Master Thesis

The Changing Nature of Work and Worker in the Digital Era

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There is nothing permanent except change

Heraclitus
Abstract

This thesis aims to investigate the major consequences Information and Technology have caused to Work since the relationship among these factors remains poorly understood. Artificial Intelligence (AI), enabled by Machine Learning (ML) and Big Data have entered dynamically the workplaces. The digital transformation of modern organizations is of strategic importance and inevitably shapes the future of work as we know it impacting on various dimensions, such as deskilling, emergence of new skills, new forms of organizing and strategizing, such as crowdsourcing. The research involves the use of qualitative methods: the data collection includes interviews data, as well as document analysis. The data analysis explores the research question.

**key words:** future of work, strategy, digital transformation, information, technology, workforce

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Glossary of Terms

*Artificial Intelligence:* investigating intelligent problem-solving behaviour and creating intelligent computer systems
(http://wirtschaftslexikon.gabler.de/Archiv/74650/kuenstliche-intelligenz-ki-v12.html as cited in IBA, 2017)

*Big Data:* datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze

*blue collar:* manual labourer

*Captive centers:* client-owned-and-operated service delivery centers, typically in a nondomestic, low-cost location, that provide service resources directly to their organization. The personnel in a captive facility are legal employees of the organization, not the vendor (Gartner IT Glossary, 2018)
collective intelligence: a form of networking enabled by the rise of communications technology, which has enabled interactivity and users generating their own content (Dictionary.com, 2018)

white collar: medium and highly skilled worker, clerical worker

crowdsourcing: the sporadic services of a large number of people, either paid or unpaid, typically via the Internet—derives its potential from the massed ranks of workers with the ability to work wherever they want (The Economist Intelligence Unit, 2014, p.21)

gig economy: includes “crowdwork”, and “work-on-demand via apps”, under which the demand and supply of working activities is matched online or via mobile apps (De Stefano, 2016)

machine learning: a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention (Sas.com, 2018)

mobile robotics: the industry related to creating mobile robots, which are robots that can move around in a physical environment. They combine the progress in artificial intelligence with physical robotics, which allows them to navigate their surroundings (Techopedia, 2018)

Millennials or “Generation Y”: employees currently under 33 years of age (Finn and Donovan, 2013)

outsourcing: subcontracting a portion of secondary activities previously carried out internally to a specialized company in order to achieve savings in terms of finance and human (Digout, et al, 2013)

routine task: task entailing repetitive procedures

workforce analytics: Workforce analytics uses statistical models and other techniques to analyze worker-related data, allowing leaders to improve the effectiveness of people-related decision-making and human resources strategy (The Economist Intelligence Unit, 2016)

Abbreviations

AI- Artificial Intelligence
HR- Human Resources
ML-Machine Learning
MR- Mobile Robotics
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1. Introduction

Chapter 1 (Introduction) introduces the reader to the digital era and current developments in work and how they have affected and affect worker, as well. The intention is to give an overview of the thesis’ topic and the background to why this is important for research and followed by the purpose of the thesis and the related research question.

1.1 Introduction and Research Setting

The global character of business, changing demographics and changing patterns of mobility will continue to change the nature of work and the worker. Sweeping demographic changes, a multi-generational workforce, lack of standardization in education and growing cultural diversity form the scenery for the next five to ten years (The Economist Intelligence Unit, 2014). Additional factors sculpting the picture up to 2030, according to Brown, et al (2017), are technological breakthroughs, rapid urbanisation, shifts in global economic power, resource scarcity and climate change. Considerable sources of change gaining ground every day are “open” models of production (e.g., open source software), open sourcing of ideas and solutions (e.g., crowdsourcing and collective intelligence), and open access to information resources (Forman, King and Lyytinen, 2014, p.790).

As Hunt (2014) puts it as the Digital Era continues to progress, many of technology’s most profound effects are likely to be in the world of work. AI, enabled by machine learning and Big data has had a significant impact on work liberating capabilities, but also threatens the existence of many occupations, replacing old skills with new skills such as data analytics. In terms of strategy and structure, more and more organizations will change their strategies and tactics to reflect the ways in which their operating environment and operations will be digitally transformed. Moreover, planning and staffing challenges are complicated by the fact that digital transformation takes time. New positions are created, organizational leaders will have to define the job responsibilities, relevant knowledge, skills and abilities, and key performance indicators for those positions. Staffing to job design, training and development, performance management, and compensation are other dimensions of the phenomenon (Hunt, 2014,p.40-1).

