

MBA

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# The Factors Determine Knowledge Workers Productivity within the Irish IT Industry

Raul Fernandez Gomez

Student Number: 1689523

Supervisor: Martin O'Dea

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A thesis presented to Dublin Business School and Liverpool John Moore's University in partial fulfillment of the requirements for the award degree of Masters of Business Administration under the supervision of Mr. Martin O'Dea.

## Declaration

I declare that all the work in this dissertation is entirely my own (with the exception of specific sources that are referenced in the text and bibliography), no portion of the work referred to in this dissertation has been submitted in support of an application for another degree or qualification to any University or learning institution. Furthermore, all the work in this dissertation is entirely my own.

A handwritten signature in blue ink, appearing to read 'Raul Fernandez', enclosed in a light blue rectangular box.

Signed:

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Raul Fernandez

Dated:

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16<sup>th</sup> August, 2013

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## **Abstract**

This quantitative research study test the theories surrounding knowledge worker segmentation and knowledge worker productivity within the Irish IT industry. Firstly corroborating that a segmentation of knowledge workers exists, and finally by justifying the positive effect of knowledge worker motivation, use of IT technology, and personal skill development and training has in knowledge worker productivity.

## Chapter 2 -

### Acknowledges

I would like to thank my parents, Belarmino and Mari Carmen, because without their support I wouldn't be here. *Gracias padres!*

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## Chapter 1 - Introduction

### 1.1 Research Background

Different researchers point a recent report from McKinsey Global Institute (MGI) that suggests by 2020, the world could have a shortage of 40 million college-educated and highly skilled workers (Dewhurst *et al.*, 2013, pp.58-64, Dobbs *et al.*, 2012, pp.92-102). Moreover, approximately 95 million workers could lack the education, the skills and the experience required for employment (Dobbs *et al.*, 2012, pp.92-102). In the OECD countries there has been a fundamental structural change in the labour markets, with a growing demand for employees with academic education (Erne, 2011, pp.59-76). With those expectations, it is presumed a higher rate of unemployment on the global labour market, an increase on social tensions that may provoke political instability and in the worst scenario a social class war (Dobbs *et al.*, 2012, pp.92-102, Drucker, 1991, pp.69-79).

The technology sector, referred as ICT Sector (Information, Communication & Technology) competes at the high end of the labour market. A shortfall of highly skilled workers connotes a global competition for talent (Dobbs *et al.*, 2012, pp.92-102); this will force organisations to use their employees more effectively (Lund *et al.*, 2012, pp.103-110). The repercussion of the expansion in the ICT sector and the arising of skill shortages are felt by knowledge workers, which felt an increase of their workload and job expectation<sup>1</sup> (2010, pp.05-05) and outrun their capacity (Allen and Schwartz, 2011, pp.82-87), lowering their motivation and hence, reducing their productivity.

In Ireland, there are approximately 5,400 ICT enterprises – comprising foreign owned and domestic companies (ICTIreland, 2011), with employment toping

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<sup>1</sup> From a Training and Development in Australia report (2011)

84,000 in 2011 (McCoy and Murphy, 2011) and 90,000 in May 2013<sup>2</sup>. Ireland is the perfect place for researching ICT as the top companies have located the European header quarters in the territory (See Appendix A). The Irish Software Association (ISA) states that over 3,000 jobs have been announced Irish ICT enterprises in the first six months of 2013, and over 15,000 jobs since January 2010. 75% of ICT companies are currently seeking workers (Oireachtas, 2012). The insights of future skill requirements for Irish firms are focused in hiring engineers, most likely in the ICT sector, which shows an employment growth (see Figure 1). However, skill shortage has been identified in this sector, specially in the IT, originated from the lack of technical skills and education but also due to a lack of work experience – programmers, software developers, IT business analysts, system designers, testers, IT consultants, etc. (FÁS, 2012a, 2012b, 2012c, McCoy and Murphy, 2011) (see Table 1).

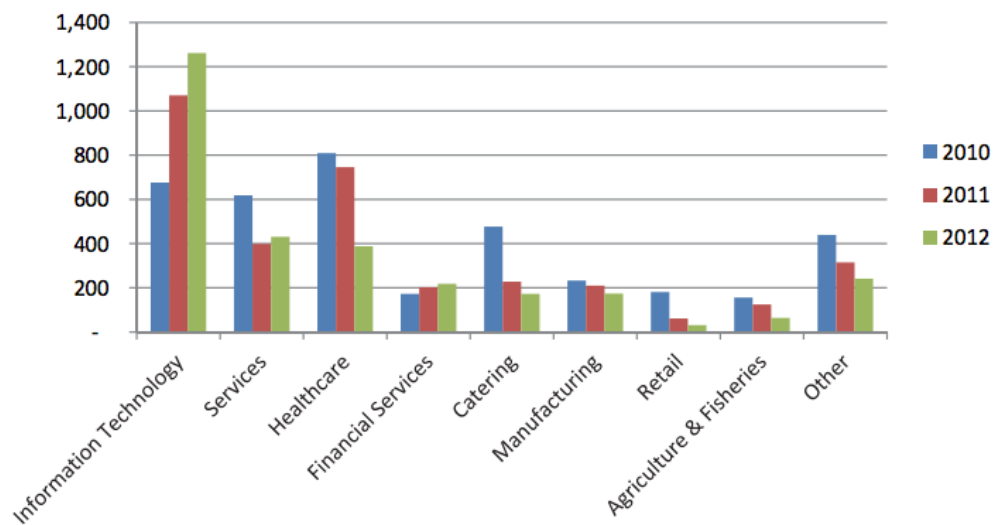


Figure 1 - Employment Permits by Sector in Ireland, 2010-2012 (Source: DJEI)

<sup>2</sup> Information gathered from Eoghan Ó Faoláin, Senior Executive, Irish Software Association (16<sup>th</sup> of July, 2013)

Occupation	Number Employed, 2012 (Annual average - '000s)	% Female	% Part-Time	Unemployment Rate (%)	Shortage Indicator
Web designers & developers	1.9	31.80	12.10		Skill Shortage
ICT Professionals n.e.c.	7.6	16.70	6.90	Below average	Skill Shortage
IT operations technicians	8.3	30.40	9.50	Below average	Skill Shortage
IT user support technicians	3.8	44.70	4.10		Skill Shortage
IT Business analysts & systems designers	2.6	27.00	8.90		Skill Shortage
Programmers & software developers	17.3	21.20	4.20	Below average	Skill Shortage
ICT specialist & project managers	13.9	26.30	2.90	Below average	Skill Shortage

**Table 1 - Demand and Shortage Indicators for ICT Occupation (Adapted from Demand and Shortage Indicators for Selected Occupations. Source: National Skill Bulletin 2013 - July 2013)**

Based on these assumptions, the current situation of ICT companies in Ireland in relation to skill shortages will grow in the following years. Hence, it is vital that managers, senior executives and chief technology officers begin to better comprehend how to make knowledge workers more productive, by identifying the factors that foster or hinder productivity, and by identifying any relationship between these factors and their roles.

Since Peter Drucker in 1959 coined the term 'knowledge worker' referring to workers that create and use information in their jobs, many authors and scholars have described knowledge workers from different perspectives and have presented models and frameworks to improve productivity, presenting their factors and challenges. However, some authors agree that the same models and productivity frameworks won't work for all the knowledge workers, implying

the existence of segmentation within knowledge workers. Despite the literature surrounding knowledge worker and knowledge worker productivity, there are no studies related to these terms within the Irish context. Hence the purpose of this research is to explore knowledge worker segmentation and its fit within the IT industry, to be able to identify the most important factors that foster knowledge worker productivity.

## **1.2 Recipients of the research**

This research study is the dissertation of the Master in Business Administration programme at Dublin Business School in association with John Moore University (Liverpool, UK). The main recipients of this research study are Dublin Business School and John Moore University. Since this research study aims to investigate the factors determining knowledge worker productivity in the Irish IT context, and since a survey strategy was decided for approaching the deductive quantitative research, some of the survey participants have contacted the researcher showing interest in the study – to those of them, will receive a copy of the survey results.

## **1.3 Interest in the Subject and Justification for the Research**

There are many reasons of choosing the subject of knowledge worker productivity for this dissertation. First of all, the researcher is a knowledge worker in the ICT industry in Ireland, which has experienced the increase of workload in the last years and the scarce work force. Secondly, productivity has been always a hot topic in business management, initially the improvement of blue-collar productivity and nowadays white-collar or knowledge worker productivity. The researcher, as an MBA student, felt curious to explore the dimensions, factors and challenges of knowledge worker productivity, and provide the body of knowledge with new insights in relation to the segmentation of knowledge workers in the IT industry and the factors that foster their productivity. Thirdly, Ireland is the 'Silicon Valley' of Europe – comprising approximately 5,400 ICT enterprises and having 10 of the top 10 ICT worldwide companies – and all the recent reports (FÁS, 2012a, 2012b, 2012c, ICTIreland, 2011) indicates that the growth of the ICT industry in Ireland will continue.

Finally, there is no literature about knowledge workers in the Irish IT industry, which leaves a gap that can be approached.

#### **1.4 Research Question, Objectives and Hypotheses**

The research questions, objectives and hypotheses represent distinct statements of the grounds of the study (Creswell, 1994). Saunders *et al* (2011) states that “research objectives are likely to lead to great specificity than research questions”. For the purpose of this research, these are the research objectives:

1. To explore the effect of knowledge work task definition amongst the use of IT technology, Knowledge worker motivation and personal skill development and training.
2. To test that, three major factors – use of IT Technology, Knowledge Worker motivation and personal skill development and training – will influence knowledge worker productivity.
3. To explore the segmentation of knowledge workers in the Irish IT industry and test the relationship amongst knowledge worker experience, education and job position (demographic factors).

#### **1.5 Organisation of the Dissertation**

The dissertation begins with Chapter One, which attempt to introduce the topic of discussion, provide a preliminary understanding to the research problem, and indicate the importance of the research problem whilst discussing the significance of the problem for a specific audience. The researcher introduces the theoretical model, explaining the rationale of the research objectives. The limitations of the dissertation are highlighted and the researcher’s interest in the subject and justification is explained.

In Chapter Two, the Literature Review, the researcher introduces the main broad areas of the research, Knowledge Worker and Productivity, through academic literature/reviews. First, the term knowledge worker is explained by describing all their characteristics. Due to the broad description of the term, some authors and scholars believe in some kind of segmentation within that force, creating a

debate in the literature. Secondly, the researcher describes how some factors can hinder or foster productivity on knowledge workers – their motivation, the use of the IT technology, and their personal skill development and training, but also, how these factors are closely connected with the definition of their knowledge work tasks. And finally, in order to measure knowledge worker productivity, different productivity dimensions are presented with their own challenges. From the debate presented in the literature review, the researcher compares and contrasts concepts and theories, which leads to formulate the research questions, objectives and hypotheses.

In Chapter Three – the Research Methodology presented for this dissertation is explained. Following Saunders' Research Onion, the researcher describes the different alternatives in the research design laying greater stress at the rationale of the chosen design. A positivist research philosophy is selected for this quantitative research. A survey strategy is designed, discarding other strategies.

In Chapter Four – the Data Analysis and Findings – the researcher presents and describes the results from the online questionnaire, which represents the primary data for this research. First, the sample characteristics are presented by using descriptive statistical analysis. And finally, each research objective and hypotheses are analysed, and conclusions are drawn regarding to the population by using inferential statistics.

In Chapter Five – Conclusions – the researcher extrapolate the findings with the identified gaps in the literature review, discussing the limitations and providing a path for future research. Moreover, the researcher discusses the effect the potential effect of the research findings in the real world and how the audience (managers, senior executives, scholars) can benefit from them.

And finally, in Chapter Six "A self-reflection approach to learning", it is explained the process of reflection based on the researcher's own experiences. Firstly, the researcher explains the importance of reflection, and describes the most

important frameworks and models used. Secondly, the researcher describes the experience of doing the MBA programme by evaluating how the learning happened. Thirdly, the researcher, following the selected framework, describes his MBA experience and evaluates the learning process using theories and concepts. Finally the researcher focuses on how this new learning can be used in the future.

### **1.6 Scope of the Dissertation**

This study confines itself to survey knowledge workers within the Irish IT Industry. The roles that hold the studied knowledge workers are software/web/mobile developers, system analysts/testers, software architects, database administrators, system administrators, software/web designers, business analysts, project managers and product managers. The rest of the roles within the IT industry are excluded from the research – sale agents, post-sale agents, customer service agents, implementation agents.

## Chapter 2 - Literature Review

### 2.1 Segmenting Knowledge Workers within the IT Industry

In order to investigate the dimensions of knowledge worker productivity within the IT industry, firstly, a knowledge worker is defined. The term 'knowledge worker' originated from Peter Drucker in 1959 as workers that create and use information in their job (Drucker, 1999, pp.79-94). In contrast with manual workers, Drucker stresses that knowledge workers must be seen as an *asset* rather than a *cost*. Knowledge workers are characterized by working primarily with information, and/or developing and using knowledge (Drucker, 1999, pp.79-94), they possess high levels of expertise, education and experience (Davenport, 2005, p.1, Davenport *et al.*, 2002, pp.23-30), they have the ability to gather, analyse, interpret, and synthesize information (Frick and Drucker, 2011, pp.368-387), superior interpersonal communication skills, exceptional information processing abilities (Carleton, 2011, pp.459-468), their major working tool is their knowledge (Mládková, 2012, pp.766-773) and they are experts with prized skills (Dewhurst *et al.*, 2013, pp.58-64).

There are some commonalities from the findings in the literature. However, the term 'knowledge-worker' is too broad to study the factors that influence productivity. Hence, there is a necessity to segment knowledge workers (Davenport, 2002, p.3, Dove, 1998, pp.26-28). Dove (1998, pp.26-28) classified knowledge workers in three classes based on how they use their knowledge; (1) creation of knowledge work, based on innovation, (2) portable knowledge work, based on immediate utility, and (3) speciality knowledge work, based on narrow but high efficacy. However, Dove's model is not based on measurable dimensions, which makes it hard to apply in the real world. Davenport (2002, p.3) distinguish four types of knowledge workers – Transaction Workers, Integrated Workers, Collaborative Workers and Expert Workers – based on two dimensions – the level of interdependence and the complexity of work.

Transaction Workers are characterised by a low level of interdependence (individual actors) and low complexity of work (Routine); knowledge workers in this segment do routine work, rely on formal rules, procedures, and training and employ low-discretion workforce for automation. Integrated Workers are characterized by a high level of interdependence (collaborative groups) and low complexity of work; knowledge workers in this segment do systematic and repeatable work, they rely on formal processes, methodologies and standards, and need tight integration across functional boundaries. Collaborative workers are characterized by a high level of interdependence and high level of complexity of work (interpretation/ judgement); knowledge workers in this category do improvisational work, they are highly reliant on deep expertise across multiple functions and their work involves flexible teams deployed fluidly. And lastly, expert workers are characterized by a low level of interdependence and high level of complexity of work; workers in this category do judgement-oriented work, rely on individual expertise and experience, and they are characterized by being star performers (Davenport, 2002, p.3).

Erne (2011, pp.59-76) also agree with Davenport in the segmentation of knowledge workers for his research 'Making Knowledge Workers Productive', focusing on the expert workers, including a software development firm. However, it is not clear the segmentation of knowledge workers within the IT industry, or the role they hold: programmers, business analysts, system analysts, system administrators, project managers, technicians, etc. This research will address this gap by describing knowledge worker segmentation within the IT industry and by finding any direct relation with the job role, using Davenport's segmentation model (See Appendix D) based on work complexity and knowledge worker's autonomy.

## 2.2 Factors

*In terms of actual work on knowledge-worker productivity, we will be in the year 2000 roughly where we were in the year 1900 in terms of the productivity of the manual worker (Drucker, 1999, pp.79-94).*

Drucker (1999, pp.79-94) identified six important factors that determine knowledge worker productivity; firstly, knowledge workers must establish the task by themselves, (2) in order to impose responsibility on their own productivity, knowledge workers have to have autonomy, (3) continuous innovation must be presented as part of knowledge work, (4) knowledge work involves continuous learning and teaching, (5) knowledge worker productivity is based on more quality than quantity, and finally (6) knowledge workers must be seen as an 'asset' rather than a 'cost'.

The literature surrounding knowledge worker productivity has been focused on strengthening some of Drucker's factors (Dewhurst *et al.*, 2013, pp.58-64, Lund *et al.*, 2012, pp.103-110, Allen and Schwartz, 2011, pp.82-87, Hammer *et al.*, 2004, pp.14-18, Davenport *et al.*, 1996, pp.53-66) and embracing new ones – the use of IT technology (Davenport, 2011, pp.89-99, Matson and Prusak, 2010, pp.93-96), knowledge worker motivation (Mládková, 2012, pp.766-773, Frick and Drucker, 2011, pp.368-387), and personal skill development and training (Hopp *et al.*, 2009, pp.1-32, Hammer *et al.*, 2004, pp.14-18, Kelloway and Barling, 2000, p.287). Nonetheless, new challenges have flourished in relation to the way knowledge workers access the information (Dean and Webb, 2011, pp.80-88).

For the purpose of this research, the factors that are identified have been selected as being more related to the IT industry, based on the researcher's experience. The definition of knowledge work tasks, the use of IT technology, and the personal skill development and training of knowledge workers seems to be related to enhanced knowledge worker productivity. The researcher believes there is a relation between these factors and they can be measured using the productivity dimensions described in the next subchapter.

### **2.2.1 Knowledge Work Task Definition**

Knowledge workers spend their working time doing administrative tasks (reading and writing emails, writing documentation and reports), interactions

(meetings, presentations, phone calls) to value-adding activities (based on knowledge worker role – programming, testing, etc.).

In view of the fact that knowledge work is too heterogeneous (Maruta, 2012, pp.203-214) and knowledge workers' role is continuously changing (Mládková, 2012, pp.766-773), there is no method to generically measure knowledge worker productivity (Hammer *et al.*, 2004, pp.14-18). David Allen, in an interview for the HBR journal (2011, pp.82-87), recognizes the issue of defining and choosing the right work for knowledge workers: "It's harder to be more productive today because the work has become more complex".

Many researchers suggest that the key to making knowledge workers more productive is to eliminate all the non-value-adding tasks from their work (Lund *et al.*, 2012, pp.103-110, Allen and Schwartz, 2011, pp.82-87, Hammer *et al.*, 2004, pp.14-18, Drucker, 1999, pp.79-94, Davenport *et al.*, 1996, pp.53-66). Drucker (1999, pp.79-94) described the importance of task definition as a direct factor for knowledge worker productivity.

However, Malone (2011, pp.56-65), goes beyond the elimination of non-value-adding tasks by dividing tasks in subtasks and finding the right talented workers for such work. He highlights that understanding how knowledge-based work is done and by whom, value-adding tasks and subtasks can be identified to "perform with higher quality, at greater speed, or at lower costs". He called this phenomenon '*hyperspecialization*'.

It is obvious from the literature that knowledge work task definition has a direct impact on knowledge worker productivity. To better understand this relationship, Hackman and Oldham (1976, pp.250-279, 1975, p.159) created the Job Characteristic Model which identifies that five core work characteristics – skill variety, task identity, task significance, autonomy, and feedback – which enhance the individual's psychological state to produce motivation, satisfaction and overall productivity. These job characteristics are expressed as dimensions

in Hackman and Oldham's model (See Appendix B). Skill variety represents the "degree to which a job requires the worker to perform activities that challenge his skills and abilities" (Hackman *et al.*, 1975, pp.57-71). Task identity represents the degree to which a task has a notable output as a whole. Task significance represents the degree to which the job or task has an impact on others. Autonomy represents the degree to which the job or task gives the worker autonomy and freedom to schedule and determine how and when to perform the work. Lastly, feedback represents the degree to which a worker gets information about his/her effectiveness.

