys4@tcd.ie***

7.7 Appendix G – Semi-Structured Interview Questions

The questions for interview are:

1. Do you think technology interruptions can provide a quick win? E.g. a five minute chat over Instant Message (IM) may allow a colleague to progress with an issue that they may otherwise be stuck on.

2. Should colleagues be contactable at all times? And if so, why do you think that?

3. My research indicates that technology interruptions can facilitate a collaborative work environment, do you agree?

4. Do you think that technology interruptions need to be managed? e.g. by the introduction of 'Calm Inbox' or 'quite time'
   Calm Inbox: Respond to emails only at a specific time, Use flags for follow up, Unsubscribe from newsletters, have a template of responses
   Quiet time: A specific time every day/week where interruptions are not allowed or have to be kept to a minimum.
5. What do you consider to be some positives and negatives of current technological interruptions?

7.8 Appendix H – Survey comments for question 9

Further comments in response to 'Why' technology interruptions were not an issue for the respondent:

"My work can be quite solitary and doesn't usually solicit a lot of inquiries from colleagues",

"My workload is such that they don't affect performance. Sometimes they are necessary for me to complete my task",

"These interruptions need to happen. I believe the person who has sent the messages requires your assistance",

"It helps to complete your tasks in a better way and also increase your knowledge in other areas",

"They could be helpful in sharing the information and may increase the efficiency if channelled in right direction",

"It is because it keeps you updated and reduced communication gap for discussions",

"Part of (work) life"

"Most interruptions I receive are regarding work or something important. If I don't want to respond to someone as I feel it's not important, I will either ignore the interruption or tell the person that I am currently busy but will get back to them",

"It's a part of work. I don't work in the Dublin or India office so if I need something I must be able to reach out. The same principles apply to my colleagues, so if they need something from me I should be able to provide it",

"I also need to be able to filter out some of the 'noise' within the communication, similar to day to day life outside of work",

"Aid to getting work done",

"Overall internal communication levels are enhanced by technology interruptions. Errors and misunderstandings can result from working in isolation. Obviously, system outages will always be an issue",

"They come with the territory of working in a software company!",

“Rarely cause any "real" disruption. If busy people generally don't message”,

“I can multi task and handle extra work on top of my own”.