A quick, but reasonable conclusion to be drawn is that human management is one of the key challenges a company will have to face the next years. The research problem that interests the current degree project is the ways that work and worker have changed in the digital era, exploring new forms of organizing and strategizing emerging or already emerged nowadays. These changes signify the struggle for competitive advantage from a business’ perspective.
1.1.1 The character of the technological era

The technological era that this assignment focuses on is the 'digital era' which is put in the exhalation of 'Industry 3.0' when digitilization has already taken place as well as automation in working steps and global access to information is already a reality. The context of 'Industry 4.0' is already set and in essence means:

the technical integration of cyber physical systems (CPS) into production and logistics and the use of the ‘internet of things’ (connection between everyday objects) and services in (industrial) processes – including the consequences for a new creation of value, business models as well as downstream services and work organisation

as cited in (IBA, 2017, p.12).

The notifying difference for the transition in this new era is the introduction of AI in the services sector. As far as the elements of automatisation in the production line are concerned, these are control by machines, the real-time production, decentralization of production, individualisation of production (ibid.) which fits the economy's needs. ‘Smart factories’, driverless cars, delivery drones or 3D printers, which, based on an individual template, can produce highly complex things without changes in the production process or the necessity of a human action and are recognizable examples of AI and Robotics (ibid.)

1.1.2 Disturbance at the labour market

Although the fear of losing one's job because of the intelligent IT systems is not ranked in the first places (Smith, 2016) the fact remains that the introduction of AI in the workplaces has caused, if not deskilling in all cases, serious and various implications. The introduction of new systems may entail employees to be involved in the development and the process of change at an early stage in order to grow accustomed to the new technology themselves (as cited in IBA, 2017, p.24). Additionally, the employee must be able to reposition or to distance himself or herself from the machine by individual skills so adaptability and lifelong learning are key words in a contemporary working person's lifestyle (ibid.)

One aspect of what recent developments in this era bring is given in (Frey and Osborne 2013, p.16) where it is claimed that with the availability of big data, a wide range of non-routine cognitive tasks are becoming computerisable. ML algorithms running on computers are now, in many cases, better able to detect patterns in big data than humans since they have beaten humans in terms of scalability and absence of bias. The comparative advantages of computers are likely to change the nature of work across a wide range of industries and occupations (ibid.). For instance, fraud detection, health diagnostics, law and finance services. However, this automation caused by sophisticated algorithms and developments in MR, building upon with big data, does not concern occupations that involve complex perception and manipulation tasks, creative intelligence tasks at least for the next decade or two (ibid.,p.27).
1.1.3 New forms of organizing and strategising: the case of Crowdsourcing

There are various forms of organizing work today which reflect strategic choices for retaining or gaining advantage in the arena of competition.

For instance, *open innovation* which has changed the way many companies think about making products, but also providing services. It may be twofold, bringing the *outside in* or taking the *inside out*. In the first case, take Amazon and customers' reviews or third parties selling products on its site. In the second case, a company selling its expertise to retailers that want to sell their products via their own sites.

Another form that the literature has already examined is that of the offshoring of information-based tasks to foreign worksites (as cited in Frey and Osborne, 2013, p.5). Estimates about two defining characteristics of jobs that cannot be offshored are that the job must be performed at a specific work location and that it requires face-to-face personal communication. Further, Forman, King and Lyytinen (2014, p.791) support:

> modularization across locations is not optimal for tasks that are not analyzable, routinized, or common to captive centers. Alternate coordination strategies relying on information and knowledge sharing might overcome these challenges and prove more useful for the coordination of complex distributed work.