Nevertheless, the literature does not directly relate knowledge work task definition, with other factors that determine knowledge worker productivity, such as the use of IT technology, skill development and training and knowledge worker motivation. This research will address this gap by finding any direct relationship between knowledge work task definition and the other factors.

### **2.2.2 Knowledge Worker Motivation**

Frick (2011, pp.368-387) analyses the principal theories of motivation and represents them in a two-dimensional framework (See Appendix E), concluding that there is no universal theory on knowledge worker motivation. The same way as knowledge worker productivity, Frick identifies the most important factors from the existing literature review; however, he does not mention what is the effect of knowledge work task definition on the knowledge worker motivation. From a different perspective, the job design theory presented by Hackman and Oldham (1976, pp.250-279, 1975, p.159) indicates that task identity appears to contribute to knowledge worker motivation, which is an aspect of job design (Kelloway and Barling, 2000, p.287). Kelloway defines job design as a potential predictor of knowledge worker ability and knowledge worker motivation.

*Without prioritizing the work of KWs to fit with their specialized skill set, a firm risks employee disengagement and turnover, in addition to lost opportunities for using knowledge worker strengths for value-adding*

*innovation... In no time, they will be misassigned. They will be where they cannot be productive, no matter how well motivated, how highly qualified, how dedicated they are.* (Drucker (1985 p.115) cited by (Carleton, 2011, pp.459-468)).

According to Mládková (2012, pp.766-773), knowledge worker motivation is influenced more by good co-workers, the access of stakeholders and knowledge, than existing HR policies and benefits. Erne (2011, pp.59-76) also finds that motivation is enhanced by accomplishment of specific tasks, the job content and the opportunity for skill development. This description fits with the intrinsic motivation theory described by Frick (2011, pp.368-387) in his framework. Knowledge worker motivation will always decrease if they are not able to do what they are being paid to do (Drucker, 1985).

According to Hackman and Oldham (1976, pp.250-279), there are three psychological states critical to determine a person's motivation and satisfaction at work, hence increasing productivity: (1) experienced meaningfulness, (2) experienced responsibility, and (3) the individual must know on a regular basis that the outcomes of his/her work are satisfactory. Task identity and autonomy have been identified as a job characteristic that creates a psychological state of meaningfulness and enhances KW motivation and productivity; appealing and challenging work tasks stimulate employee retention and increase KW productivity (Carleton, 2011, pp.459-468), whilst autonomy imposes responsibility from the knowledge workers themselves (Drucker, 1999, pp.79-94). However, Malone (2011, pp.56-65), stated that lower task identity – hyperspecialization – produces the same effect when applied to the right worker. In view of the gaps found in the existing literature surrounded the theories of motivation and job design, this study will test the relationship with the knowledge work task definition.

### **2.2.3 Use of IT Technology**

Some researchers agree that the productivity paradox has ended, owing to the fact that massive investment in information technology has failed to provide

significant productivity benefits (Davenport, 2011, pp.89-99, Pinsonneault and Rivard, 1998, pp.287-311). These investments are mostly associated with knowledge workers communications (emails, intranet, and networks) and administrative tasks. However, “technology still has an important role to play in knowledge work” (Davenport, 2002, p.3). In relation to the IT industry, software development and services organizations depend heavily on IT technology usage, and the arguments mention before, lack empirical research within the industry.

Many authors agree that the use of IT technology improves productivity due to the access to huge volume of information. However, there is a challenge within the usage of IT technology that affects all knowledge workers. Davenport (2011, pp.89-99) states that “always-on, multitasking work environments are so distracting that they are sapping productivity”, reducing creativity and making knowledge workers unhappy (Dean and Webb, 2011, pp.80-88).

Information Technology (IT) has enhanced the access of information across the Internet. Davenport (2011, pp.89-99) describes two management approaches in the use of IT to gather information. On one hand, the free-access approach, knowledge workers define and integrate their own information environments, giving them a broad variety of tools and information resources. On the other hand, the structured provision of information and knowledge, in which information is delivered based on well-defined tasks. The first approach presents two challenges: (1) the presumption that knowledge workers have the skills for searching and managing information and (2) they have the control to avoid ‘*wilfing*’, a term used to explain the phenomenon of surfing the web with no particular purpose (Eng, 2007, pp.19-19). According to various reports (2010, pp.05-05, Dance, 2009), knowledge workers spend more than a quarter of their time searching for information<sup>3</sup>. Furthermore, the two management approaches described by Davenport (2011, pp.89-99) suggest that the definition of knowledge work influence the decision to adopt one or both strategies.

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<sup>3</sup> See **Appendix 5** for more statistics about the time spent in searching for information on the Internet.

Davenport (Davenport, 2011, pp.89-99) states that according to the tasks knowledge workers perform, the usage of IT technology must vary across the organisation. Kelloway (2000, p.287) states that new technology has an impact on task identity, task variety, feedback and other job characteristics presented by Hackman and Oldham (1976, pp.250-279, 1975, p.159). While knowledge work task definition has an important role in the use of IT technology, there is no evidence from the literature about how both are related within the IT industry.

#### **2.2.4 Personal Skill Development and Training**

Learning plays an important role in knowledge workers, in view of the fact that knowledge work environments frequently evolve rapidly, hence workers must continually learn new things to perform well (Hopp *et al.*, 2009, pp.1-32). As a job characteristic, knowledge workers need to learn new skills and/or new knowledge (task variety), which also appear to contribute to knowledge worker motivation (Kelloway and Barling, 2000, p.287). Drucker (1999, pp.79-94) identified knowledge workers requires continuous learning and continuous teaching. Knowledge workers are unique in their knowledge, skills and experience (Davenport *et al.*, 2002, pp.23-30). These represent the tacit knowledge or '*know-how*', as opposite to explicit knowledge.

Nonaka (1994, pp.14-37, 1991, pp.239-275) suggested a fourfold classification as a result of the transfer of these two types of knowledge – socialization, combination, articulation and internalization. Socialization involves the transfer of tacit knowledge between knowledge workers (apprenticeships, on-the-job trainings, etc.). Combination involves the transfer of explicit knowledge between knowledge workers (formal education). Articulation relates to transformation from tacit knowledge to explicit knowledge. Finally, internalization relates to the transformation from explicit knowledge to tacit knowledge. In the IT industry, knowledge workers require problem-solving skills in most of their tasks, which is based on internalization. While internalization and articulation are the most important form of knowledge creation in view of the fact that expands the knowledge of the organisation (Nonaka, 1991, pp.239-275), socialization and

combination are strongly affected by the knowledge work task definition, and knowledge workers themselves.

Managers should be aware of the difficulty of transferring tacit knowledge, since the imminent shortfall of talented workers with expert skills (Hammer *et al.*, 2004, pp.14-18). Leonard (2004, pp.92-95) proposes that companies should foster master-apprentice relationship, for transferring tacit knowledge. Dewhurst (2013, pp.58-64) states “some firms are taking steps to expand the talent pool... by investing in apprenticeships and other training programs”. However, some employers are still resistant to promote knowledge worker learning and skill development, justifying that it will end up being advantageous to another organisation (Carleton, 2011, pp.459-468).

In general, organizations can opt for training and developing skills of their knowledge workers, or outsourcing (Dewhurst *et al.*, 2013, pp.58-64). Mohanta and Thooyamani (2010, pp.89-100) find that on-the-job training improves the productivity of knowledge workers, ensuring they are at the top of their game, and ready for innovative problem-solving (Carleton, 2011, pp.459-468). However, many companies fail to do so, as they become ‘training organizations’ rather than ‘learning organizations’ (Carleton, 2011, pp.459-468). According to Bharadwaj, (2005, pp.65-75), software development can be described as a complex problem-solving process. Hence, the important of skill development and training adjusted to the knowledge worker and knowledge worker task is vital.

### **2.3 Measuring Knowledge Worker Productivity**

The first challenge the literature finds on measuring productivity, is that tools and methods for assessing manual worker productivity cannot be applied to knowledge workers, or at least in totality (Pepitone, 2002, p.39). Drucker (1999, pp.79-94) stated:

*The most important, and indeed the truly unique, contribution of management in the 20<sup>th</sup> century was the fifty-fold increase in the productivity of the manual worker in manufacturing. The most important*

*contribution management needs to make in the 21<sup>st</sup> century is similarly to increase the productivity of 'knowledge work' and 'knowledge workers'.*  
(Drucker, 1999, pp.79-94)

Some authors agree that while there are some methods for assessing knowledge worker productivity, none are universally accepted (Ramírez and Nembhard, 2004, pp.602-628, Drucker, 1999, pp.79-94). Instead, “each business process needs to be examined individually and redesigned on its own terms” (Hammer *et al.*, 2004, pp.14-18). Furthermore, “knowledge workers themselves are the ones resisting change” (Davenport *et al.*, 2002, pp.23-30) upon the management initiatives to design a more productive work environment (Jones, 2005, pp.641-646). In software development organizations, where there is a high level of interdependence and high complexity of work, knowledge workers dislike the idea of being measured in the traditional way – by quantity rather than quality. It is for that reason, different tools and methods are used to assess their productivity, reflected in some management styles, or as Davenport (2002, p.3) stated “hire smart people and leave them alone”.

According to Ramírez and Nembhard (2004, pp.602-628), “knowledge worker measurement systems [existing in the literature] may only provide evidence of relative productivity for a certain industry, job, organization or individual worker”. The authors examined the different measurement systems, identifying 13 productivity dimensions for measuring knowledge worker productivity and concluding that none of the existing systems uses all of the productivity dimensions. The authors identified the following productivity dimensions: (1) quantity – which accounts for outputs and outcomes, (2) costs and profitability; (3) timeliness – which accounts for independence and for the number of tasks a worker can do at once, (4) autonomy, (5) efficiency – which accounts for correctness, (6) quality, (7) effectiveness – which accounts for doing the right tasks; (8) customer satisfaction, (9) innovation/creativity, (10) project success, (11) responsibility/ importance of work, (12) KWs perception of productivity, and (13) absenteeism.

For software development organizations, Erne (2011, pp.59-76) distinguishing 'good software' (quality) and 'planning compliance' (time), quality of interaction, innovation behaviour, personal skill development and compliance with work standards are amongst the predominant performance indicators. The researchers find similarities with the performance indicators across knowledge-intensive firms in different industries. However, the context limitation of the study (only US region) and the limitation on the sample size (one case study for each industry sector) suggest that more empirical research is needed to shed more light on the findings.

### **2.3.1 Time**

Knowledge worker productivity is always affected by time constraints. According to Erne (2011, pp.59-76), productivity can be assessed by the amount of time spent on solving a problem. However, the challenge is measuring the "tasks that are not fixed, have no production standard times, and the tasks can be performed differently by amongst different knowledge workers (Ramírez and Nembhard, 2004, pp.602-628). Time can be spent on acquiring information, thinking, travelling and organizing meetings.

Regarding this study, productivity will be measured for the time knowledge workers gather information, and for the time a problem-solving task is finished.

### **2.3.2 Innovation**

When knowledge is applied to tasks we already know how to do, we call it 'productivity'. If we apply knowledge to tasks that are new and different, we call it 'innovation' (Drucker, 1992 p.26 cited by Carleton (2011, pp.459-468)). Innovation can be defined as the creation of new knowledge to improve the productivity (Ramírez and Nembhard, 2004, pp.602-628). Drucker identified continuous innovation as a factor for enhancing knowledge worker productivity (Drucker, 1999, pp.79-94). Davenport *et al.* (Davenport *et al.*, 2002, pp.23-30) understand that knowledge work is at the heart of innovation and growth. Innovation is associated with organisational structure and management style

(Mahmood and Ali, 2011, pp.27-38). Innovation is nurtured by collaboration (Gummer, 2000, pp.75-92) and hindered by multitasking and information overload (Dean and Webb, 2011, pp.80-88).

According to Carleton (2011, pp.459-468), social interactions resulting from the use of IT technology, improve problem-solving practice. Dean and Webb (2011, pp.80-88) give the opposite opinion, as “the likelihood of creative thinking is higher when people focus on one activity for a significant part of the day and collaborate with just one other person”. The contrast on opinions leaves a gap in the literature about the benefits or detriment of the usage of IT technology. For this study, innovation will be used as a knowledge worker productivity measurement, in the form of the creation of new knowledge for the organization and the innovative problem-solving skills.

### 2.3.3 Quality

“Knowledge workers have traditionally been concerned more with the quality of their output than with...time and cost. The quality of knowledge work outputs, is usually difficult to measure” (Davenport *et al.*, 1996, pp.53-66). According to Ramírez *et al.* (2004, pp.602-628), quality is a rarely a part of measurement due the intangibility of knowledge, and the heavy emphasis on quantitative process measures (Davenport *et al.*, 1996, pp.53-66). However, in practice, Erne (2011, pp.59-76), finds that quality in software development can be defined as the “correctness, stability, maintainability, expandability and clarity or transparency of coding”. However, this definition of quality can only be applied to software developers, excluding the many different roles that composed an IT organization (business analysts, system analysts, system designers, system administrators, etc.). For this study, productivity will be measured in response to the quality of knowledge workers outputs and quality of interactions.

## Chapter 3 - Research Methodology

### 3.1 Introduction

The study is designed to empirically test the relationship between knowledge work task definition and three productivity factors highlighted from the literature. These factors are the use of IT technology, knowledge worker motivation and personal skill development and training, to test if these three factors will influence knowledge worker productivity and to test the segmentation of knowledge workers in the Irish IT context, exploring the relationship with the knowledge work task definition.

To achieve it, primary and secondary research is used. The study follows Saunders's research methodology, also known as the research '*onion*' (Saunders *et al.*, 2011). Each layer of the '*onion*' helps to understand the development of the research. Below, is the representation of Saunders' methodology with the chosen philosophies, approaches, strategies, choices, time horizons, and techniques and procedures for this research study.

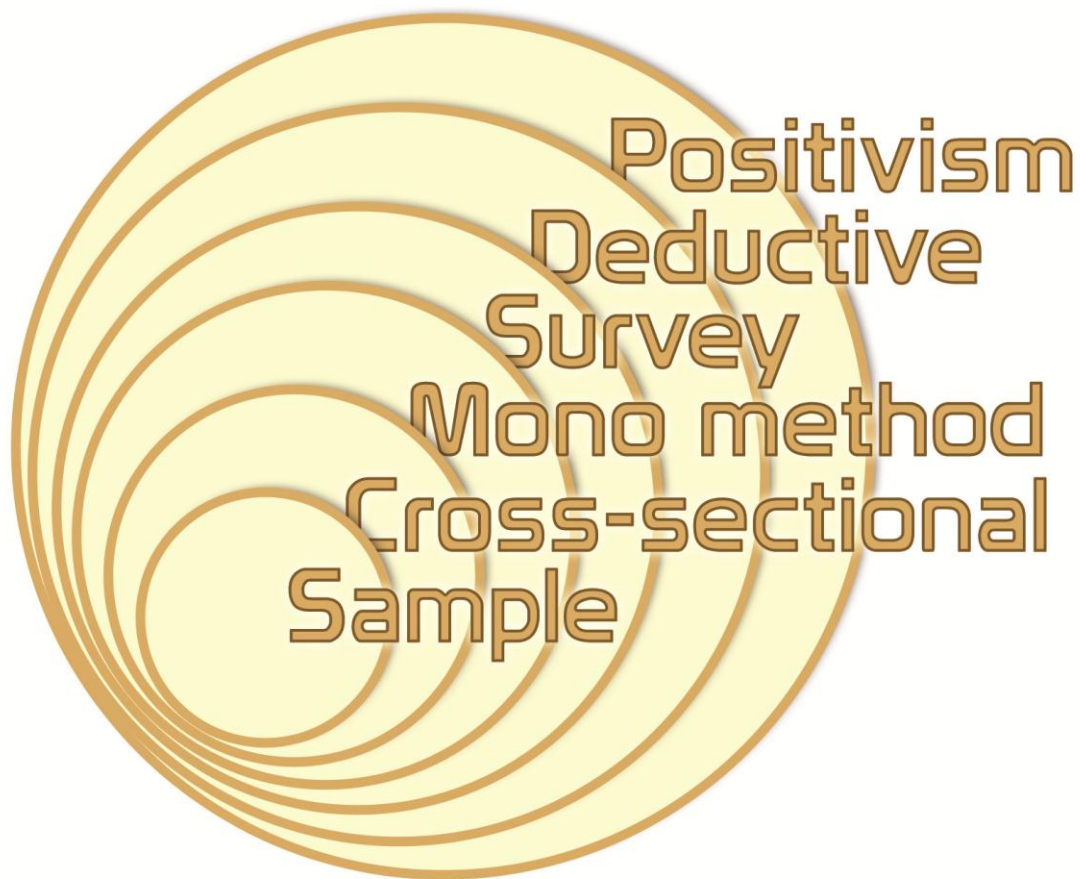


Figure 2 – Research structure based on Saunders's research 'onion' (Saunders *et al.*, 2011)

### 3.2 Research Philosophy – Positivism

Saunders *et al.* (2011) explain that research philosophy answers the question 'how to research?' - by relating the term to the development of knowledge – and 'why research?' – by relating the nature of that knowledge. Ontology describes the nature of reality and is “the corner stone of all other assumptions” (Holden and Lynch, 2004, pp.397-409). Epistemology refers to the study of the nature of knowledge (Holden and Lynch, 2004, pp.397-409). Creswell (1994) described other assumptions that help design the research study – axiological assumption, rhetorical assumption and methodological assumption. Axiology studies the nature of values and value judgements, especially in ethics.

The research philosophy describes important assumptions in relation to the way the researcher views the world considering different research paradigms and matters of ontology and epistemology. Saunders *et al.* (2011) propose four

research philosophy methods: Pragmatism, Interpretivism, Realism and Positivism.

For this research, the objectivist approach to social science is positivism, which is characterised by believing in independent causes that lead to observable effects and hypotheses that are tested based on the observed effects (Holden and Lynch, 2004, pp.397-409). Ponterotto (2005, pp.126-136) describes positivism as a form of philosophical realism that ties closely with the hypothetico-deductive method. With regards to the philosophical anchor of ontology, Ponterotto (2005, pp.126-136) states that positivist claims that there is only one true reality, that is identifiable and measurable (also known as *naïve realism*). With regards to the philosophical anchor of epistemology, positivists emphasizes objectivism and dualism; the researcher, the topic and the research participants are independent of one another; and by following meticulous and standard procedures, the topic and the research participants can be studied and measured without bias (Dewhurst *et al.*, 2013, pp.58-64). Saunders *et al.* (2011) reckon that researchers adopting this philosophy undertake the role of an objective analyst, whose distinct interpretations and opinions come from the data gathered. With respect to the philosophical anchor of axiology, positivists state that there is no place for values – hopes, feelings, and expectations – in the research process, eliminating or controlling any influence on the research process or the research participants (Ponterotto, 2005, pp.126-136). Creswell (1994) states that the axiological assumption of positivism is value-free and unbiased.

### **3.3 Research Approach – Deductive - Quantitative Research**

All research projects involve the use of theory. An important question in relation to the design of the research project is whether this theory is clear in an early stage of the research project. According to Saunders *et al.* (2011), there are two types of research approaches: deductive, where the researcher tests a theory or hypothesis (or hypotheses) and designs a strategy for testing it, and inductive, where the researcher develops a theory from the data collected. A deductive research method requires the development of a conceptual and theoretical

structure before being tested through empirical examination (John and Phil, 2002). Robson (2002) proposes five sequential stages to progress through a deductive research:

1. Deduce a hypothesis from the theory.
2. Express the hypothesis in operational terms.
3. Test the operational hypothesis.
4. Examine the specific outcome
5. If necessary, modify the theory in the light of the findings.

Similarly, Ponterotto (Ponterotto, 2005, pp.126-136) describes the deductive approach from a positivist philosophy: “It involves systematic observation and description of phenomena contextualized within a model of theory, the presentation of hypotheses, the execution of tightly controlled experimental study, the use of inferential statistics to test hypotheses, and, finally, the interpretation of the statistical result in light of the original theory” (Ponterotto, 2005, pp.126-136). According to Saunders et al. (2011), a deductive approach must be generalizable, and only is achievable by analysing a sample of sufficient numerical size.

For this study a deductive approach is chosen. Following Robson’s stages, the literature has been reviewed, finding the gaps to deduce the research objectives, which are tested using quantitative methods, as it is expected to generalize the findings. The deductive approach follows from the positivist research philosophy: the researcher maintains dualism and objectivism since hypotheses are formulated from existing theory, the researcher is independent of what is being observed (research topic and research participants), and the research process is value-free and unbiased.

### **3.4 Research Strategy – Survey**

Saunders et al. (2011) describe seven research strategies – experiment, survey, case study, action research, grounded theory, ethnography and archival research – that can be used for exploratory, descriptive and exploratory research studies, even though some of them clearly belong to deductive or inductive approaches.

Since the approach chosen is deductive, experiment and survey are the most suitable. The purpose of an experiment is to study causal links, between one independent variable and another dependent variable (Saunders *et al.*, 2011) using a control group and experimental group that have been randomly selected from the sample. On the other hand, survey strategy provides a quantitative description of some fraction of the population (sample), which enables the researcher to generalize the findings (Floyd, 2002, p.178).

Following the deductive approach of this explanatory study (establishing causal relationships between variables), the survey strategy is chosen, as the study's aim is to generalize the findings on the three research objectives: (1) to test if knowledge work task definition has a positive effect KW motivation, use of IT technology and personal skill development and training; (2) to test if these three factors have a positive effect on KW productivity; and (3) to explore knowledge worker segmentation in the Irish IT industry and test its relationship with the population. Hence, it is expected the recipient of the research would perceive it as authoritative, or at least within the context – Ireland, as it “allows the collection of a large amount of data from a sizeable population” (Saunders *et al.*, 2011). Another characteristic of the survey strategy is that provides the researcher further control over the process.

“The survey strategy allows you to collect quantitative data that you can analyse quantitatively using statistics and can be used to suggest possible reasons for particular relationships between variables” (Saunders *et al.*, 2011). According to Bryman and Bell (2007), survey research is regarded as a cross-sectional design, as quantitative and quantifiable data, in relation with two or more variables and is collected throughout a questionnaire, which are then examined to detect patterns of associations. Floyd (2002, p.178) describes the potential characteristics for choosing a survey strategy, based on the data collected: probability samplings, which enables an unbiased sample of the population; and standardized measurement, which maintains consistency across all respondents, hence, providing meaningful statistics.

### **3.4.1 Selecting a Method of Data Collection**

For the study, a questionnaire will be chosen, as well as structured observation and structured interviews, as part of the strategy selected. The type of questionnaire will be self-administered, and will use the Internet as the channel for gathering the data, which will give the researcher independence. Other types of questionnaires are not considered, since time is a constraint, are a postal questionnaire and a delivery-collection questionnaire. According to Saunders et al (2011), the time expected for collecting all the data using the Internet is between 2 to 6 weeks. However, the likely response rate is equal or lower than 11% when using the Internet.

### **3.5 Research Choice – Mono method**

Research choices are defined by Bryman and Bell (2007) as techniques or methods for gathering data, taking into account specific instruments – such as structured interviews, questionnaires, or observation. Saunders et al (2011) state that whether the data collected is quantitative (numeric) and/or qualitative (words), is the researcher's choice to combine it; using a mono-method, which means using a single data collection technique and corresponding analysis procedures; or using multiple methods, which combines quantitative and qualitative data collection techniques and corresponding analysis procedures.

This study is structured to collect data using a single method (mono-method) using a questionnaire to collect quantitative primary data, in combination with secondary data from the literature review. Other research choices are excluded – multi-methods and mixed-methods – as the researcher wants to be as independent from the topic and research participants as possible, creating dualism and avoiding biases and interpretations. The questionnaire will be composed of closed questions and will not include any open questions as the researcher aims for objectivism while interpreting the results.

### 3.6 Research Time horizon – Cross-sectional

According to Saunders et al (2011), there are two time horizons: cross-sectional and longitudinal. He also emphasizes that the time horizon choice is independent of the research strategy or the chosen method. As a consequence of the time limitation, a cross-sectional study is chosen. It demands the collection of data at a single point in time. The period expected for the collection of data is between 2 to 6 weeks.

### 3.7 Techniques And Procedures – Research Population and Sample

Floyd (2002, p.178) states that the techniques and procedures used to run a survey have a major effect on the probability that the gathered data will describe precisely what it is intended to describe. To decide what is the best technique and procedure for this research, first the research population needs to be defined (Czaja and Blair, 2005, p.300). For this study, the researcher approached the research question and research methodology, by defining the population: knowledge workers in the Irish IT Industry. The Joint Committee on Jobs, Enterprise and Innovation published a report in October 2012 (Oireachtas, 2012) indicating that the ICT industry in Ireland currently employs 90,000 people. Moreover, another report on the ICT Sector in Ireland (McHugh, 2010) adds that there are approximately 5,400 ICT enterprises.

There are different techniques and procedures used to conduct a survey. A census means collecting information about every individual in a population (Floyd, 2002, p.178). However, it is practically impossible to reach the entire population due to restrictions of time, money and access (Saunders *et al.*, 2011). The idea of the sampling technique is that by selecting some elements in the population, conclusions can be drawn of the entire population. According to Saunders et al (2011), the different choice of sampling technique is dependent on the research question(s) and objective(s), whether it is required generalisation (probability samples) or not (non-probability samples). Probability sampling gives some individuals in the population the chance to be selected under known characteristics and equal conditions (Saunders *et al.*, 2011, Floyd, 2002, p.178). There are four types of probability sample: simple

random sampling, systematic sampling, stratified sampling and multi-stage sampling. The first three types are characterized by the direct access from the researcher or sampler to the entire population (Floyd, 2002, p.178). The last type of probability sampling (multi-stage) consists in linking population members to some kind of grouping that can be sampled (Floyd, 2002, p.178), for instance, in this research, knowing that 90,000 knowledge workers are spread over approximately 5,400 organisations and the desired sample is 100 (1/900 of knowledge), the strategy would be to select in the first stage 1/10 of the organisations and in the second stage select 1/90 of knowledge workers, reaching an overall probability of selection of 1/900. However, these four probability sample types are discarded for this research due the lack of access to the list of organisations and the time to approach them.

Another type of sample is a non-probability design, which includes quota, convenience, purposive and snowball samples (Czaja and Blair, 2005, p.300). For the purpose of this research, different techniques are used to design the sample. Using convenience sampling, the researcher uses known organisations that have access to the information. However, some snowball sampling is expected due the difficulty of achieving a high level of responses using the internet (see Research strategy – Survey). Snowball sampling techniques – in which the initial respondents give access to more respondents – due to the difficulty of identifying or reaching members of the population, and the self-selection sampling – in which the individuals voluntarily take part in the research. To enable the self-selection sampling, a specialised social network is used ([www.linkedin.com](http://www.linkedin.com)), in which the researcher publicises a web link to the online questionnaire in professional groups, within the Irish context (See Appendix C) and on the profile wall. The main problem of snowball sampling is getting the initial contact (Saunders *et al.*, 2011).

### **3.8 Credibility and Reliability of Research Findings**

Saunders et al (2011) state that to reduce the possibility of getting an answer wrong, the researcher should focus on reliability and validity within the research design. Reliability refers to the measures of item consistency (Creswell, 1994); in

other words, the questions should mean the same for all respondents (Floyd, 2002, p.178) and the results could be replicated if the questions are answered several times. Saunders et al (2011) describe four threats to reliability that can be caused by the subject or respondent error, the subject or respondent bias, the observer error and the observer bias. The researcher cannot eliminate these threats, but minimize the threat of them occurring. "Validity is concerned with whether the findings are really about what they appear to be about" (Saunders *et al.*, 2011). To make the research findings credible, Czaja (2005, p.300) suggests that first, questions must measure the dimension or construct of interest; and second, the respondents must interpret the questions as intended. For the purpose of this study, questions have been pilot tested with researcher's peers (professionals within the IT industry and scholars).

### **3.9 Research Data Collection**

Having chosen the survey research strategy, Czaja *et al.* (2005, p.300) describes four main survey approaches for gathering the research data: mailed questionnaires, Internet surveys, telephone interviews and face-to-face interviews. The researcher follows a positivist philosophy; hence telephone interviews and face-to-face interviews are discarded because research influence is high in these two forms (Czaja and Blair, 2005, p.300).

Floyd (2002, p.178) presents a list of major issues in choosing a survey method: sampling characteristics, type of population, question form, question content, response rates, costs, available facilities and length of data collection. Czaja et al (2005, p.300) compares the different survey methods against most of the issues Floyd presented. While both methods (mailed questions and Internet surveys) are very similar, Internet surveys are less costly, the length of the data collection is very short (from 1 to 3 weeks), the geographic distribution of sample may be wide and it allows complexity in the questionnaire. Brace (2005) discuss the advantages and disadvantages of these two methods for data collection. While both methods are flexible and can reach a wide sample of the population, the mailed questionnaire requires a high quality of production and most

importantly, the time frame for gathering the data is around 10 weeks, as respondents must to send back the questionnaires.

Having said so, the chosen survey method for this research is the Internet survey. Bradley (1999) cited by Brace (2005) summarized the different delivery approaches when using Internet surveys – open web, closed web, hidden web, e-mail URL embedded, simple e-mail and e-mail attachment. None of them are mandatory; hence the researcher can use multiple methods. However, using existing online survey services (i.e. SurveyMonkey), sharing the URL of the online survey throughout email or social networks is the best and quickest approach for gathering the data.

For this research the only survey service chosen is Survey Monkey ([www.surveymonkey.com](http://www.surveymonkey.com)). The service is free, but it does not provide enough number of questions per questionnaire or number of respondents. The researcher has chosen the Premium plan ‘Select’ (which costs 25€ per calendar month), having unlimited number of questions in the questionnaire and a maximum of 1000 responses per month, which is adequate for the research.

### 3.10 Questionnaire Design

*“The survey questionnaire is the conduit through which information flows from the world of everyday behaviour and opinion into the world of research and analysis” (Czaja and Blair, 2005, p.300) p.59*

To provide accurate, good-quality information, the questionnaire needs to be planned. For that, the researcher should ask relevant questions for the objectives and not ask questions of interest that are irrelevant to the research (Brace, 2005). Brace (2005) proposes three steps for planning the questionnaire, once the researcher knows the definition of the research universe, the survey design and the data collection methods; (1) defining the information that is required, (2) determine what else is required for analysis purposes and (3) map the flow of the subject areas or sub-sections within the questionnaire. Following Brace’s steps for designing a questionnaire, firstly, the researcher gathers the required

information from the literature review and the research objectives. The questionnaire is divided in three pages, each page corresponding with a research objective. Secondly, the questionnaire contains another page for demographic data, as well as specific data related to the respondents' job.

Floyd (2002, p.178) p.78) states that in a questionnaire, an answer is valuable only if it can be shown to have a predictable relationship to facts or subjective states that are of interest. In order to achieve this, he proposes increasing the reliability and validity of answers by designing precise questions and ensuring consistent meaning to all respondents (see Appendix F for full Questionnaire Design).

### 3.10.1 Questionnaire Structure

Page 1 of the questionnaire covers the following research objective: "To explore the relationship between knowledge work task definition and the use of IT technology, Knowledge Worker motivation, and personal skill development and training". The page is divided in three questions.

Question 1 relates knowledge work task definition and knowledge worker motivation using a *likert* scale. Based on the design job theory (Hackman and Oldham, 1976, pp.250-279, 1975, p.159), this question measures autonomy and task identity against respondent's motivational factors. Each variable is assigned three statements, which measure the level of the variable and the level of the motivation produced by that variable. Question 2 relates to knowledge work task definition and the use of IT Technology using a Likert scale. This question measures the level of autonomy and the level of access to information based on the task definition. Question 3 relates to knowledge work task definition and personal skill development and training using a Likert scale. Based on Nonaka's spiral of knowledge (Nonaka, 1994, pp.14-37, 1991, pp.96-104, 1991, pp.239-275), the question measured socialization and combination stages, by asking respondents the level of each variable in their defined job tasks, and by the level of agreement.

Page 2 of the questionnaire covers the following research objective: “To test that, three major factors – use of IT technology, knowledge worker motivation and personal skill development and training – will influence knowledge worker productivity”. The page is divided in three questions; each of the questions measures the factors (Knowledge worker productivity, the use of IT technology, and personal skill development and training) against three productivity dimensions (quality, timeliness and innovation). All the questions use Likert scales.

Page 3 of the questionnaire covers the following research objective: “To test the segmentation of knowledge workers in the Irish IT Industry based on Davenport’s KW segmentation framework and to explore the relationships amongst the previous factors”. Based on Davenport’s Knowledge Worker Segmentation Framework, respondents are asked about the characteristics in their current job and current daily work, using pre-coded questions that are single and multiple choices.

Lastly, page 4 of the questionnaire covers demographic questions and gathers information related to the respondent’s education, job and work experience.

All of the questions from the first two pages of the questionnaire have been designed using a *likert* scale. The purpose of the statements in a Likert question is to represent different aspects of the same attitude (Brace, 2005). Five points within the scale have been chosen, as they give enough discrimination for most purposes and respondents can easily understand them (Brace, 2005). Moreover, the choice of an even number of points will not force a response to go in one direction or another. However this choice will cause an issue in the responses known as central tendency – in the following section, the measures to avoid this bias are explained.

### **3.10.2 Questionnaire Design Biases**

There are four issues that researchers must be aware of when using Likert scales – order effect, acquiescence, central tendency, and pattern answering (Brace,

2005). The order in which the scalar responses (Likert) are prompted will affect the answer. Brace (2005) states that if positive end of the scale is presented on the left, the question will produce more positive answers. Similarly, acquiescence is the propensity for participants to agree. All the Likert scales in the research questions have been presented from the negative end of the scale to the left, to avoid order bias and acquiescence bias. Central tendency is the unwillingness of respondents to use extreme positions. Albaum (1997, cited by Brace (2005)) indicates that two-stage questions provide a better proportion of extreme responses. To avoid central tendency, the researcher has set two-stage questions in the first six questions of the research (covering the first two objectives). And lastly, pattern answering is when respondents answer questions following a pattern, in most cases as a symptom of weariness. To avoid this, the researcher has set the statements for the first six questions (all Likert type) to be prompt in a random order<sup>4</sup>.

### **3.11 Personal Biases**

Saunders et al (2011) stated that when following a deductive approach, “deduction dictates that the researcher should be independent of what is being observed”. Whilst survey strategy, in the form of a questionnaire, gives the researcher independency from the data collected, the non-probabilistic sampling can affect the findings. In the case of this research study, the initial participants from the questionnaire are chosen from the current and previous researcher’s organisations, and contacts from online social networks. This can affect the findings, as the context for this study is Ireland, and also due the proximity to the researcher. However, the researcher is expecting a snowball sampling with the use of specialized social networks (LinkedIn) and the initial participants to compensate the bias. However, by introducing snowball sampling, another bias is created, “as respondents are most likely to identify other potential respondents who are similar to them, resulting in a homogeneous sample” (Lee 1993, cited by Saunders et al, 2011).

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<sup>4</sup> Note that this is a feature and advantage of online questionnaires, phone questionnaires and interview based questionnaires. This feature has been achieved by enabling an option in [www.surveymonkey.com](http://www.surveymonkey.com).

Brace (2005) states that no matter how cautiously the researcher builds the questions, “the data collected are only as accurate as the responses that are elicited”. Respondents give inaccurate answers for a number of different reasons. Particular to this research study topic, the researcher is aware of the social desirability bias (SDB). SDB appears because survey participants like to be other than they are, usually when expressing their attitudes (Brace, 2005) regarding to personal income, feelings, intellectual achievements, etc. To deal with SDB, the researcher uses web-based questionnaires; hence, participants do not need to create an impression to the interviewer; moreover, it enforces the idea of anonymity.

### 3.12 Ethical Issues

“The value of research depends as much on its ethical veracity as on the novelty of its discoveries” (Walliman, 2006, p.147). The author explains that it will be hard to believe the findings of a research that have been conducted dishonestly; and defines ethics as the rules of conduct in research, proposing two perspectives in which ethical issues can be viewed:

- The values of honesty and frankness and personal integrity.
- Ethical responsibilities to the subjects of research, such as consent, confidentiality and courtesy.

According to May (2011), ethics is concerned with the attempt to formulate codes and principles of moral behavior. Saunders *et al* (2011) also agree in that the research design should not embarrass or harm to those being researched.

The research ethical guidelines from the Sociological Association of Ireland (SAI) relate relations with research participants and responsibilities towards them, anonymity, privacy, and confidentiality, as the most relevant for this study.

There are certain ethical issues in survey research. Two concepts are central to the treatment of respondents: protection of confidentiality and informed consent (Czaja and Blair, 2005, p.300). Floyd (2002, p.178) states “it is a basic premise of ethical survey research that respondents should be informed about what it is that they are volunteering for”. Floyd dictates that prior to the survey questions, the research must provide the following information:

- Name of the organization/University and researcher name.
- Sponsorship.
- A reasonably accurate brief description of the purpose of the research.
- An statement with respect to data protection and confidentiality.
- Assurance that cooperation is voluntary.
- Assurance that respondents can skip any questions that they do not want to answer.

Brace (2005) adds that the interview length (in time) also should be included. The researcher of this study has considered the ethical implications of the research design and of the relationship with research participants. The research questionnaire will be anonymous. There is no deception in this study, and this will be clarified in the questionnaire to all participants. In relation with the data collected, it will not be shared within the domain of DBS (supervisor) and the researcher, and will be destroyed as soon as the study finished.

## Chapter 4 - Data Analysis and Findings

This chapter will present the findings made in the primary research, which will be the foundation for the concluding chapter in this dissertation. Therefore, no in-depth discussions or direct relation to the secondary research, the literature review, will be made. The findings are divided into four sections. First, the researcher analyse the sample validity of the primary research data through the demographic questions, which provides evidence for the sample being representative of the targeted population. The best approach for this analysis is using descriptive statistics. With descriptive statistics, the main concern is to present and describe the set of results from the group being studied (Pagano, 2011).

The second part of this chapter, each of the research objectives is analysed using inferential statistics. Brase et al (2011) states “inferential statistics involves methods of using information from a sample to draw conclusions regarding the population”. To address that, first the researcher test the internal consistency reliability between variables, second finds any correlation, and finally by ensures generalizability amongst the population.

The web questionnaire was online from the 1<sup>st</sup> of July 2013 to the 25<sup>th</sup> of July 2013. During this time, 120 participants filled the questionnaire, but only 102 completed it (85% of total responses). This is the defined valid sample for this study research, as if non-completed responses are included, (1) the defined sample will not be representative of the population, because it is not described by the totality of the responses, and (2) the findings will be affected. Frequency analysis is used to validate the sample of the quantitative research data against the population because it shows the number of occurrences of each response.