Crowdsourcing is self explanatory. It refers to outsourcing of a company task i.e subcontracting a portion of secondary activities previously carried out internally to a specialized company in order to achieve savings in terms of finance and human, from the "crowd" of Internet users (Digout, et al., 2013, p.7). On the internet, millions of information are transmitted, circulated and then connected to each other, and, if we admit that lots of people contributions are more valuable than one's contribution, crowdsourcing is actually a form of *collective intelligence*. Hence, it is unrestricted which leads to talk about *open outsourcing* (ibid.). Crowdsourcing could be seen, as mentioned previously, in the frame of the gig economy, booming this era. It is also viewed as especially beneficial for routine-heavy companies (Kolbjørnsrud, Amico and Thomas, 2016,p.21). In an attempt to clarify the terms, it should be said that *crowdworking* covers smaller tasks, such as writing product reviews, searching for phone numbers, and more comprehensive work, such as testing software, providing legal advice, ghostwriting or designing and programming a website, whereas bigger and more meaningful tasks are regularly summarised under the term *crowdsourcing* (IBA, 2017,p.28). It is very common for marketing purposes and offers significant opportunities for the development of external product, advice, contribution to product development, active participation in the resolution of a specific problem (Digout, et al., 2013, p.8).

The most important and disadvantageous dimension for the workers is that they are legally invisible. As put in (IBA, 2017), *owing to the digitalisation and internationalisation of online platforms on which crowdworkers and clickworkers offer their services, the choice of applicable law is usually uncertain*. Questions raised, such as, which country's laws are applicable,
especially those of social security and welfare or whether the freelancer (i.e the crowdworker) who receives orders from one platform is actually an employee or not (ibid.), purposefully remain unanswered.

Another aspect to be examined is the one of remuneration. It is claimed by some that digitalisation and the growth of crowdworkers will eventually destroy high wage structures in Western countries. The argument, provided in IBA (2017, p.30) is that the wide range of freelancers from developing countries will lead to a decreasing demand for Western freelancers and ultimately to decreased remuneration for their individual tasks, and it continues:

On the other hand, it is said that qualified freelancers from developing countries will obtain higher payments for their work because Western companies usually pay more than local companies in developing countries. The net result would be a global change in payment structures taking place due to digitalisation: namely remuneration in Western countries will decline while the wages in developing countries will rise.

The information systems field has always sought to examine changes in work that might be attributed to information and technology. The existing literature proves that is one of the most persistent and important topics in information and technology discussions over the last five decades (Forman, King, and Lyytinen, 2014, p.791). According to (Kling 1980, Attewell and Rule 1984, Zuboff 1988 as cited in Forman, King, and Lyytinen, 2014) that scope exceeds from the work content and design, work coordination and control, organization to sustainment of work competencies and skills in what has been historically called “livelihood” or “career”. However, new capabilities might be reversing that and making organizations more dependent on the nature of work (Forman, King, and Lyytinen, 2014). Hence, there is need for further research.

### 1.2 Purpose and research question

Given the background presented above it is evident that there are ongoing changes in digital work and, consequently, in the workers. This research project aims to investigate these ongoing changes in digital work and, consequently, in the workers, since Artificial Intelligence (AI), enabled by Machine Learning (ML) and Big Data has entered dynamically the workplaces. These developments shape the future of work as we know it impacting on various dimensions, such as deskilling, emergence of new skills, new forms of organising and strategizing, such as crowdsourcing. This project builds on research previously carried out by other researchers and has been designed to allow comparisons with previous findings.

One research question has been derived from the purpose and drives the degree project. The question aspires to contribute to the purpose by exploring what changed and how old skills are replaced by new skills. Different forms of organizing with focus on crowdsourcing are also included in the question.

**RQ: How has the work and the worker changed in the digital era?**

It is estimated that this research question provides a solid foundation for fulfilling the purpose.
1.3 Topic Justification

Apart from the prevalent societal interest in this research, it might provide useful insight into human capital issues that currently concern businesses and trade unions. The impact of the above described changes together with the new forms of working relationships and terms raise legal issues and a currently transforming reality affecting human life. According to Hunt (2014), transformation of human capital will be a key priority for organizations in addition to changes in product and business development, knowledge management, data analysis, and other operational processes.