## 4.1

### 4.2 Demographic data and Population Validity

#### 4.2.1 Gender

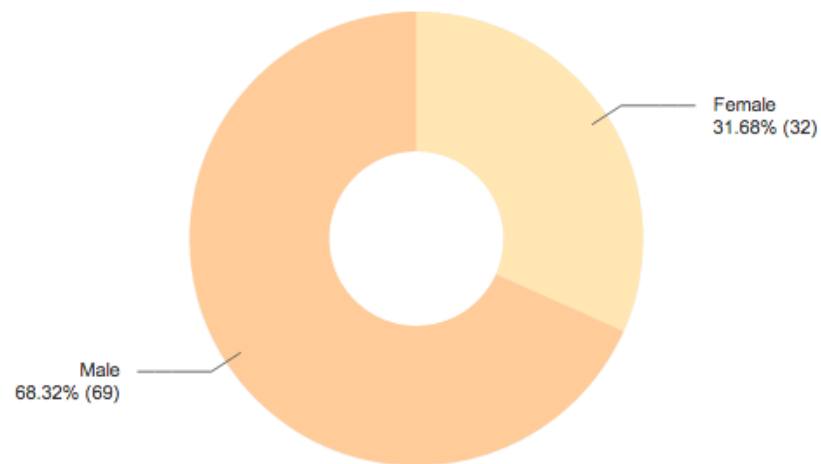


Figure 3 - Q9 - Participants Gender

From the total of the valid responses (102), only 101 participants answered the gender question and 1 participant skip the question. The data revealed that 68.32% of the sample is represented by males (69 responses) against 31.68% of females (32 responses). The distribution is favourable to males, but according to the National Skill Bulletin Report (2013), this ratio represents the population of knowledge workers in the Irish IT Industry, having an average of female of 28.3% in ICT jobs.

#### 4.2.2 Age

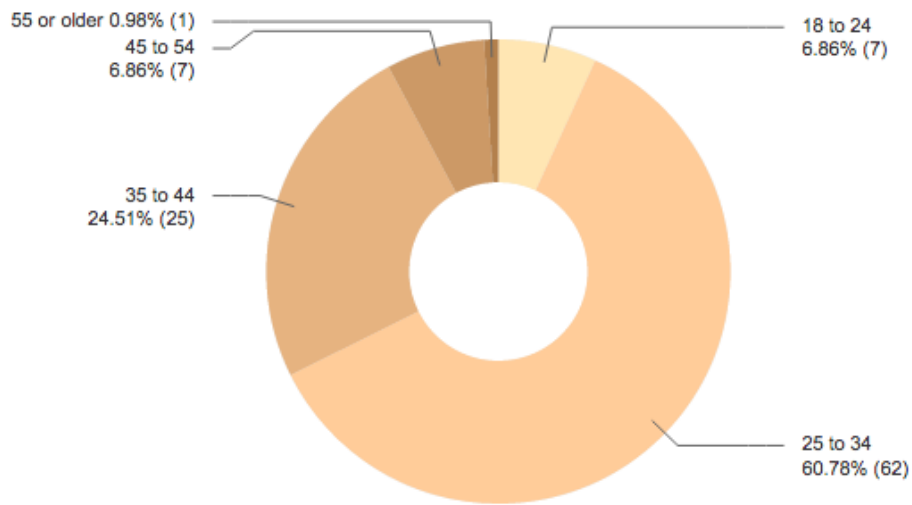


Figure 4 - Q10 - Participants Age

The range of participants' age goes from 18 to over 55 years old. The majority of participants fit in the 25 to 34 years-old range, which represents the 60.78%. The major range in the population is between 25 and 54 years old, representing 89%. Summing up the ranges from 25 to 54, the percentage of the sample is 92.2%, which is very representative.

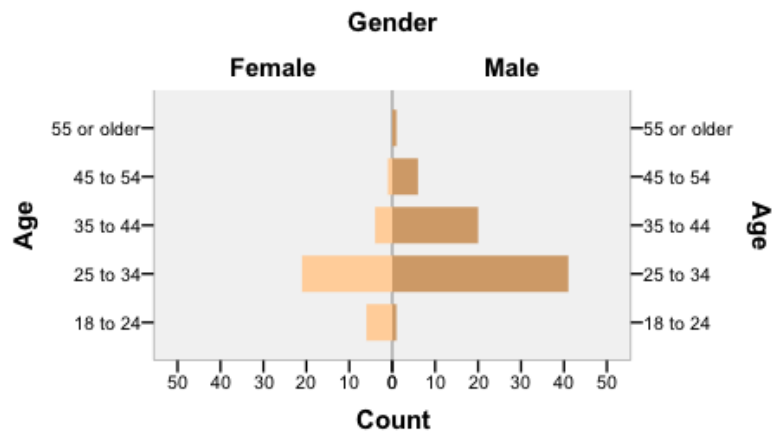


Figure 5 - Population Pyramid of Age against Gender

### 4.2.3 Education

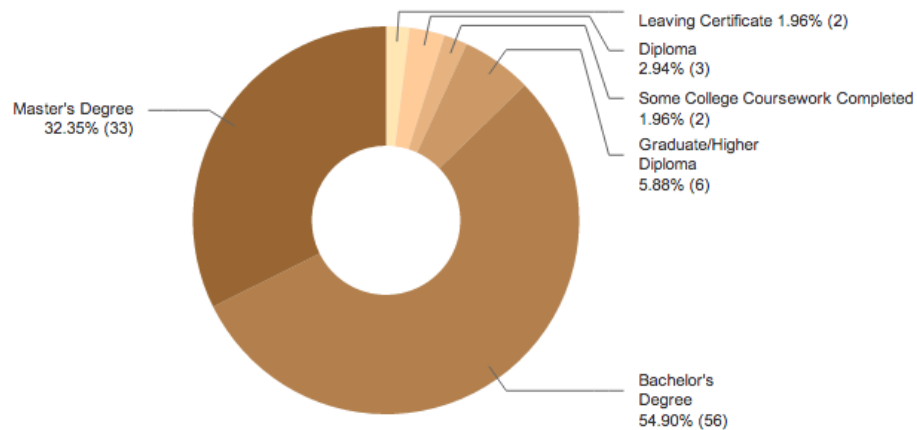


Figure 6 - Q11 - Participants Level Of Education

The majority of the participants have a bachelor's degree (54.9%) and 32.35% (33)<sup>5</sup> have finished a master's degree. No participants account for a doctoral degree, and 12.8% (13) have lower education level. The National Skill Bulletin Report (July-2013) observed that a 95% of the ICT professionals were third level graduates. Compared to the research sample, which accounts 87.27% (89).

### 4.2.4 Professional Characteristics

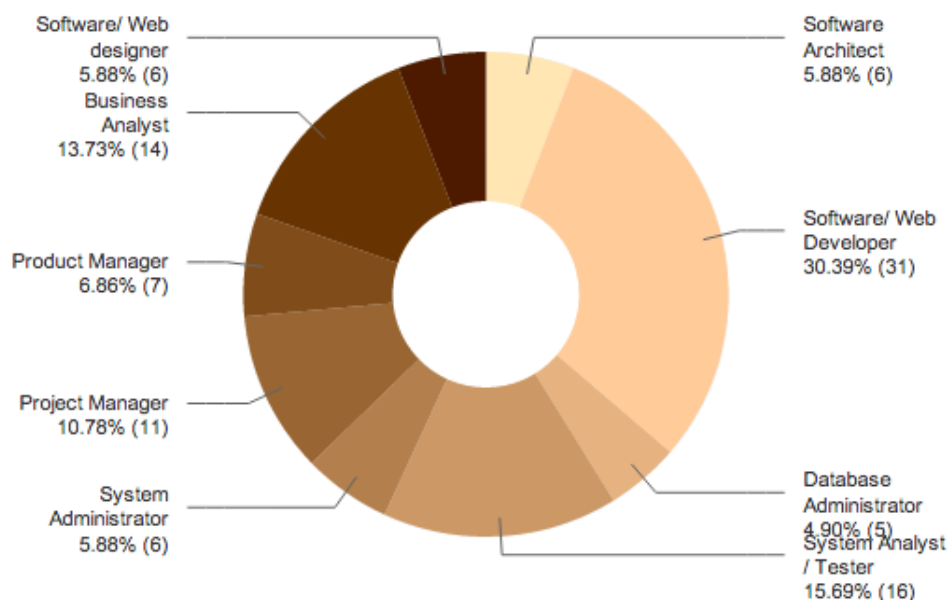


Figure 7 - Q12 - Participants Role

<sup>5</sup> The values that are represented are the percentage and the frequency in brackets. This format is going to be use along the findings.

There are three major groups of professional roles: Software/Web developers with 30.39% (31), System analysts/testers with 15.69% (16) and business analysts with 13.73% (14). While these three groups accounts for more than 50%, it reflects the population, as these three roles are the foundation of any ICT enterprise.

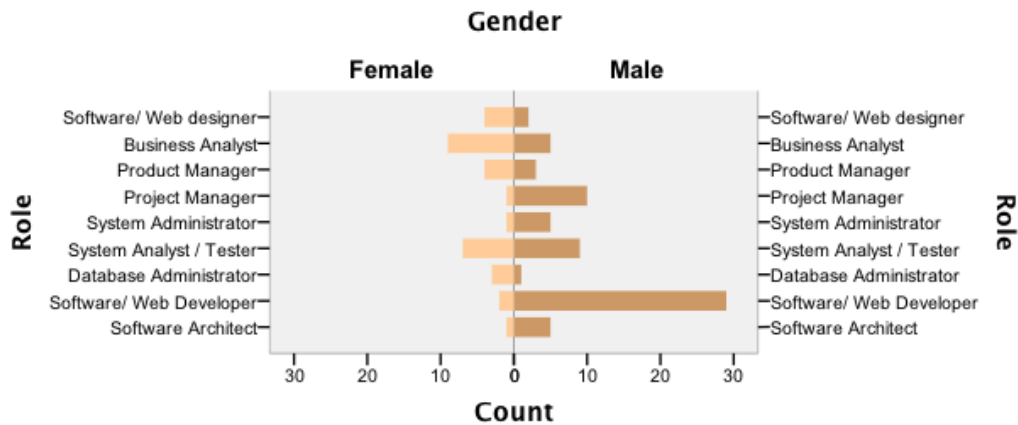
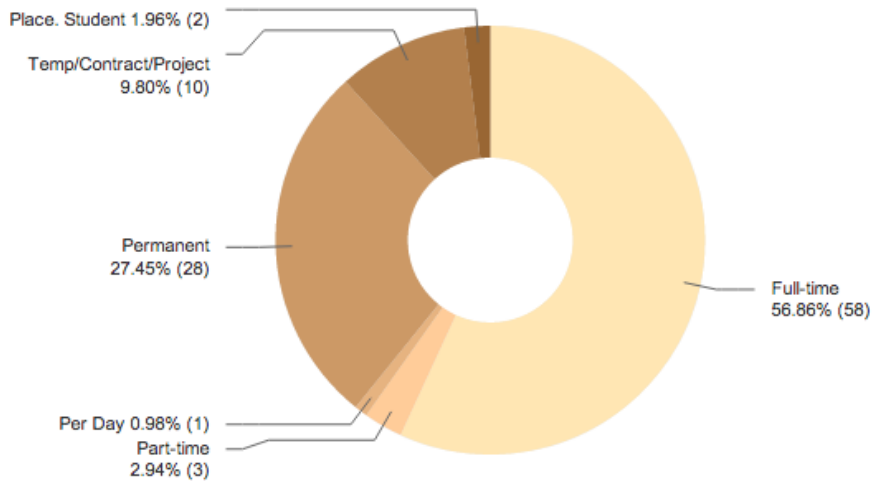


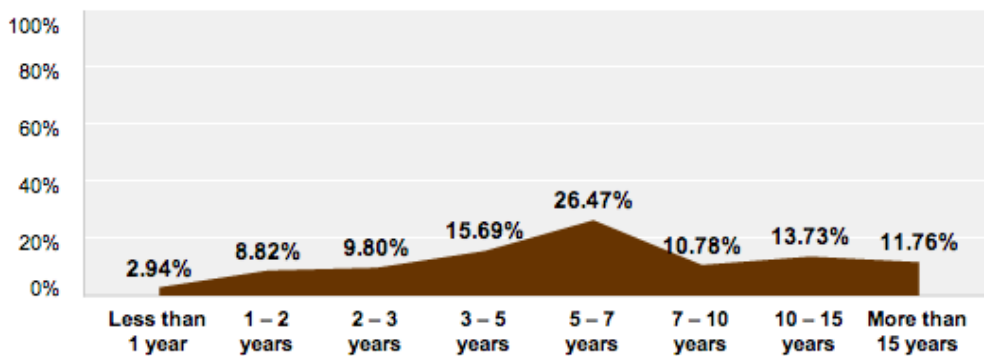
Figure 8 - Population Pyramid of Role against Gender

The distribution of roles based on gender shows that males represent the majority of software developers while the majority of business analysts are represented by females. An equal distribution between genders is found in system analyst/tester role.



**Figure 9 - Q13 - Participants Contract Type**

Analysis illustrates the majority of participants in two groups: 56.58% (58) of the participants work full-time, 27.45% (28) of the participants are permanent. Only 9.80% (10) of participants work as temporal/contact/project, and the rest (5.88%) represents placement students, part-time workers and per day contractors. The National Skill Bulletin report of July 2013 observed that around 85% of ICT workers work full time. This data demonstrate that the sample use for this research is again accurate, accounting 84.31% (86) of respondents in full-time and permanent jobs.



**Figure 10 - Q14 - Participants Years of Experience**

The range of work experience within the Industry is range from less than one year to more than 15 years. The analysis shows 26.47% (27) of participants range a work experience between five to seven years, accounting for the biggest proportion. The curve represented in Figure 10 with the maximum peak in 5-7 years range, can be contrasted with the level of experience required for available ICT jobs in Ireland, which states that 69% of available offers seek for employees with experience between 2 to 6 years (FAS, 2012) pp.26-31).

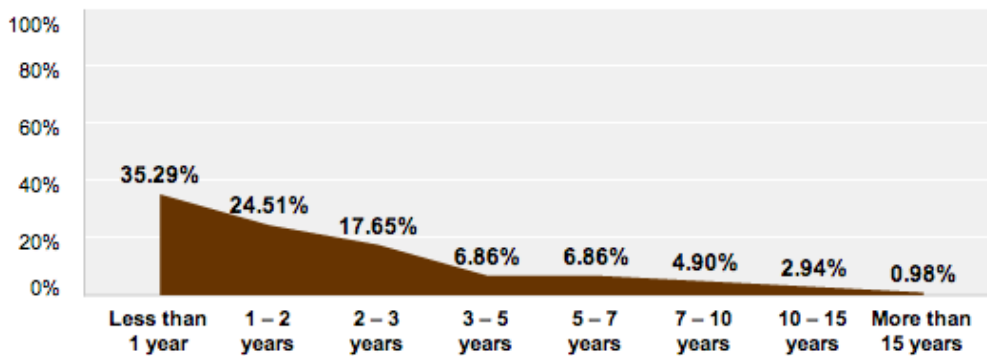


Figure 11 – Q15 - Length (In Years) of Participants current Position

In accordance with the duration (in years) of your current position, the analysis shows that 35.29% (36) of the participants have been working in their current position for less than a year. The frequency of participant numbers among the following ranges decrease by 11 (24.5 %) in the range of 1 to 2 years, and by half between 2 to 3 years.

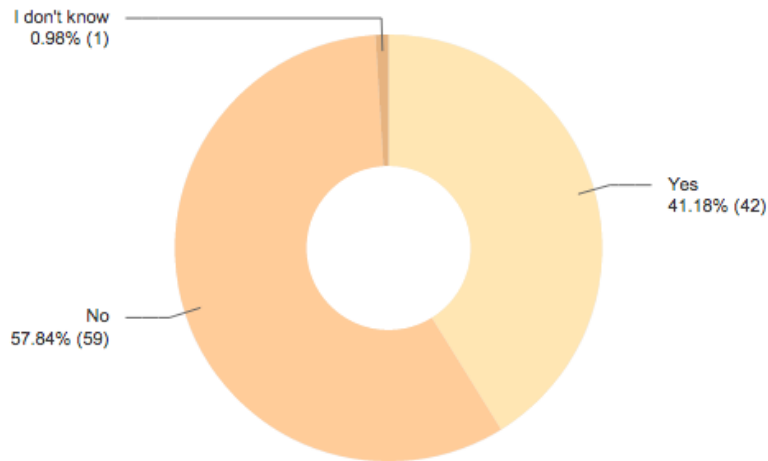


Figure 12 - Q16 - Participants Management Responsibilities

Participants with management responsibilities are accounted by 41.18% (42) of the responses, against 57.84% (59) with no responsibilities. Only one participant does not know about it (0.98%).

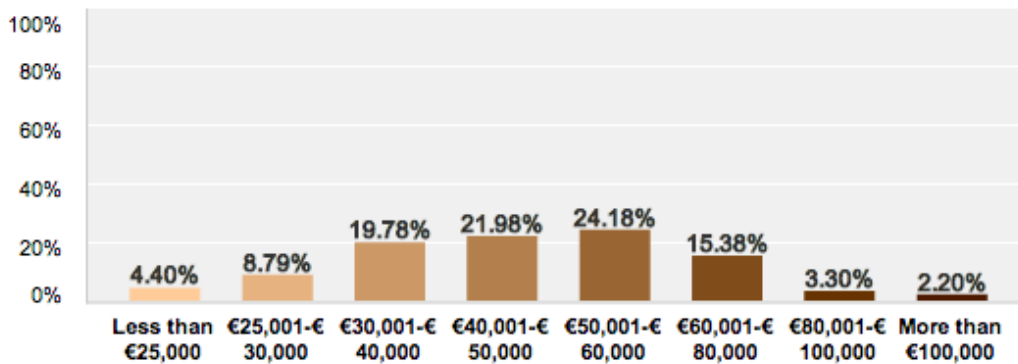


Figure 13 - Q17 - Participants Annual Gross Income

Lastly, from 102 responses only 91 answered the question in relation to the participant annual gross income. 24.18% (22) of participants earns between 50,001€ and 60,000€, while 4.4% (4) participants earn less than 25,000€ and 2.2% (2) of participants earn more than 100,000€.

### 4.3

#### 4.4 Findings of Research Objective #1

Question 1 to question 3 covers the analysis and findings for the first research objective – to explore the relationships between knowledge work task definition and KW motivation, Use of IT Technology, and Personal Skill Development and Training. For this research objective, three alternative hypotheses were created:

- H<sub>1a</sub> → Knowledge work task definition has an effect to Knowledge Worker motivation.
- H<sub>1b</sub> → Knowledge work task definition has an effect to the use of IT technology.
- H<sub>1c</sub> → Knowledge work task definition has an effect to personal skill development and training.

#### 4.4.1 Relationship between Knowledge Work Task Definition and Knowledge Worker Motivation

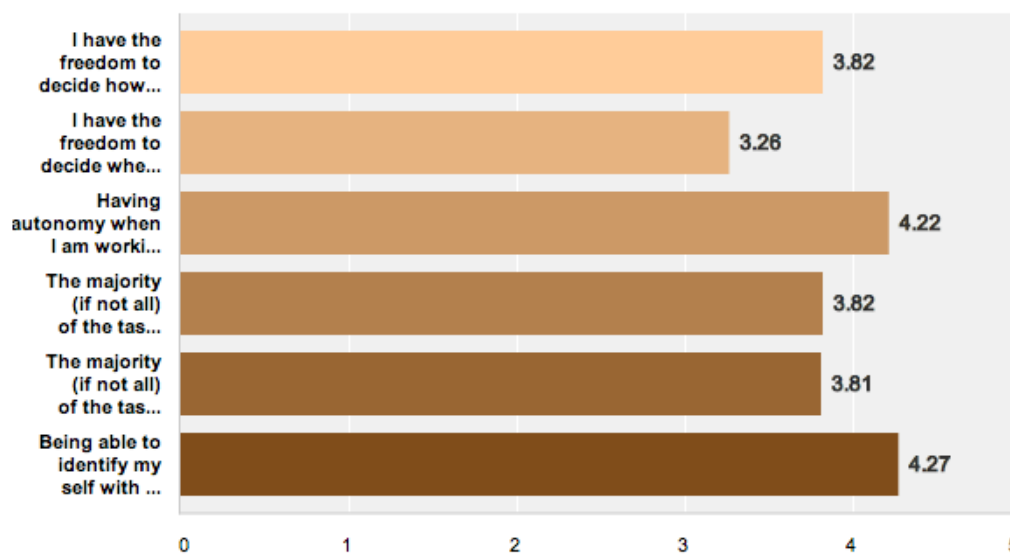


Figure 14 - Q1 - Bar chart of the statements Mean for Knowledge work task definition and Motivation

The statements in question one were ranged from 1 (strongly disagree) to 5 (strongly agree). The first three statements measure the level of autonomy and motivation; the last three statements measure the level of task identification and motivation. Participants agree that they have the freedom to decide how (by

60.78%) and when (41.18%) to perform their tasks at work. Moreover, they agree by 43.14% (44) that having autonomy while they are working on a task increases their motivation. With respect to task identity, participants agree that the majority of their tasks (if not all) they are working on have a tangible outcome – agree by 57.84% (59) – and require lot of responsibility – agree by 48.04% (49). Moreover, participants agree by 45.10% (46) that task identity increases motivation at work. Other descriptive analysis results can be found in Table 2.

**Table 2 -Q1 - Descriptive Analyses: Mean and Percentages of Participant Attitudes toward KW Task Definition and Motivation**

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Total	Average Rating
I have the freedom to decide how to perform my tasks at work	0.98% 1	13.73% 14	5.88% 6	60.78% 62	18.63% 19	102	3.82
I have the freedom to decide when to perform my tasks at work	3.92% 4	20.59% 21	27.45% 28	41.18% 42	6.86% 7	102	3.26
Having autonomy when I am working on a task increases my motivation at work	0% 0	1.96% 2	14.71% 15	43.14% 44	40.20% 41	102	4.22
The majority (if not all) of the tasks I am working on have a tangible outcome	0% 0	12.75% 13	10.78% 11	57.84% 59	18.63% 19	102	3.82
The majority (if not all) of the tasks I am working on require lot of responsibility	0.98% 1	7.84% 8	21.57% 22	48.04% 49	21.57% 22	102	3.81
Being able to identify my self with the final product/service after finishing a task increases my motivation at work	0.98% 1	1.96% 2	8.82% 9	45.10% 46	43.14% 44	102	4.27

Before analysing the relationship between these two variables, the researcher calculated the level of internal consistency reliability of the variables (first, second, fourth and fifth statements are tested) using Cronbach’s alpha and inter-variable correlation. The internal consistency coefficient ( $\alpha$ ) is 0.778 for the first group of statements (1<sup>st</sup>, 2<sup>nd</sup>, 4<sup>th</sup> & 5<sup>th</sup> statements). This indicates an acceptable level of consistency between the variables. There is a lot of discussion about what the level is consistency is acceptable (Lance *et al.*, 2006, pp.202-220). For the purpose of this research, an acceptable level will be equal or higher than 0.7 (Nunnally Jum and Bernstein Ira, 1978). There is a good inter correlation between these four items, which is between 0.3 and 0.7.

To test if there is any correlation between knowledge worker motivation and knowledge work task definition, the researcher used Spearman's correlation coefficient to determine any dependence between these two variables. First, the correlation of the two measured attributes is analysed – autonomy, and task identity. To do this, the first two statements are merged into one variable, which represented the level of autonomy, and then, it is tested against the third statement, which measured the level of satisfaction produced by that level of autonomy. The same procedure is repeated for the following three statements, which measure the level of task identity. And last, both attributes are combined into one range variable<sup>6</sup>, and test against the sum of statement 3 and 6 (which measured the level of motivation against the variables).

The correlation coefficient for the relationship between the level of autonomy and the level of motivation is 0.354, with a significant level less than 0.01. The correlation coefficient for the relationship between level of task identity and level of motivation is 0.302, with a significant level of 0.002. Overall, the correlation coefficient between knowledge work task definition and knowledge worker motivation is 0.396, with a significant level less than 0.01.

These three correlation coefficients are between 0.3 - 0.5 ranges and all three correlations are significant at the 0.01 level (2-tailed). The results from these analyses indicate that there is a weak, positive relationship between knowledge work task definition and KW motivation, and the result is very significant, which means, that can be generalized to the entire population. Hence, the researcher rejects  $H_{0a}$  – that knowledge work task definition has *no* effect in knowledge worker motivation – in favour to  $H_{1a}$ .

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<sup>6</sup> The range variable is the sum of the likert scales from the statements 1, 2, 4, and 5.

#### 4.4.2 Relationship between Knowledge Work Task Definition and the Use of IT Technology

The statements in question two were evaluating the level of autonomy and the level of access to information from the participants in order to relate knowledge work task definition and the use of IT Technology.

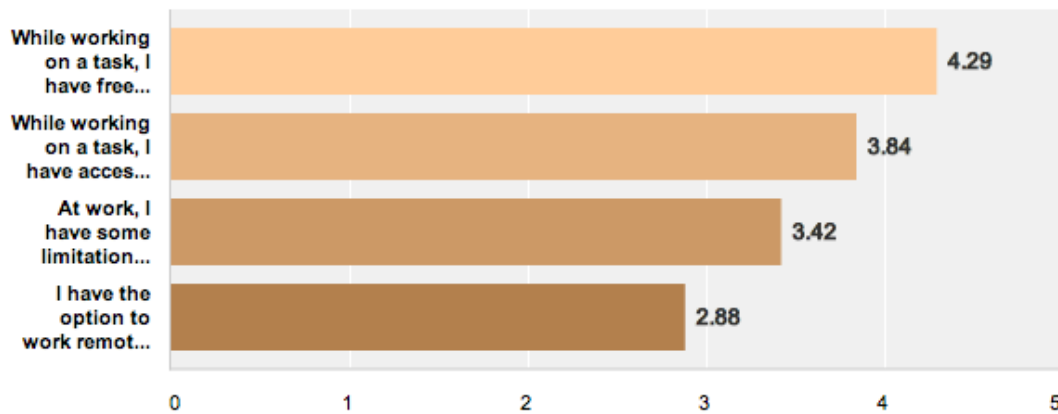


Figure 15 – Q2 - Bar chart of the statements Mean for Knowledge work task definition and Use of IT Technology

Analysis revealed the majority of participants agree or strongly agree that they have free access to information through the use of IT while working on a task, achieving a total of 90.20% (92) of total responses. Moreover, participants also agree by 41.18% (42) that they have access to structure provision of information. 48.08% (47) of participants agree that they have some restrictions or limitations when accessing personal information at work. Finally, 31.37% (32) of participants have the option to work remotely at any time against 25.49% (26) that cannot. Other descriptive analysis results can be found in Table 3.

**Table 3 – Q2 – Mean and Percentages of Participant Attitudes toward KW Task Definition and the Use of IT Technology**

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Total	Average Rating
While working on a task, I have free access to information through the use of IT Technology	0.98% 1	3.92% 4	4.90% 5	45.10% 46	45.10% 46	102	4.29
While working on a task, I have access to structured provision of information through the use of IT Technology	1.96% 2	5.88% 6	24.51% 25	41.18% 42	26.47% 27	102	3.84
At work, I have some limitations/restrictions when accessing personal information (i.e.: social networks, video-sharing websites, news, music, etc.)	14.71% 15	11.76% 12	8.82% 9	46.08% 47	18.63% 19	102	3.42
I have the option to work remotely at any time.	20.59% 21	25.49% 26	10.78% 11	31.37% 32	11.76% 12	102	2.88

For this question, no internal consistency reliability test is needed, as each statement measured different characteristics of the use of IT technology based on the knowledge work task definition.

There is a negative weak correlation between having a free access approach for gathering information and the restriction of personal information of -0.309 with a significant level of 0.002. There is no correlation between free access approach and working remotely (0.190) and the result is not significant to the population (0.056). In the other hand, having a structured provision of information is not correlated to the access of personal information (-0.80), or to working remotely (-0.036). Both results are not significant to the population, showing a significance level of 0.426 and 0.722 respectively (superior to 0.05). In conclusion,  $H_0b$  –knowledge work task definition has *no* effect on the use of IT technology – is not rejected.

### 4.4.3

#### 4.4.4 Relationship between Knowledge Work Task Definition and Personal Skill Development and Training

The statements in question three were evaluating two stages of Nonaka's spiral of knowledge (Nonaka, 1994, pp.14-37, 1991, pp.96-104, 1991, pp.239-275) – socialization and combination – against the level of relation to the work task definition.

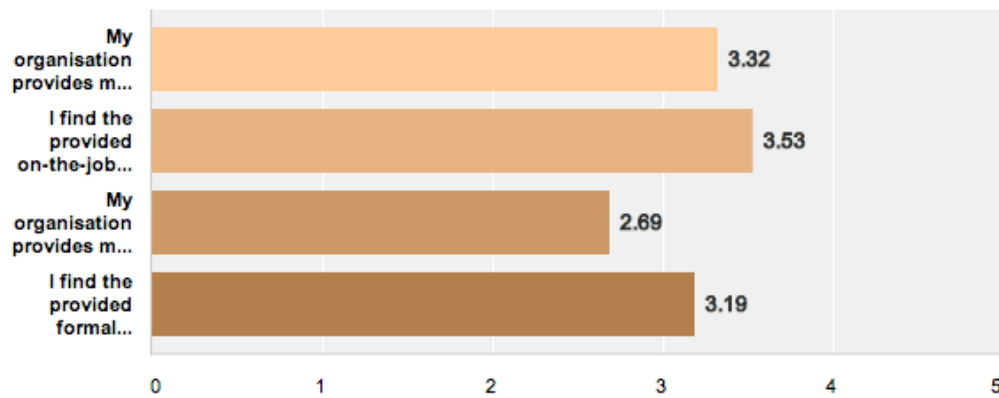


Figure 16 – Q3 - Bar chart of the statements Mean for Knowledge work task definition and Personal Skill Development & Training

Analysis revealed that participants agree by 40.20% (41) that their organisations provide them with on-the-job training specific to their tasks, which is very suitable for doing their tasks (37.25 %). When questioned about organisations providing participants with formal education specific to their tasks, 36.27 % (37) were disagree. However, 35.29% (36) of participants agree that formal education provided by organisations is very suitable for developing their tasks at work. Other descriptive analysis results can be found in Table 4.

**Table 4 – Q3 – Mean and Percentages of Participant Attitudes toward KW Task Definition and Personal Skill Development & Training**

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Total	Average Rating
My organisation provides me with on-the-job training specific to the tasks I am involved in	7.84% 8	19.61% 20	18.63% 19	40.20% 41	13.73% 14	102	3.32
I find the provided on-the-job training very suitable for doing my tasks	5.88% 6	15.69% 16	19.61% 20	37.25% 38	21.57% 22	102	3.53
My organisation provides me with formal education specific to the tasks I am involved in	17.65% 18	36.27% 37	13.73% 14	24.51% 25	7.84% 8	102	2.69
I find the provided formal education very suitable for doing my tasks	13.73% 14	16.67% 17	20.59% 21	35.29% 36	13.73% 14	102	3.19

To measure the level of reliability between the participants attitude towards these two variables (on-the-job training and formal education), the Cronbach’s alpha is calculated between the second and fourth statement in question three. The consistency coefficient is 0.843, which indicates a good consistency level (between 0.8 and 0.9). Moreover, there is a good inter correlation between these two items of 0.731.

To test the relationship between personal skill development & training and KW task definition, Spearman’s correlation coefficient is used, to determine any dependence between on-the-job training, formal education and knowledge work task. First, the first two statements relate training and the participant’s attitude towards the suitability of training; the last two statements relate formal education and the participants’ attitude towards the suitability of formal education. Finally, statements 1 and 3 are merged and correlates with merged 2 and 4 statements to test the overall correlation.

The correlation coefficient for the relationship between on-the-job training and KW task is 0.684, which is between 05 - 0.7 and the significance level is under 0.01. The correlation coefficient for the relationship between formal education and KW task is 0.706, which is between 07 – 1 and the significance level is under

0.01. The correlation coefficient of the overall relationship – between the combined variables – is 0.683, which is between 0.5 - 0.7 and the significance level is under 0.01. The results from these analyses demonstrate that there is a moderate (training and KW task) to strong (formal education and KW task), positive relationship between the variables; hence,  $H_{0c}$  – that knowledge work task definition has *no* effect on personal skill development and training – is rejected in favour of  $H_{1c}$ . Moreover, the results are significant and can be generalize to the entire population.

#### 4.5 Findings of Research Objective #2

Questions 4 to 6 cover the analysis and findings for the second research objective – to test that three major factors – knowledge worker motivation, use of IT Technology and Personal Skill development & Training – will influence knowledge worker productivity. For each question, the described factor is measured against three productivity dimensions – quality, timeliness, and innovation – grouped in paired likert statements. For this research objective, three alternative hypotheses were created:

- $H_{1d}$  → Knowledge worker motivation has a direct impact on knowledge worker productivity.
- $H_{1e}$  → The use of IT Technology has a direct impact on knowledge worker productivity
- $H_{1f}$  → Personal skill development has a direct impact on knowledge worker productivity.

#### 4.5.1 Relationship between Knowledge Worker Motivation and Knowledge Worker Productivity

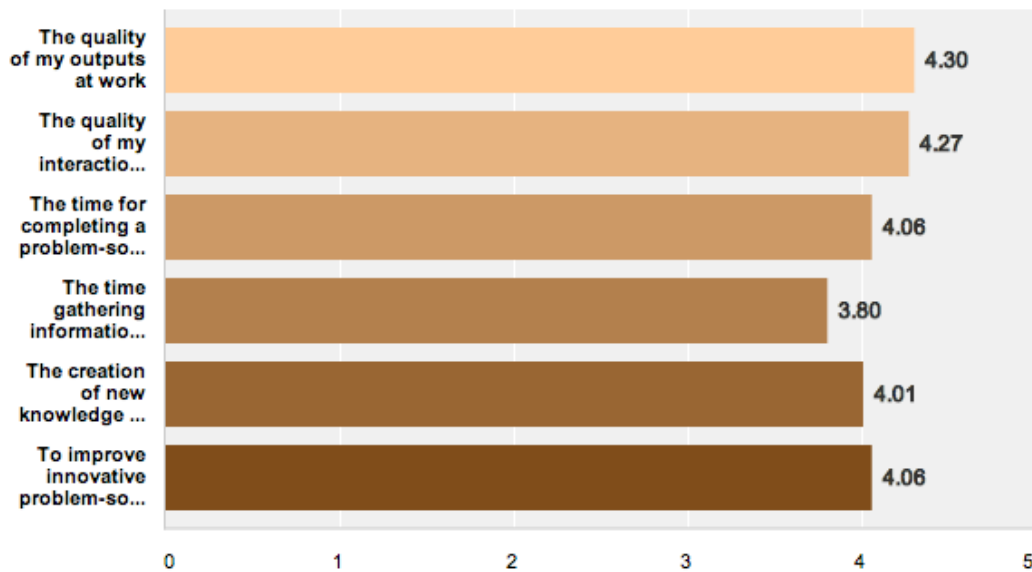


Figure 17 – Q4 - Bar chart of the statements Means for the benefits of Knowledge Worker Motivation against Productivity

Overall, participants agree that the benefits of being motivated – as a knowledge worker – improve the quality of outputs (57.84%), the quality of interaction with co-workers (51.95%), the time for completing a problem-solving task (60.78%), the time gathering information (52.94%), the creation of new knowledge (63.73%) and to improve their innovative problem-solving skills (62.75%). Moreover, the quality of outputs showed the highest mean (4.30). Other descriptive analysis results can be found in Table 5.

**Table 5 - Q4 -Mean and Percentages of Participant Attitudes toward the benefits of Knowledge Worker Motivation**

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Total	Average Rating
The quality of my outputs at work	0% 0	0% 0	5.88% 6	57.84% 59	36.27% 37	102	4.30
The quality of my interactions with coworkers at work	0% 0	0.98% 1	8.82% 9	51.96% 53	38.24% 39	102	4.27
The time for completing a problem-solving task	0% 0	1.96% 2	13.73% 14	60.78% 62	23.53% 24	102	4.06
The time gathering information related to a task	0% 0	7.84% 8	21.57% 22	52.94% 54	17.65% 18	102	3.80
The creation of new knowledge for the organisation	0% 0	1.96% 2	14.71% 15	63.73% 65	19.61% 20	102	4.01
To improve innovative problem-solving skills	1.96% 2	1.96% 2	8.82% 9	62.75% 64	24.51% 25	102	4.06

In the previous research objective, the level of KW motivation was measured by merging the third and sixth statement from the first question. Question No.4 measures the impact of KW motivation against three productivity dimensions. To test the relationship between these variables, first, the researcher used Spearman's correlation to determine the level of dependence between KW motivation, quality, timeliness and innovation dimensions. Finally, the six statements are merged into one variable to measure the impact of KW motivation on productivity.

In order to combine the different variables, the researcher evaluated the level of internal consistency reliability using Cronbach's alpha and inter correlation analysis. The Cronbach's Alpha coefficient of the six variables is 0.697, which can be considered as acceptable (Nunnally Jum and Bernstein Ira, 1978). However, the inter correlation analysis shows coefficients under 0.3 when correlating innovation with quality or timeliness. This indicates that while overall, there is an internal consistency reliability level when combining all variables; attention must be paid when combining innovation and the other two variables.

The correlation coefficient between motivation level and innovation impact is 0.206, with a significance level of 0.037. The correlation coefficient between

motivation level and quality impact is 0.200, with a significance level of 0.044. The correlation coefficient between motivation level and timeliness impact is 0.197, with a significance level of 0.047. These coefficients test that there is a weak positive relationship between the level of participant’s motivation and the productivity dimensions. Furthermore, the significance levels for these three correlations are under 0.05, which indicates that the results can be generalizable. The relationship between the overall productivity level and motivation level is 0.276. The analysis also demonstrates an overall relationship between KW motivation and KW productivity. Hence,  $H_0d$  – that knowledge worker motivation has *no* effect on knowledge worker productivity - is rejected in favour to  $H_{1d}$ .

#### 4.5.2 Relationship between the Use of IT Technology and Knowledge Worker Productivity

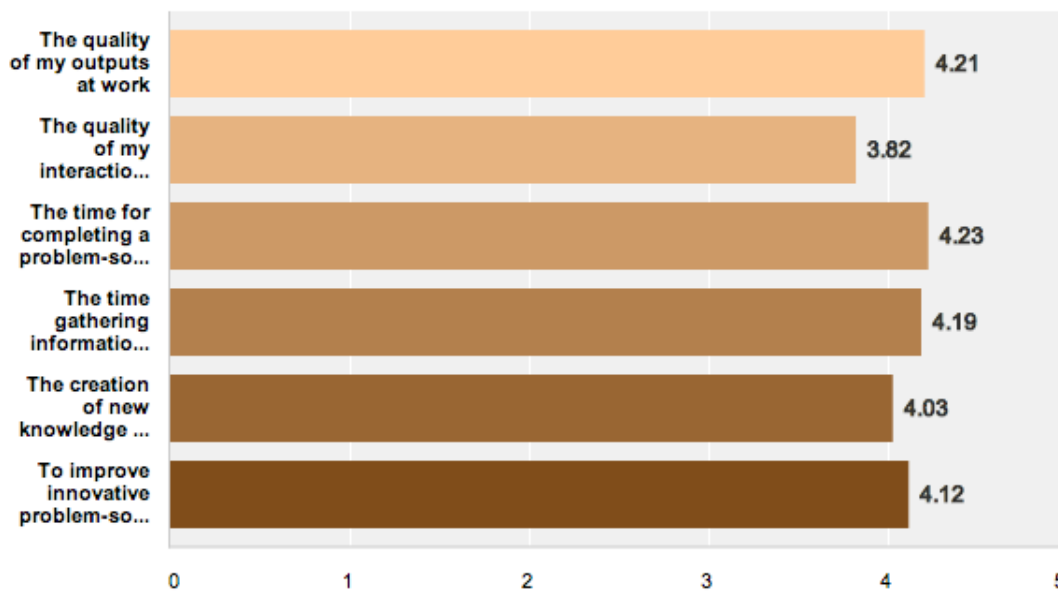


Figure 18 – Q5 - Bar chart of the statements Mean for the benefits of the use of IT Technology against Productivity

Similarly to the benefits of being motivated, participants’ attitudes toward the benefits of the use of IT Technology show a level of agreement between 37.25% and 60.78%. The highest mean is accounted by the time for completing a problem-solving task (4.23). Another important factor is that no participant has

scored with strongly disagreement to any of the statements. Other descriptive analysis results can be found in Table 6.