1.4 Scope and Limitations

In more detail, this study regards the work as manual and cognitive, involving routine and non-routine tasks in any sector of economy and intends to examine indicative sectors and business departments that include manual (e.g. mining company) and cognitive tasks (e.g. IT departments/companies), routine and non-routine tasks. Hence, the technologies entered in the workplaces that are examined here is Artificial Intelligence, enabled by Big data and Machine Learning and the time period to be explored is since 2000- starting from the period of the mobile devices and Web 2.0, according to Manyika et al. (2011, p.25)- until today. Consequently, worker is regarded as the person working in any business department of any sector doing these tasks, ranging in specialty, occupation, education and skills, excluding managerial positions.

The current research does not take into account exhaustive descriptions of the ways digitisation and digitalisation have occurred in the workplaces. The scope is the organisation and its strategy, as well as new forms of work in the digital era.

This degree project observes the computerization of various occupations according to the tasks performed by them i.e manual and cognitive, routine and non-routine tasks, in any combination, and keeps track of the recent trends and the possibilities and their impact on the labour market. Subsequently, other dimensions of work and worker, for instance skilled and unskilled or low income, middle income and high income jobs are examined secondarily. Hence, for the needs of this project 'various occupations' means both blue collar and white collar occupations. A choice of particular branches of Industry (e.g IT sector, constructions etc) will also be typical of where this type of work and worker can be located. The same is applicable for the size of the company, although small enterprises are not intended to be examined in depth.

Another considerable aspect of how work has changed in the recent years is the different ways of strategizing and organizing. Strategic choices of businesses today in order to reduce their costs, sustain or gain a competitive position include offshoring, outsourcing, open models of production (e.g., open source software), open sourcing of ideas and solutions (e.g., crowdsourcing and collective intelligence) (Forman, King and Lyytinen, 2014, p.790). Crowdworking is a symbol of a changing world of work for white-collar workers in the gig economy (IBA, 2017). In this sense, there are many challenges that these developments raise for human-capital issues. Legal extensions are also present since deregulations of traditional forms take place. The current research aims to investigate this transforming reality in the private sector.
The short time frame of this master thesis limits the depth of the study terms of the amount of literature, empirical data gathered and analyzed, too.

1.5 Thesis Organization

The thesis consists of six chapters. This is a description of their content:

Chapter 1 (Introduction) introduces the reader to the digital era and current developments in work and how they have affected and affect worker, as well. The intention is to give an overview of the thesis’s topic and the background to why this is important for research and followed by the purpose of the thesis and the related research question.

Chapter 2 (Literature Review): In this chapter I present findings, applied methods and raised issues from literature that can be related to changes at work. This provides a foundational understanding and the literature is used to create an exploratory framework used for gathering and analysis of empirical data to investigate the research question.

Chapter 3 (Methodology) presents the academic relevance and the author’s approach for the study and gives an overview of the workflow’s different steps. The chapter finalizes with the method of analysis and a discussion of the study’s validity and reliability, as well as ethical considerations.

Chapter 4 (Empirical Findings): In this chapter, the gathered empirical data is presented. The chapter consists of two main parts. The first part contains the document analysis findings and consists of secondary empirical data from contemporary reports about the areas of changes explored. The second part provides an argumentation for the industries and occupations selected and contains primary empirical data from interviews.

Chapter 5 (Discussion): In this chapter, the gathered empirical data is analyzed in a structured way. Primary data from interviews is analyzed based on the frame of reference. The data examination aims to confirm or contradict the literature or to provide insights that extend beyond the frame of reference. The data is also examined in correlation with the secondary empirical data from contemporary reports. This analysis is conducted with the objective to increase the amount of data and to extend the frame of reference with connections and knowledge presented in the reports.

In Chapter 6 (Conclusion), a summary of the process and the significant findings from the analysis are presented in relation to the purpose and research question. Thesis contribution and directions for future research are also suggested.
Chapter 2 (Literature Review): In this chapter I present findings, applied methods and raised issues from literature that can be related to changes at work. This provides a foundational understanding and the literature is used to create an exploratory framework used for gathering and analysis of empirical data to investigate the research question.

The literature study was conducted under the prism of ensuring a deeper understanding of the topic so as to lay a basis for a literature-based frame of reference and to compose the exploratory framework.

The areas of interest were **AI impact and skills and new forms of organizing and strategizing and changing working patterns.** The purpose for choosing these areas was to detect the degree of vulnerability of professions to computerization and explore new skills that emerge today. Additionally, to explore crowdsourcing as an option for businesses and workers respectively. The amount of literature, as well as the empirical data that could be gathered and analyzed, i.e the depth of the study, were limited by the given time for the degree project.

In Table 1, there is a depiction of this exploration framework, which includes the above mentioned publications and in the following section the selection criteria are analyzed. The contribution to the following work, i.e the empirical data collection and analysis is crucial since they laid the basis for the questionnaire used for the interview data and they provided the current project with themes derived from them.

*Table 1 Literature Frame of Reference*

<table>
<thead>
<tr>
<th>Author</th>
<th>Article</th>
<th>Main themes</th>
</tr>
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<tbody>
<tr>
<td>Frey &amp; Osborne, 2013</td>
<td>How susceptible are jobs to computerization?</td>
<td>occupations, computerization, susceptibility</td>
</tr>
<tr>
<td>Forman, King &amp; Lyttinen, 2014</td>
<td>Information, Technology and the changing nature of Work</td>
<td>work organisation</td>
</tr>
<tr>
<td>Hunt, 2014</td>
<td>Managing Human Capital in the Digital Era</td>
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<td>Hunt, 2015</td>
<td>Leading in the Digital Era</td>
<td></td>
</tr>
<tr>
<td>Digou, et al., 2013</td>
<td>Crowdsourcing, Outsourcing to obtain a creativity group</td>
<td>open/user innovation, open source, crowd</td>
</tr>
<tr>
<td>Autor, 2015</td>
<td>Why are there so many jobs? The history and the future of workplace</td>
<td></td>
</tr>
<tr>
<td>Stone, 2016</td>
<td>A Labor Law for the Digital Era</td>
<td></td>
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<tr>
<td>Card &amp; DiNardo, 2002</td>
<td>Still-Biased Technological Change and Wage Rising Inequality</td>
<td></td>
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<tr>
<td>Van Laar, et al., 2017</td>
<td>The relation between 21st century skills and digital skills</td>
<td></td>
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<tr>
<td>Gattautis &amp; Vidukaitea, 2013</td>
<td>Crowdsourcing application in marketing activities, Contemporary issue</td>
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</tbody>
</table>
2.1 Literature-Based Frame of Reference

Established academic literature that can be related to the changes at work because of Artificial Intelligence and Big Data provided a foundational understanding. The literature was used to create an exploratory framework used for gathering and analysis of empirical data to investigate the research question.

Figure 1. illustrates the research question formed to fulfill the purpose. The changing nature of work because of AI and Big Data effect has led to new forms of organizing.

![Diagram](image)

*Figure 1 Research question illustration*

Articles in journals were the foundation for the frame of reference before the empirical data being collected i.e the contemporary reports and the interviews. This selection criterion was used since journals are considered as the most reliable source of scientific information. A lot of publications
were studied before this specific frame of reference was formed. Publications referring to the public sector, as well as publications that were too specialized (although some with special sector interest were leveraged), old publications about work were excluded. The rationale is that the public sector is very specific, serves another role and would not mirror today’s economy, exhaustive details in specific sectors could not be generalized and digital era is the recent, current era.

The articles are presented in two parts, one for each exploration framework area following the pattern of the questions used in the interviews in order the primary data to be collected, as well as the document analysis. Key findings and methodology applied are described in these that are previous studies. Articles that express opinions are also included.

The below presented publications serve the purpose of this thesis seeing that they investigate these ongoing changes in digital work and, consequently, in the workers, since Artificial Intelligence (AI), enabled by Machine Learning (ML) and Big Data has entered dynamically the workplaces. They also shed light on various dimensions like deskilling, emergence of new skills, new forms of organising and strategizing, such as crowdsourcing.