**Table 6 – Q5 –Mean and Percentages of Participant Attitudes toward the benefits of the use of IT Technology**

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Total	Average Rating
The quality of my outputs at work	0% 0	1.96% 2	9.80% 10	53.92% 55	34.31% 35	102	4.21
The quality of my interactions with coworkers at work	0% 0	7.84% 8	28.43% 29	37.25% 38	26.47% 27	102	3.82
The time for completing a problem-solving task	0% 0	0.98% 1	6.86% 7	60.78% 62	31.37% 32	102	4.23
The time gathering information related to a task	0% 0	1.96% 2	13.73% 14	48.04% 49	36.27% 37	102	4.19
The creation of new knowledge for the organisation	0% 0	2.94% 3	19.61% 20	49.02% 50	28.43% 29	102	4.03
To improve innovative problem-solving skills	0% 0	1.96% 2	15.69% 16	50.98% 52	31.37% 32	102	4.12

Similarly to question no. 4, to test the relationship between the use of IT technology and KW productivity, the researcher used spearman’s correlation coefficient analysis against the three dimensions of productivity; and later, the overall merged productivity impact level is tested against the different approaches for accessing information using IT technology (first and second statements of second question).

Beforehand, the level of internal consistency reliability is calculated – by using Cronbach’s Alpha and inter-item correlation analyses in the six statements of question 5. The consistency coefficient is 0.823, which indicates a good internal consistency (Lance *et al.*, 2006, pp.202-220). There is also a good inter-item correlation, showing values within the 0.2 - 0.7 ranges. Overall, the statements in question 5 show a good consistency of results, which demonstrates the relation of these variables with the benefits of the use of IT and the productivity level.

Firstly, the free-access approach for accessing information using IT technology is tested against the three productivity dimensions; when relating it to quality, the correlation coefficient is 0.163 and the significant level is 0.101; when relating it to timeliness, the correlation coefficient is 0.291 and the significance level is

0.003; and when relating it to innovation, the index is 0.265 and the significance level is 0.007. The correlation coefficient between the free-access approach and the overall productivity level is 0.274 with a significance level of 0.005. The result from this analysis showed that there is no correlation between the free-access approach and the quality dimension. Moreover, the results are not significant to the research population. A weak<sup>7</sup>, positive correlation exists between the free-access approach, timeliness and innovation. Furthermore, the results are significant to the population and can be generalized as the significance level is under 0.01. Overall, there is a weak positive correlation between the free-access approach (in the use of IT technology) and productivity.

Secondly, the analysis showed that the structured provision of information is not related to quality (0.101) and the results cannot be generalized, showing a significance level of 0.310; however it has a weak positive correlation with timeliness (0.238) - with a significance level of 0.016; it also has a weak positive correlation to innovation (0.255) - with a significance level of 0.010; and a weak positive correlation with the overall productivity level (0.239) - with a significance level of 0.016. In summary,  $H_0e$  - that the use of IT technology has *no* effect in knowledge worker productivity - is rejected in favour to  $H_{1e}$ .

An interesting fact from these analyses is that the free-access approach is more related to timeliness, while structured provision is more related to innovation.

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<sup>7</sup> Weak correlation because the coefficient is between the range of 0.2 and 0.5

### 4.5.3 Relationship between Personal Skill Development & Training and Knowledge

#### Worker Productivity

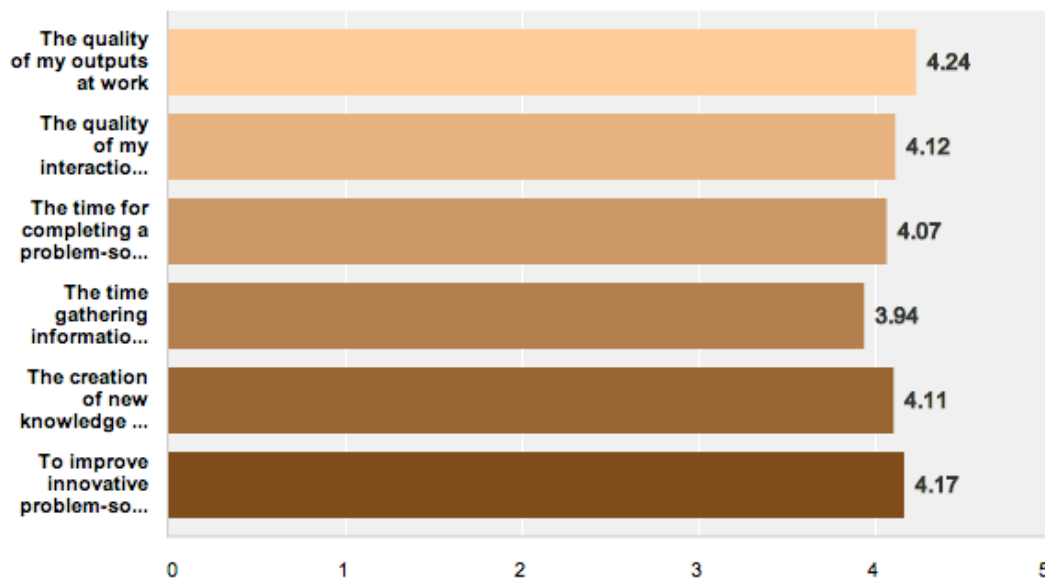


Figure 19 – Q6 - Bar chart of the statements Mean for the benefits of personal skill development and training against Productivity

The participants' attitude toward the benefits of personal skill development and training showed a level of agreement for the three dimensions – quality, timeliness and innovation – ranging between 49.02% and 58.88%. The biggest benefit of personal skill development is accounted to the quality of the output at work with 4.24. Equally to the use of IT technology, there was no participant who score a strongly disagreement to any of the statements, and the average level of disagreement accounted for less than 3%. Other descriptive analysis results can be found in Table 7.

**Table 7 – Q6 –Mean and Percentages of Participant Attitudes toward the benefits of personal skill development and training**

	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree	Total	Average Rating
The quality of my outputs at work	0% 0	0.98% 1	8.82% 9	55.88% 57	34.31% 35	102	4.24
The quality of my interactions with coworkers at work	0% 0	1.96% 2	16.67% 17	49.02% 50	32.35% 33	102	4.12
The time for completing a problem-solving task	0% 0	2.94% 3	16.67% 17	50.98% 52	29.41% 30	102	4.07
The time gathering information related to a task	0% 0	2.94% 3	20.59% 21	55.88% 57	20.59% 21	102	3.94
The creation of new knowledge for the organisation	0% 0	0.98% 1	13.73% 14	58.82% 60	26.47% 27	102	4.11
To improve innovative problem-solving skills	0% 0	1.96% 2	12.75% 13	51.96% 53	33.33% 34	102	4.17

First of all, the level of internal consistency reliability is calculated – by using Cronbach’s Alpha and inter-item correlation analyses in the six statements of question 6. The consistency coefficient is 0.847, which indicates a good internal consistency (Lance *et al.*, 2006, pp.202-220). There is also a good inter-item correlation, showing values within the 0.2 - 0.7 ranges. Overall, the statements in question 5 show a good consistency of results, which demonstrates the relation of these variables with the benefits of personal skill development and training, and the productivity level.

The researcher ran the Spearman’s correlation analysis between the participant’s attitudes toward the benefits of personal skill development and training, and the level of on-the-job training and level of formal education received by the participants (from question 3). The results showed there is no correlation between the level of participants’ on-the-job training and their attitudes towards its benefits – all the correlation coefficients are under 0.1 – and the results cannot be generalized to the entire population, as all the significance levels are above 0.05. The results of the analysis also showed that there is no correlation between the levels of participants’ formal education and their attitudes towards its benefits - benefits – all the correlation coefficients are

under 0.1 – and the results cannot be generalized to the entire population – all the significance levels are above 0.05. Hence, the researcher does not reject  $H_0$  – that personal skill development and training has *no* effect in knowledge worker productivity.

#### 4.6 Findings of Research Objective #3

Questions 7 and 8 cover the analysis and findings for the third research objective – to explore the segmentation of knowledge workers in the Irish IT industry and to find out any relationship amongst knowledge worker characteristics.

##### 4.6.1 Current Job Description

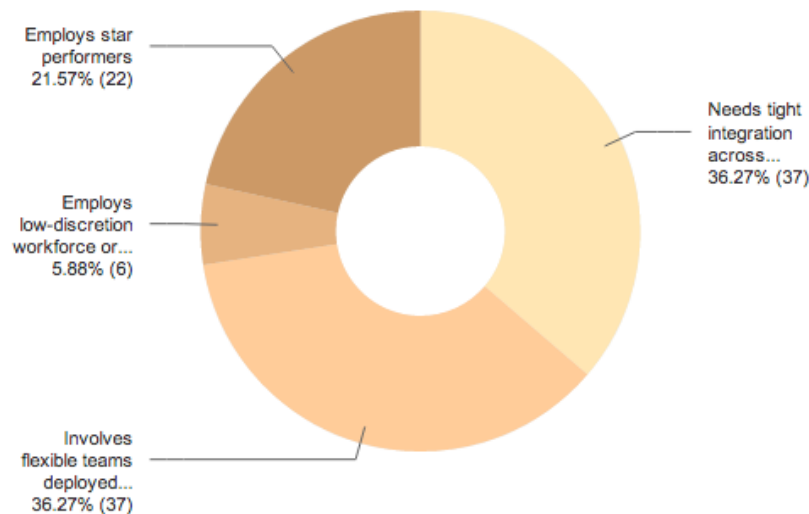


Figure 20 –Q7 – Current Job Descriptions

When participants have been asked to describe their current job by choosing one of the four options presented, 36.27% (37) participants have chosen ‘Involves flexible teams deployed fluidly’ and another 36.27% (37) participants have chosen ‘Needs tight integration across functional boundaries’. 22 participants have described their jobs by being employing start performers (21.75%), and only 6 out of 102 participants have described their jobs by employing low-discretion workforce or by having automation. To go further, a cross table analysis between the current job description and the knowledge worker role (question no. 12):

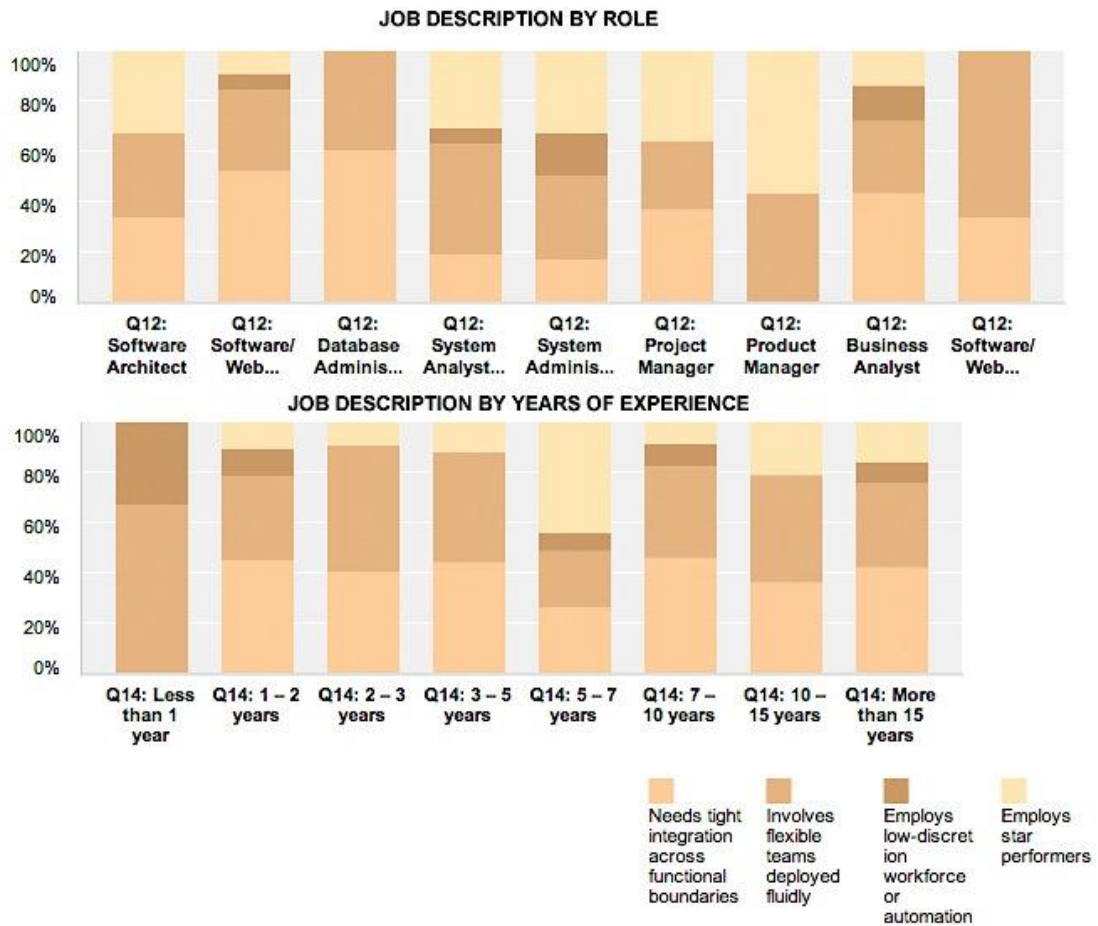


Figure 21 – Accumulated Bar Chart of Job description by Role (top) and Job description by years of experience (bottom).

If job description is cross-tabled with role (see Figure 21 – Accumulated Bar Chart of Job description by Role (top) and Job description by years of experience (bottom).), jobs that need tight integration across functional boundaries is preferred by software architects (33.33%), software/web developers by 51.61% (16), database administrators (60%), project managers (36.36%) and business analysts (42.86%). Jobs that involve flexible teams deployed fluidly are chosen by system analyst the most (43.75% (7)). Business analysts (14.29%) and software developers (6.45%), accounting two responses each, choose jobs that employ low-discretion workforce. And finally, product managers (57.14%) and project managers (36.36%), accounting four responses each, choose jobs that employ star performers.

By looking at the work experience, participants with 5 to 7 years of experience have chosen by 44.44% (12) jobs that employ star performance, while the other participants have chosen jobs that need tight integration or that involve flexible teams deployed.

#### 4.6.2 Current Daily Work Description

Participants described their current daily work by choosing one to two options from question number eight. 51 of the participants described their daily work as relying on individual expertise and experience, followed by 29 participants who described their daily work as highly reliant on deep expertise across multiple functions. 9 participants only choose Works that relies on formal rules, procedures and training. More information about participant choices can be found below in Figure 22.

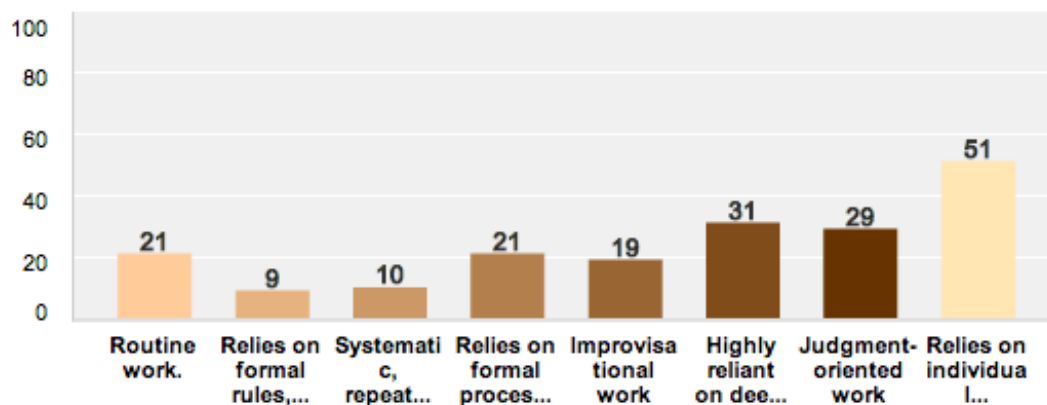


Figure 22 - Q8 - Bar chart of Current Daily Work Description

Davenport stated that there is a segmentation in knowledge workers, and hence, they cannot be treated and managed in the same way (Davenport, 2002, p.3, Davenport *et al.*, 2002, pp.23-30). Knowledge workers are segmented by the complexity of their work and the level of interdependence. Davenport presented four groups in a bi-dimensional matrix:

- Transaction Work, characterized by employing low-discretion workforce or automation, and by routine work (first and second options),
- Integrated Work, characterized by being systematic, repeatable, and by relying on formal processes, methodologies, or standards (third and fourth options),

- Collaborative Work, characterized by being improvisational and highly reliant on deep expertise across multiple functions (fifth and sixth options),
- And Expert Work, characterized by being judgement oriented and relying on individual expertise and experience (seventh and eighth options).

The objective of the analysis for the third research objective is to find out how many participants have described their jobs and their daily work as Davenport's framework dictates. Secondary to the objective of the analysis is to explore, in the case of not matching Davenport's KW segmentation framework, what the participants have chosen for describing their jobs. Table 8 and Table 9 illustrate these analyses.

From the 6 participants that described their job as employing low-discretion workforce or automation, only the 66.7% (4) described their daily work as routine work. Participants that described their job by needing tight integration across functional boundaries (37), best described their daily work as relying on individual expertise and experience by 56.8% (21). However, 37.8% (14) of participants' descriptions fit with Davenport's integrated worker. From the other 37 participants where their jobs involve flexible teams deployed fluidly, only 15 participants have described their daily work in accordance with Davenport's segmentation model; it is important to say that 45.9% (17) of participants thinks their daily work relays on individual expertise and experience. And finally, from the last 22 participants where they job employs start performers, 50% (11) have described their daily work as relying in expertise and experience, and by being judgement-oriented (40.9% (9)). The rest of participant choices are distributed mainly around collaborative work (row 5<sup>th</sup> and 6<sup>th</sup> from Table 8).

**Table 8 – Cross Table between Job Description (Q7) and Daily Work Description (Q8).**

		Job Description				Total
		Needs tight integration across functional boundaries	Involves flexible teams deployed fluidly	Employs low-discretion workforce or automation	Employs star performers	
Routine work	Count	6	9	4	2	21
	% within Work Description	28.6%	42.9%	19.0%	9.5%	
	% within Job Description	16.2%	24.3%	66.7%	9.1%	
	% of Total	5.9%	8.8%	3.9%	2.0%	20.6%
Relies on formal rules, procedures, and training	Count	4	3	0	2	9
	% within Work Description	44.4%	33.3%	0.0%	22.2%	
	% within Job Description	10.8%	8.1%	0.0%	9.1%	
	% of Total	3.9%	2.9%	0.0%	2.0%	8.8%
Systematic, repeatable work	Count	3	3	3	1	10
	% within Work Description	30.0%	30.0%	30.0%	10.0%	
	% within Job Description	8.1%	8.1%	50.0%	4.5%	
	% of Total	2.9%	2.9%	2.9%	1.0%	9.8%
Relies on formal processes, methodologies, or standards	Count	11	9	0	1	21
	% within Work Description	52.4%	42.9%	0.0%	4.8%	
	% within Job Description	29.7%	24.3%	0.0%	4.5%	
	% of Total	10.8%	8.8%	0.0%	1.0%	20.6%
Improvisational work	Count	4	6	2	7	19
	% within Work Description	21.1%	31.6%	10.5%	36.8%	
	% within Job Description	10.8%	16.2%	33.3%	31.8%	
	% of Total	3.9%	5.9%	2.0%	6.9%	18.6%
Highly reliant on deep expertise across multiple functions	Count	14	9	0	8	31
	% within Work Description	45.2%	29.0%	0.0%	25.8%	
	% within Job Description	37.8%	24.3%	0.0%	36.4%	
	% of Total	13.7%	8.8%	0.0%	7.8%	30.4%
Judgment-oriented work	Count	10	10	0	9	29
	% within Work Description	34.5%	34.5%	0.0%	31.0%	
	% within Job Description	27.0%	27.0%	0.0%	40.9%	
	% of Total	9.8%	9.8%	0.0%	8.8%	28.4%
Relies on individual expertise and experience	Count	21	17	2	11	51
	% within Work Description	41.2%	33.3%	3.9%	21.6%	
	% within Job Description	56.8%	45.9%	33.3%	50.0%	
	% of Total	20.6%	16.7%	2.0%	10.8%	50.0%
Total	Count	37	37	6	22	102
	% of Total	36.3%	36.3%	5.9%	21.6%	100.0%

Percentages and totals are based on respondents.