2.1.1 AI impact and skills

Forman, King, and Lyytinen (2014) in their publication include five papers accepted for the special section 'Information, Technology, and the Changing Nature of Work' in Information Systems Research (ISR) journal after a call of papers was issued. These are complementary stories about the changing nature of work and they range from broad but detailed grounded theory to more focused analyses of changes in innovation work. The topics progress from what is possible in the social construction of meaning to the direct effects on the nature and organization of work. They contribute to the understanding of the relationship between information, technology, and work. The authors have found, quoting a literature discussion (e.g. Autor, et al, 2003), that there has been discussion of shifting demands for skills and some claim that the shifting is accelerating and touches previously untouched workers, including middle management and knowledge workers. However, they do not adopt this perspective and support that the radical ‘deskilling’(substituting automation for skilled labor) predicted in the 1990’s never occurred.

Frey & Osborne (2013) have been the 'spine' for the interview guide I designed before the interviews took place. Other researchers cited in the current project have also quoted the given study. The researchers have explored how susceptible are professions to computerization. They have found that their model predicts that computerisation will mainly substitute for low-skill and low-wage jobs in the near future rather than reducing the demand for middle-income occupations, which has been the pattern over the past decades. By contrast, high-skill and high-wage occupations are the least susceptible to computer capital (ibid.,p.42).

About the workers, they complement their previous argument underlining that their findings imply that as technology races ahead, low-skill workers will reallocate to tasks that are non-susceptible to computerisation – i.e., tasks requiring creative and social intelligence.
As regards particular skills, they state that their model predicts gradual diminishment of the comparative advantage of human labour in tasks involving mobility and dexterity.

They also support that the extent and pace of legislative implementation can furthermore be related to the public acceptance of technological progress (ibid., p.23).

Autor’s (2015) publication takes into account secondary data from 1979 to 2012 in USA and examines different aspects of changes in work due to technology. As for the deskilling, he views as an economic reality that tasks that cannot be substituted by automation are generally complemented by it. Regarding wage implications he supports that changes in technology do alter the types of jobs available and what those jobs pay. Autor (2015) observes as a change in the last few decades the “polarization” of the labor market, in which wage gains went disproportionately to those at the top and at the bottom of the income and skill distribution, not to those in the middle. However, he notes that technological change is far from the only factor affecting US labor markets in the last 15 years, pointing to economy.

Furthermore, in Autor (2015 as cited in 2015), he suggests about the abstract task-intensive jobs that they are not growing as rapidly as the potential supply of highly educated workers, giving as one interpretation that of automation, information technology are beginning to substitute strongly for the work done by professional, technical, and managerial occupations. However, this doesn’t follow the pattern of computer and software investment that should be higher.

About the middle-skill jobs which have preoccupied for decades literature Autor (2015, p.27) concludes that although some of the tasks in many of these jobs are susceptible to automation, many middle-skill jobs will continue to demand a mixture of tasks from across the skill spectrum. This fits a number of modern clerical occupations that provide coordination and decision-making functions, rather than simply typing and filing. In addition, the author states that there are also cases where technology is enabling workers with less esoteric technical mastery to perform additional tasks and he expects that many of middle-skill jobs will persist in coming decades. Or, at least, their replacement cannot be without a substantial drop in quality. His argument suggests that:

*many of the middle-skill jobs that persist in the future will combine routine technical tasks with the set of nonroutine tasks in which workers hold comparative advantage: interpersonal interaction, flexibility, adaptability, and problem solving*

Putting education in the frame Autor (2015) argues that the issue is not that middle-class workers are doomed by automation and technology, but instead that human capital investment must be at the heart of any long-term strategy for producing skills that are complemented by rather than substituted for by technological change. Further, he draws the attention to a typically neglected point, as he puts it, and supports that if human labor is indeed rendered superfluous by automation, then our chief economic problem will be one of distribution, not of scarcity.

Hunt (2015) foresees that changing technologies will give rise to a variety of new social and digitally oriented jobs and career paths, while may also cause notable declines and changes in traditional roles. She argues that these projected role changes likely will require new human capital strategies and adjustments in organizational structures, leadership roles and hierarchies (ibid., p. 50).
As for the new skills and traits of workforce required in the digital era Hunt (2015) argues that traits such as flexibility, adaptability, openness to experience, and tolerance for risk are more important than ever. Adopting digital skills and achieving digital literacy may mean additional training. As the author puts it (ibid, p. 53) leaders can pay for courses or employ the services of digital coaches or mentors to help themselves and others climb their learning curves faster and better, and to help them tackle more complex issues.