Summarizing the cross table analysis, from the 102 participants, 1 described his/her job as transactional work; 2 participants described their job as integrated work; 4 participants described their job as collaborative work; and lastly 15 participants described their job as expert work. The other 78.43% (80) participants have chosen or only one of the two options available mixed with another daily work description, or they have chosen none of the corresponding segmentation description. Table 9 summarizes the match count from the different daily work description options.

Table 9 – Cross Table between Daily Work Description

	Daily Work Description							
	Routine work	Relies on formal rules, procedures, and training	Systematic, repeatable work	Relies on formal processes, methodologies, or standards	Improvisational work	Highly reliant on deep expertise across multiple functions	Judgment-oriented work	Relies on individual expertise and experience
Routine work		1	4	2	1	1	2	6
Relies on formal rules, procedures, and training	1		1	4	1	2	0	0
Systematic, repeatable work	4	1		2	0	2	0	1
Relies on formal processes, methodologies, or standards	2	4	2		0	4	4	4
Improvisational work	1	1	0	0		4	4	8
Highly reliant on deep expertise across multiple functions	1	2	2	4	4		4	12
Judgment-oriented work	2	0	0	4	4	4		15
Relies on individual expertise and experience	6	0	1	4	8	12	15	

Percentages and totals are based on respondents.

## Chapter 5 - Conclusions

### 5.1 Conclusions on Research Objectives

The following conclusions can be drawn from the results of this dissertation.

#### 5.1.1 Research Objective #1

The first research objective was to test the relationship between the definition of the knowledge work tasks and different factors that have been highlighted as enhancements of knowledge worker productivity. These factors are knowledge worker motivation, the use of IT technology, particularly in relation to how knowledge workers gather information, and personal skill development and training. Three hypotheses were created, to test the relationship of KW task definition against the three factors.

The first hypothesis stated that knowledge work task definition has a positive effect on knowledge worker motivation. In order to measure the strength of that relationship, two job design characteristics were measured. Hackman and Oldham (1975, pp.57-71) identified autonomy and task identity as job characteristics that produced psychological states critical to determine knowledge workers' motivation. Participants showed a high level of job autonomy (86%) and an even higher level of task identity (88%). Quantitative research revealed that knowledge work task definition has a positive effect on knowledge worker motivation. It also revealed that the results are generalizable to the entire population of knowledge workers within the IT industry in Ireland.

The second hypothesis stated that knowledge work task definition has a positive effect on the use of IT technology, particularly in relation to the way knowledge workers gather information. In order to measure it, participants were asked to score the degree of how they access the information. Davenport (2011, pp.89-99) described two management approaches on the use of IT to collect the information. In one hand, there is the free-access approach, where knowledge

workers have free access to all the resources available, and in the other hand, the structured provision of information, in which information is delivered based on well-defined tasks. Only 67% of respondents had a structured provision of information when gathering information. The majority of the respondents (90%) agreed that while they were working on any task, they have free access to the resources available through the use of IT technology for developing it. The presumption for this majority is that knowledge workers have enough discipline to avoid wasting time accessing personal information or surfing the web (Davenport, 2011, pp.89-99). Quantitative research data revealed that knowledge work task definition has no effect on the use of IT technology. However, the data shows that the results cannot be generalized to the population, because the sample is not significant. The results then, do not reject the null hypothesis.

The third hypothesis stated that knowledge work task definition has a positive effect on knowledge workers skill development and their training. Nonaka (Nonaka, 1994, pp.14-37, 1991, pp.96-104, 1991, pp.239-275) described personal skill development or formal education and training in his spiral of knowledge. Formal education corresponds to the socialization stage, where explicit individuals transfer explicit knowledge. On the other hand, training corresponds to combination, which is the transfer of tacit knowledge between individuals. In order to measure the relationship, participants were asked to score the degree in which their companies use on-the-job training and formal education to improve their day-to-day tasks. Subsequently, participants were asked about their attitudes towards their company's actions (provided on-the-job training, or formal education). The quantitative research revealed that knowledge work task definition has a positive effect on personal skill development and training; hence the researcher rejects the null hypothesis in favour of the one formulated. Furthermore, the results can be generalized, which means, that they are significant to the population. The majority of participants (40%) agreed that their organisation provides them with specific training for their tasks. This result reflects the need for transferring the tacit knowledge

since the imminent shortfall of knowledge workers with highly skills (Hammer *et al.*, 2004, pp.14-18). Moreover, the majority of respondents (54%)<sup>8</sup> recognized that their organisations do not provide them with formal education. Nevertheless, the results show that participants agree that both, on-the-job training and formal education will help in improving performance while working on a task.

### 5.1.2 Research Objective #2

The second research objective was to test the relationships of knowledge worker motivation, the use of IT technology, personal skill development and training, with knowledge worker productivity. The literature has revealed how knowledge work task definition has an effect on knowledge worker productivity (Lund *et al.*, 2012, pp.103-110, Allen and Schwartz, 2011, pp.82-87, Hammer *et al.*, 2004, pp.14-18, Drucker, 1999, pp.79-94, Davenport *et al.*, 1996, pp.53-66). However, the other three factors haven't been tested. For this research objective, three hypotheses were created that test the relationship between each of the factors and knowledge worker productivity.

The first hypothesis stated that knowledge worker motivation has an effect on knowledge worker productivity. To measure the degree of the relation between these two variables, participants were asked about their attitudes towards the benefits of motivation against three productivity dimensions – quality, timeliness, and innovation. The research results showed that the motivation of the knowledge worker has a positive effect on knowledge worker productivity; hence the null hypothesis is rejected in favour of the proposed one. Moreover, the findings indicate that the results of this analysis are significant to the population, which means that if the same question were asked to a different sample within the population, the results would be the same. Respondents believe that being motivated at work will benefit the quality of their output at work and the quality of their interactions with co-workers. They also believe that being motivated will improve their time gathering information and completing

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<sup>8</sup> This percentage represents the sum of the respondents that disagreed and strongly disagreed the statement of the question.

problem-solving tasks. However, participants' attitudes contradict the statistical results, as knowledge worker motivation has no effect on the timeliness dimension of productivity. Lastly, participants believe that being motivated will affect their creativity and innovative skills. This dimension was the strongest related to knowledge worker motivation.

The second hypothesis stated that the use of IT technology has an effect on knowledge worker productivity. To measure the relationship between variables, the participants were asked about their attitudes towards the benefits of the use of IT technology against different statements that represented characteristics of the three dimensions mentioned above – quality, timeliness and innovation. Quantitative research data revealed that the use of IT technology has a positive effect on knowledge worker productivity; hence the research rejects the null hypothesis in favour of the proposed one. Moreover the results are significant. The results also revealed that participants that have free access to the use of IT technology for developing their tasks, gather information quickly and take less time to complete problem-solving tasks, while the participants who are provisioned with a limited access of information for developing a task, enjoy of more creativity and innovative solutions<sup>9</sup>. This was reaffirmed by Dean and Webb (2011, pp.80-88) which highlighted that in order to innovate, knowledge workers should focus on only one task at a time.

The third hypothesis stated that personal skill development and training has an effect on knowledge worker productivity. To measure the relationship between these two variables, participants were asked about their attitudes towards the benefits of personal skill development and training over the three productivity dimensions described in the first hypothesis (quality, timeliness, and innovation). The majority of participants believe that having on-the-job training and/ or formal education will help to improve the quality of their outputs and the interactions with their co-workers. They also believe that they will improve the time completing problem-solving tasks and reduce the time gathering

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<sup>9</sup> These are the conclusions based on the strongest correlations between the use of IT technology (free-access vs. provisioned) and each productivity dimension.

specific information related to a task. Lastly, they believe that personal skill development and training will improve their creativity and innovative skills. However, the results from the statistical analysis revealed that personal skill development and training has no effect on knowledge worker productivity. Moreover, the data cannot be generalized.

### **5.1.3 Research Objective #3**

The third research objective was to explore the segmentation amongst knowledge workers in the Irish IT Industry and find any relationship between other population characteristics. In order to explore the existence of segmentation, the questionnaire questions were designed based on Davenport's segmentation framework (2002, p.3). Davenport used two dimensions – the level of interdependence and the complexity of work – to determine the group of knowledge worker, dividing the matrix in four groups: transactional, integrated, collaborative and expert workers. Participants were asked to describe the characteristics of their job and their daily work. Both answers match the characteristics of Davenport's model. The analysis results revealed that only 22% of the participants match Davenport's framework. From that percentage, the majority fits the characteristics of expert worker, which is described as jobs that employ start performers, where the work relies on individual expertise and experience and the work is judgement-oriented. The rest of the participants have described their jobs as between integrated workers and expert workers, partially describing their jobs (always under Davenport's assumptions). The results also revealed that only a minority described their job as transactional, which can be described as a job that employs low-discretion workforce or automation, characterized by routine work and relies on formal rules, procedures and training. In conclusion, while Davenport's framework helps to roughly identify the major groups of knowledge worker segmentation, a deeper study is needed to investigate what other dimensions can describe knowledge worker segmentation in the IT industry. Overall, the results answered the research question in finding segmentation within knowledge workers.

## 5.2 Discussion

In this episode of History, knowledge work has become the main power that fuels developed economies. On one hand, there is a demand of knowledge workers due to the proliferation of knowledge intensive firms and the rapid growth in technology and communication advances (ICTIreland, 2011). On the other hand, several reports suggest that in less than a decade, the world could have a shortage of well-educated and highly skilled workers (FÁS, 2012a, 2012b, 2012c, McCoy and Murphy, 2011). To cope with this, managers, senior executives and CEOs should start looking at how to improve the productivity of the workforce, the knowledge workers. Throughout this research study, it has been revealed that knowledge work task definition has an effect on the different factors, highlighted as enhancements of productivity. Managers should look at increasing knowledge worker motivation by creating more challenging tasks, based on the skillset of the worker (Carleton, 2011, pp.459-468). Furthermore, The Irish ICT enterprises should become 'learning organisations' by developing precise on-the-job training for the workforce, trying not to become 'training organisations' where productivity is sapped (Carleton, 2011, pp.459-468). Finally, managers should be aware of the differences in the segmentation of the workforce. Davenport (Davenport, 2002, p.3, Davenport *et al.*, 2002, pp.23-30) suggests that organisations should assess their workforce to find the degree of segmentation and the degree of choice. These measures will help them to better assign their tasks and to better manage the knowledge worker, hence improving productivity.

### Research Limitations

There are a few limitations in this research worth mentioning. An examination of all the factors determining knowledge worker productivity is well beyond the scope of this study. The researcher suggests including management styles and workplace design within the theoretical model to expand the body of knowledge. Moreover, the use of the thirteen productivity dimensions described by Ramírez (2004, pp.602-628) is unfeasible due the time constraint of the study. Moreover, the sample design chosen was non-probabilistic; the researcher recognises that a

probabilistic sample design will improve the internal and external validity of the survey.

### **5.3 Further Research**

The implications from this research study provide paths for future research. Based on the literature reviewed, there is no relation between the different approaches of gathering information through the use of IT technology and the concept of *wilfing*. This research study analysed the knowledge workers attitudes towards productivity. Hence, there is a need for experimental research to measure and determine if knowledge workers attitudes match with the results.

## Chapter 6 - A Self Reflection Approach to Learning

The purpose of this chapter is to explain the process of reflection based on the researcher's own experiences. Firstly, the researcher explains the importance of reflection, and describes the most important frameworks and models used. Secondly, the researcher describes the experience of doing the MBA programme by evaluating how the learning happened. Thirdly, the researcher, following the selected framework, describes his MBA experience and evaluates the learning process using theories and concepts. Finally the researcher focuses on how this new learning can be used in the future.

### 6.1 Introduction

To better understand the process of reflection, one must first understand what 'learning' means for the individual. Boyd *et al* (1980) define learning as the process where changes on behaviours, skills, attitudes and knowledge are acquired. By this definition, learning is focusing the person in whom the change happens. Rogers (2003) states that there are two main types of formalised learning; 'acquisition learning' (also known as 'task-conscious'), which is seen as concrete, immediate and confined to a specific activity; and 'formalised learning' (also known as 'learning-conscious'), which is seen as the educative learning, where learning itself is the task. The author also suggests that both types of learning can be present in the same context. Hence, learning is a continuous process that occurs at individual's consciousness and unconsciousness levels.

*Humans have the potential to think and to think about thinking, because we are endowed with the gifts of memory and reflection. (Taylor et al., 2006)*

Reflection is an on-going process of learning from experience in practice. It is a useful approach, and contributes a way for individuals to evaluate the learning process, linking between 'learning in practice' and 'learning from practice' (Schon 1987 cited by (Regmi and Naidoo, 2013, pp.33-39)). Smith (2003) states

that the main purpose of reflective learning is to obtain deeper understanding, because it empowers individuals to describe, analyse, evaluate and plan their own experiences. Due to the dynamism of reflection, Regmi *et al* (2013, pp.33-39) recommend to choose a framework that approaches reflection cyclically. These frameworks or models are simply guidelines that help in the process of reflection by adding theoretical concepts, analysis and a critical thinking view. A reflective framework or model consists of four generic steps: description, assessment, evaluation and action. Kolb's (1974) model of reflective learning is one of the most common and recognised frameworks in higher education. His framework is the most logical, because "it recognises the principles of 'adult learning', from learners' own experience and practice. This framework is centred in experiential learning that permits practitioners to identify and build on their experiences in everyday" (Regmi and Naidoo, 2013, pp.33-39).

Kolb's model is based on four elements: concrete experience, observation and reflection, the formation of abstract concepts and testing in active experimentation in new situations. The model is cyclical, and it should be understood as a continuous spiral, because anyone can start the learning process at any of the four stages. However, Kolb and Fry (1974) believe that learning starts with a concrete experience, for instance an individual performing an action and observing the effects of that action. Secondly it is needed to understand these effects in that specific case, so if the action would be repeated under the same conditions, the individual would be able to anticipate the effect. Thirdly, it is needed to comprehend the general concept or idea behind that case, which means to understand the connection between the actions and the effects. Fourthly, the individual apply the learned action in new situations.

## 6.2 Learning Styles

Smith (2001, 2010) states that an effective learner should possess the four different skills: concrete experience skills, reflective observation skills, abstract conceptualisation skills and active experimentation skills. However, individuals often orientate to one of the extremes for each dimension, having a preferred learning style. Similarly to the preferred representational system – visual,

auditory, kinaesthetic, olfactory, and gustatory – described by O'Connor and Seymour (1993) in *Neuro Linguistic Programming* (NLP). Interestingly NLP describes that an individual has a preferred representational system, which means, that the individual represents his/her thoughts using one of these sensory types. Dunn and Dunn's VAKT learning style theory is based also in these representational systems. Kolb's experiential learning model dimensions are represented by: concrete experience and abstract conceptualisation ('transforming the experience'), and active experimentation and reflective observation ('grasping the experience'). With the combination of two of these skills (represented in the two-dimension model), four learning styles are defined by Kolb (1999).

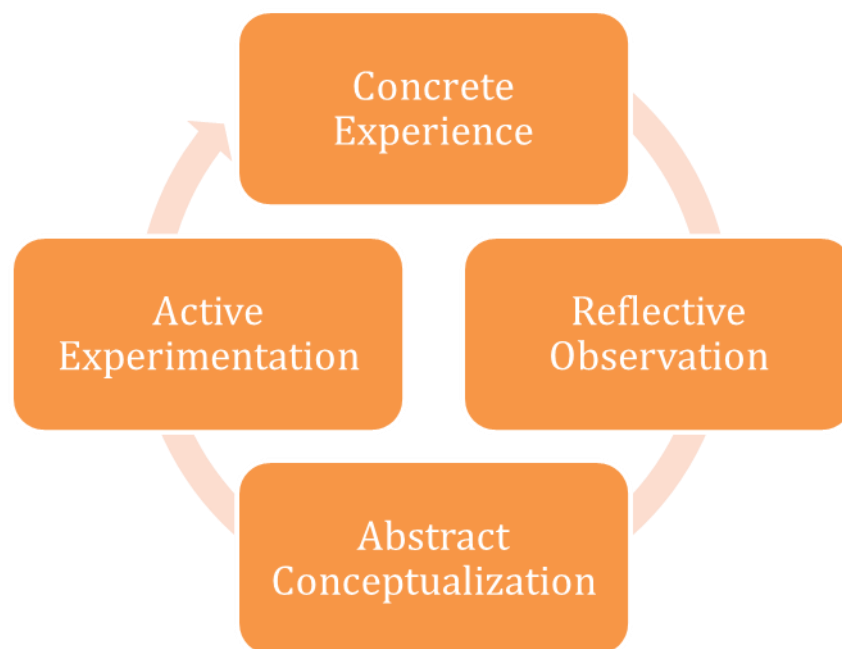


Figure 23 - Kolb's Learning Cycle

Tennant (2006) summarises the four learning styles created by Kolb. Converging learning style is the combination of abstract conceptualisation and active experimentation. Individuals with a converging learning style are characterised by strong problem-solving capabilities, and by experimenting with new ideas. Diverging learning style occurs when the learning characteristics are concrete experience and reflective observation. Individuals with a diverging learning style are good at generating ideas and can see a problem from different points of view.

They have broad cultural interests and they are interested in people and working in groups. Assimilating learning style occurs when the learning characteristics are abstract conceptualisation and reflective observation. Individuals with assimilating learning styles have a logical approach when solving issues. They are interested in concepts or abstract rather than people. Accommodating learning style is the combination of concrete experience and active experimentation. Individuals with accommodating learning style are characterised by doing lots of things. They usually take more risks and because of that they perform well in critical situations where it is required an immediate action. Furthermore, these individuals are intuitive when executing any action. Honey and Mumford (1986) adapted Kolb's Experiential Learning Model into the Learning Styles Questionnaire (LSQ). Their model has lots of similarities to Kolb's model. In their model, they call theorists to the individuals that have an assimilating learning style, activists, to those who have an accommodating style, reflectors to those who have a diverging style and pragmatists to those who have a converging style.

When I started the MBA, I learned about Kolb's experiential learning model and his learning styles, as well as Honey and Mumford's learning styles. Since then, I have completed the learning style questionnaire in two more occasions – at the beginning of the second year and before starting with the MBA dissertation. Finally I completed one more time after finishing writing the dissertation. In all four occasions, my answers were focuses on my MBA's learning experience.

<b>LSQ Date</b>	<b>Theorist</b>	<b>Pragmatist</b>	<b>Activist</b>	<b>Reflector</b>
December 2011	7	4	2	<b>9</b>
September 2012	<b>8</b>	4	4	<b>8</b>
May 2013	4	<b>8</b>	5	<b>8</b>
August 2013	4	<b>8</b>	7	6

It is compelling to observe how my learning style has shifted throughout the MBA programme. Initially, I preferred a reflecting learning approach. At the

beginning of the second year I preferred a theoretical learning approach, while I scored high in reflecting. By the end of the master programme, I feel how the pragmatic approach fits more than any other learning style. Surprisingly, the LSQ results reveal a slowly but constant increase in the activist approach of learning.