This changing reality in the digital era has got multiple implications and the most important of them is the legal framework, which is becoming irrelevant every day (Stone, 2009, p.145). The “industrial era” (Stone 2004 as cited in Stone, 2009), developed in the early and mid-twentieth century where large firms organized their work forces into a set of practices that has come to be termed “internal labor markets” (Doeringer and Piore,1971 as cited in Stone, 2009) has changed. This degree project will not expand in deeper analyses, because it is out of its scope, however these are important implications while investigating the transformation of traditional roles. A characteristic example is multiple agreements that are violating norms vital for a human’s life. In (Stone, 2009, p.149), the ‘employee’ status is being broached and what is supported is that the exclusion for independent contractors has become particularly problematic. Their argumentation is interesting:

Because the test for independent contractor status is broad, many who are dependent on a particular employer for their livelihood are nonetheless classified as independent contractors and deprived of all labor law protections. Increasingly, employers attempt to reclassify employees and to vary their employment practices to transform their former “employees” into “independent contractors”.

The publication refers to the American legislation, however the above cited extract and others may be seen as international and are met in other reports, too. For instance, Aguinis and Laval (2013, as cited in Forman, King, and Lyytinen, 2014) have reached a similar conclusion about working agreements, stating that new forms of digitally mediated contracting make short hold-time collaborations viable as alternatives to earlier models of long-term employment.

A side effect of technology and skills might be wage inequality. This issue is an intertemporal one examined in comparison with the changing reality. Card and DiNardo (2002) review in their article the Skill-Biased Technical Change (SBTC) hypothesis, i.e the hypothesis that a burst of new technology caused a rise in the demand for highly skilled workers, which in turn led to a rise in earnings inequality. They conclude that this hypothesis falls short as a unicausal explanation for the evolution of the U.S. wage structure in the 1980s and 1990s. They support that viewed from 2002, it appears that the rise in wage inequality was an episodic event and they express the opinion that while some of the early rise in inequality may have resulted from rapid technological change, the increase in the early 1980s is largely explained by other plausible—albeit more mundane factors (ibid, p.774). With this statement, we may conclude that technology is not a factor affecting wages, even if a technological introduction is radical.

An article worth mentioning is the one of Van Laar et al (2017) serving a three-fold objective; to describe the skills needed in a digital environment, go beyond mere technical use, and focus on
21st-century digital skills. It presents a theoretical framework which identifies various conceptualizations that describe the skills needed in a digital environment, covering the period 2000-2016, applying content analysis and was considered ideal for the frame of reference of the current thesis. The researchers attempt a categorization between 21st-century skills and digital skills implying that 21st-century skills are not necessarily underpinned by ICT, they are learning and thinking skills. For each included article, they listed the skills conceptualizations and operational components. Based on the results, a distinction is made between the core skills and the contextual skills; the core skills are fundamental for performing tasks that are necessary in a broad range of occupations. Contextual skills are those skills that are required to take advantage of the core skills and, therefore, must be connected to such core skills. Among their findings is that beyond skills, knowledge and attitude are viewed as essential to thrive in the knowledge society, as they name the modern society (ibid, p.582). They support that given the rapid rate of change and the influence of technology, employees need to develop 21st-century digital skills to cope and thrive in this changing society.

Among the core 21st century digital skills they put the technical, information management, communication, collaboration, creativity, critical thinking, problem solving skills, whereas among the contextual 21st century digital skills the ethical awareness, the cultural awareness, flexibility, self-direction and lifelong learning. They conclude that the vision of 21st-century digital skills is that those skills are needed to participate in the knowledge-based workforce and to put employees in charge of their own learning.

In their concluding remarks they also include an important argument about why the study of skills is vital. According to Van Laar (et al, 2017, p. 584), the essence is what employees can do with knowledge to support 21st-century skills and take full advantage of ICT. The precise definition of 21st-century digital skills is an essential first step to identify, and possibly quantify, current and expected needs.

Hunt (2014) in her article about human capital implications of social and digital technologies draws the conclusion that all the possibilities stemming from digital transformation can seem daunting and that all changes should be implemented gradually. The author supports that the human capital implications of social and digital technologies impact virtually everyone, regardless of the type of organization they work for, their profession, their functional area, or their career stage (ibid, p. 37).