### **6.3 MBA Knowledge and Skill Development: Acquisition and Future Applications**

Before I enrolled in the MBA programme, my biggest objective was to improve my soft skills – communication, cognitive skills, research skills and leadership – as I wanted to progress into a more managerial position within my organisation. My cognitive skills in business management were nonexistent. While I was a good communicator, the extent of my reports' quality was under the technical domain (software development), as I wrote for only a tiny part of the stakeholders. I worked in a team, but I didn't know what was needed for being a good leader.

Throughout the last two years studying the MBA, I have the chance to acquire that knowledge and build my skills set.

#### **6.3.1 Cognitive Skills**

In these two years, I have been taught the foundations, theories and frameworks that explain business management, to build up an entrepreneurial mind. At the beginning of the MBA programme my knowledge in business management was close to non-existent. My reflecting learning style helped me in the process of acquiring the cognitive skills, as I had the chance to participate in different teams, where most of the team members had previous management experience. Moreover, the cultural and professional diversity in my class made me see and understand each new concept from different angles. I tested myself against the new acquired knowledge by reading the business and financial section of a few daily newspapers (Irish Independent, Irish Times) as well as following specialized blogs (ft.com) and discussing news and hot topics with senior managers. The improvement of the cognitive skills in business management is also present in my final results. In my first year I obtained an average of 60 in my final results and 11.75% (71.8) more in my second year.

### 6.3.2 Effective communication

One of my biggest weaknesses in Ireland is the language. While my level of my English has improved substantially, I had always found it difficult to elaborate and present business reports, or to communicate complex ideas and arguments effectively. Moreover, I wasn't required to be an effective communicator in my previous work experiences, as employers were looking for a good technical skillset. Before joining the MBA I realized that in order to get promoted to management positions and deal with all the stakeholders, effective oral and written communications are required. To learn and improve on my oral communication skills, I volunteered for all group presentations and activities in class, since the postgraduate programme started. Before the presentations, when I was practicing with my team, I observed how the most experienced members dealt with it – body language, *rapport*, tone, pitch, speech, etc. – trying to understand the logic and the process. Then I practice, correcting in my weakest areas based on my team feedback. Once more, my reflective learning style helped me in to assimilate the rules and methods for being an effective communicator. Furthermore, not only these new concepts helped me to communicate, but also improved my interpersonal skills, as now I am able to use the learning experience in different contexts – classroom, work environment and social events. The completion of the work assignments, reports and essays throughout the MBA programme has taught me to whom I am writing (the audience) and how I am writing (the format).

### 6.3.3 Leadership

I learnt that leadership couldn't be learnt, but acquired. It involves a change in your behaviour. Something you must work from day one. It took me a while to realize that due the nature of my preferred learning style in my first year of the MBA programme. As a reflector I comprehended the keys skills needed to become a good leader, by observing my surroundings (work environment, class room, etc.). I collected the behavioural characteristics of a good leader. However, in order to progress and improve my leadership skills, I had to leave my comfort zone. From the beginning of the second year in the master programme, I started taking initiative in all group assessments, committing myself to participate in all

the lecture events, getting involved with other team members' work and helping them as much as I could. Step by step, I saw a transformation in my learning style. While my experience in leadership is not over, I have found very useful the foundation acquired in the MBA, as well as the shift from 'watch and feel' to 'do and think', as now I like to discuss problems with team members and try new things, rather than think in all different solutions.

#### **6.4 Conclusion**

I would never have expected the outcome from my MBA experience. When I initially decided to join the master programme, my aim was to improve, learn, develop my targeted skills; I wanted to be more prepared in business strategy, and be able to understand the different main streams within an organization (marketing, finances, and operations). I also wanted to deeply understand the project management stream, as that was my choice for this programme. Now, when I look back at my progression, I have not only improved in my targeted skills, but also learnt the tools to successfully acquire new knowledge through reflection.

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## Appendices

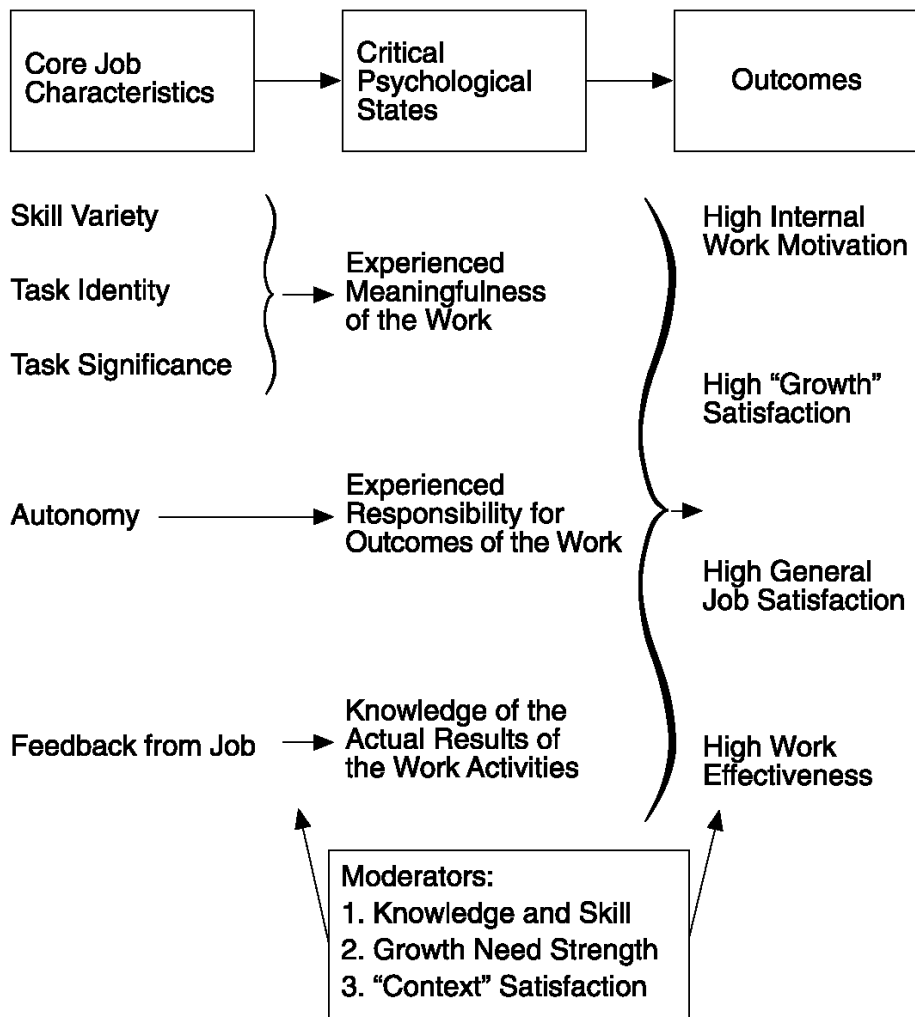
### Appendix A – ISA/ICT Figures 2008-2013

The ICT, software & digital technology sector is Ireland's fastest growing sector, and is a key enabler for other sectors of the economy.

- **10 of the top 10 ICT companies are present in Ireland**
- 9 of the top 10 global software companies (e.g. Microsoft, IBM)
- 3 of the top 3 enterprise software companies (SAP, Oracle, Sage)
- 3 of the top 3 security software companies (Symantec, Trend Micro, McAfee)
- 4 of the top 5 IT services companies (e.g. HP, Fujitsu, Accenture)
- 3 of the top 5 games companies (e.g. Activision Blizzard, Electronic Arts)
- Top 10 'born on the internet' companies (e.g. Google, Facebook, LinkedIn)
  
- The total number of ICT enterprises in Ireland is approx. 5,400.
- Current total employment: 90,000+ (between MNC and indigenous)
- Exports worth **€50 billion+** per annum (between MNC and indigenous)
- 233 of these are foreign owned ICT companies.
- 600 indigenous software companies, employing over 10,000 people
- The value of exports from indigenous software companies has reached over €1 billion, with total sales of €1.7billion in 2012.
- Indigenous total sales figures of software products & services have averaged an impressive 12% growth per annum over the past 6 yrs.

Multinational and indigenous technology companies have announced over 3,000 jobs in the first 6 months of this year, and over 15,000 jobs since January 2010.

## Appendix B – Hackman and Oldham Model

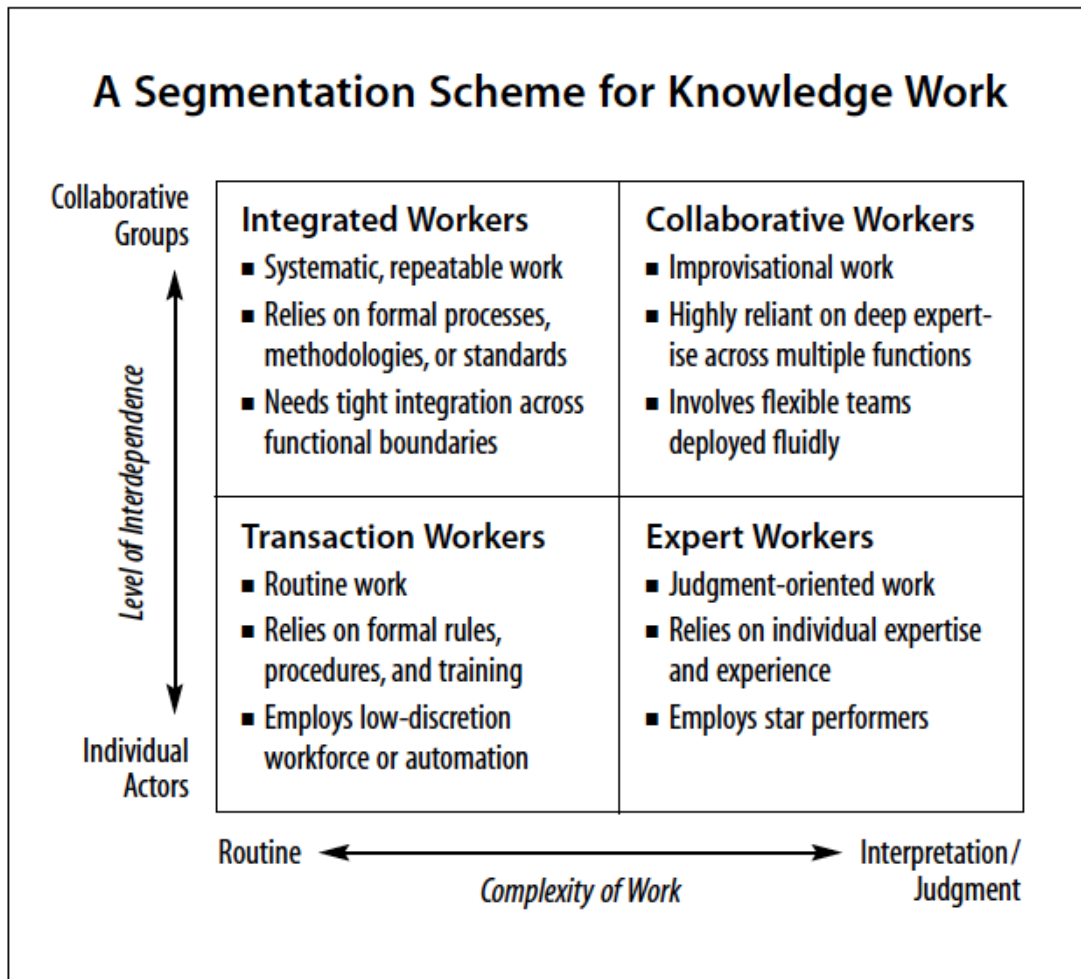


**Source:** Hackman and Oldham (1976)  
Copyright 1976 by Academic Press, Incorporated. Reprinted by permission.

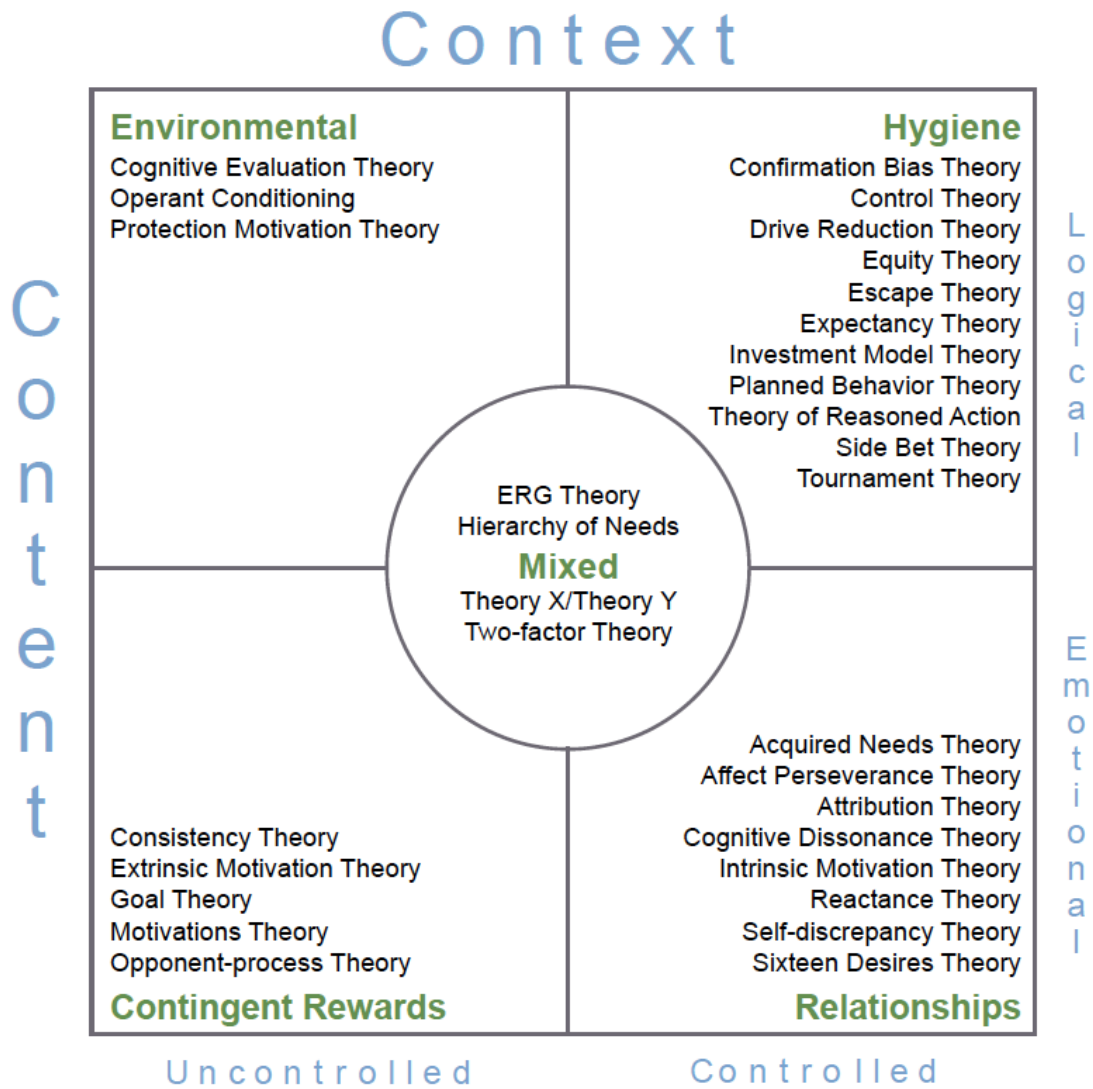
## **Appendix C – List of LinkedIn Groups**

- Irish Software Developers
- Microsoft .Net, C# & VB Group Ireland
- Digital Opportunities in the UK & Ireland
- Front End Development in Ireland
- Irish Cloud Computing
- Irish Software Association
- IT Ireland
- Paddytech
- Siliconrepublic.com

## Appendix D – Knowledge Worker Segmentation



Appendix E – Knowledge Worker Motivation



## Appendix F – Survey Monkey – Questionnaire Design

\*1. Please indicate whether you agree or disagree with each of the following statements, and how strongly, by ticking one box for each statement.

I have the freedom to decide how to perform my tasks at work

I have the freedom to decide when to perform my tasks at work

Having autonomy when I am working on a task increases my motivation at work

The majority (if not all) of the tasks I am working on have a tangible outcome

The majority (if not all) of the tasks I am working on require lot of responsibility

Being able to identify my self with the final product/service after finishing a task increases my motivation at work

\*2. Please indicate whether you agree or disagree with each of the following statements, and how strongly, by ticking one box for each statement.

While working on a task, I have free access to information through the use of IT Technology

While working on a task, I have access to structured provision of information through the use of IT Technology

At work, I have some limitations/restrictions when accessing personal information (i.e.: social networks, video-sharing websites, news, music, etc.)

I have the option to work remotely at any time.

\*3. Please indicate whether you agree or disagree with each of the following statements, and how strongly, by ticking one box for each statement.

My organisation provides me with on-the-job training specific to the tasks I am involved in

I find the provided on-the- job training very suitable for doing my tasks

My organisation provides me with formal education specific to the tasks I am involved in

I find the provided formal education very suitable for doing my tasks

\*4. Below are a number of statements that have been made about 'the benefits of being motivated at work'. For each statement please indicate how much you agree or disagree that it applies to 'the benefits of being motivated at work'.

To improve innovative problem-solving skills

The time gathering information related to a task

The quality of my interactions with coworkers at work

The creation of new knowledge for the organisation

The quality of my outputs at work

The time for completing a problem-solving task

\*5. Below are a number of statements that have been made about 'the benefits of the use of IT Technology at work'. For each statement please indicate how much you agree or disagree that it applies to 'the benefits of the use of IT Technology at work'.

The time gathering information related to a task

The creation of new knowledge for the organisation

The time for completing a problem-solving task

The quality of my outputs at work

The quality of my interactions with coworkers at work

To improve innovative problem-solving skills

\*6. Below are a number of statements that have been made about 'the benefits of personal skill development and training at work'. For each statement please

indicate how much you agree or disagree that it applies to 'the benefits of personal skill development and training at work'.

The time gathering information related to a task

The quality of my interactions with coworkers at work

The time for completing a problem-solving task

To improve innovative problem-solving skills

The creation of new knowledge for the organisation

The quality of my outputs at work

\*7. Which of the following sentences describes best your current job? (Please choose only one.)

Needs tight integration across functional boundaries

Involves flexible teams deployed fluidly

Employs low-discretion workforce or automation

Employs star performers

\*8. Which of the following sentences best describes your current daily work? (Please, choose from 1 to 2 answers)

Routine work.

Relies on formal rules, procedures, and training

Systematic, repeatable work

Relies on formal processes, methodologies, or standards

Improvisational work

Highly reliant on deep expertise across multiple functions

Judgment-oriented work

Relies on individual expertise and experience

9. What is your gender?

Female

Male

\*10. What is your age?

18 to 24

25 to 34

35 to 44

45 to 54

55 or older

\*11. What is the highest level of education you have completed?

Leaving Certificate

Diploma

Some College Coursework Completed

Graduate/Higher Diploma

Bachelor's Degree

Master's Degree

Doctorate

\*12. Which of the following best describes your role in industry?

Software Architect

Software/ Web Developer

Database Administrator

System Analyst / Tester

System Administrator

Project Manager

Product Manager

Business Analyst

Software/ Web designer

\*13. Which of the following best described the type of contract in your current position?

Full-time

Part-time

Per Day

Permanent

Temporary/Contract/Project

Placement Student

\*14. How many years of experience do you have? (Within the IT Industry)

Less than 1 year

1 – 2 years

2 – 3 years

3 – 5 years

5 – 7 years

7 – 10 years

10 – 15 years

More than 15 years

\*15. Approximately, how long have you been in your current position?

Less than 1 year

1 – 2 years

2 – 3 years

3 – 5 years

5 – 7 years

7 – 10 years

10 – 15 years

More than 15 years

\*16. In your current role, are you involved in managerial responsibilities?

Yes

No

I don't know

17. what is your annual gross income?