Hence, the human capital management functions in all organizations have a critical role to play in ensuring the efficient and effective transition and transformation from Industrial Era models and processes to their Digital Era upgrades. She gives three perspectives of how human capital management is being transformed by social and digital technologies: the impact of social and digital technologies on talent management throughout the employee life cycle, how the HR function is evolving in both high-tech and high-touch ways and how human capital management in organizations will have to adapt to the changing nature of work as the Digital Era continues to progress. She refers to hiring, onboarding, learning, performance management, career development application of digital technologies, focusing on social networks. Referring to employees selection, she seems to 'agree' with Frey & Osborne (2013) about bias and errors being eliminated by digital technologies.
Hunt (2015) supports that social and digital technologies are changing the nature of work and workforce management should adapt accordingly. She argues that the impact of these technologies on talent acquisition and learning, as well as HR operations, is already well established. The author also predicts that it will continue to increase and applications in onboarding, performance management, career development, and leadership development will be increasingly seen (ibid, p. 50).

2.1.2 New forms of organising/strategizing and changing working patterns

Forman, King and Lyytinen (2014) have also referred to crowdsourcing and they viewed it as a part of the changing image of work in terms of how information and technology effects. As they support crowdsourcing can operate through short term contracts or no contracts at all, making it, on the one hand, harder to observe some aspects of work, such as details about the relationship between those who employ workers and those doing the work, and, on the other hand, easier to observe others (e.g., workers’ long-run reputation within the platform)(ibid, p.793). They also argue that platforms offer a wealth of data on work relationships and outcomes within the platform, but as yet we know little about the implications of these forms of work for other types of employment relationships. They are also skeptical about the effectiveness of traditional mechanisms of empirical research on information, technology, and work.

Gatautis and Vitkauskaite (2013) give a chronological starting point of this phenomenon the year 2006. They note that companies might deploy crowdsourcing in various activities to gain benefits of large numbers of people performing tasks for a relatively low. This leads to different crowdsourcing conception implementation and some forms include the co-creation of products and services with experienced customers, as well as user generated content. They also include various researchers’ categorizations of crowdsourcing. They refer to crowdsourcing being deployed in various marketing activities such as product management, distribution management, communications management and marketing research through application of various types of crowdsourcing opportunities. Contributors breadth, contributors quality, public and internal reputation measures, project management capabilities and tools as well as quality control could be considered as main factors for success of crowdsourcing projects related to marketing activities. They also support that limitations and ethical issues related to it exist.

Digout, et al. (2013) describe that it was initially limited to the computing sector, but it currently tends to cater a wider number of sectors. They note that firms using this process are always more numerous in order to outsource, for limited financial compensations, activities that cannot be completed by their own employees or considered too costly in terms of manpower, finances and time (ibid, p.6).

Their paper defines, through concrete examples, how Crowdsourcing directly impact on the variables of the mix-marketing such as product development, price positioning, distribution and communication but also people, process and physical evidence. They also explore the potential evolution of the Crowdsourcing in the coming years. Their findings are that the internet users are a source of considerable wealth, a true reservoir of ideas and innovation. As a significant advantage they state the closer relationship with its consumers’, promoting the optimization of
the response to their expectations and not to mention a potential communication between them (ibid., p.14). Hence, the customer becomes a source of innovation -‘falsifying' Joseph Schumpeter's argument they mention in the beginning of their publication. In the first part of their research they focus on the context in which ‘crowdsourcing’ appeared, this first part of our study will be led throughout an analysis of the Web 2.0 and the increasing role of consumers in their business relationship. In the second part, they develop their study on the basis of the concept of crowdsourcing and the opportunities it offers to the field of marketing. Finally in the third part, they study the effect of the evolution of crowdsourcing. They examine indicative examples-companies.

3. Methodology

Chapter 3 (Methodology) presents the academic relevance and the author’s approach for the study and gives an overview of the workflow’s different steps. The chapter finalizes with the method of analysis and a discussion of the study’s validity and reliability, as well as the ethical considerations.

<table>
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<tr>
<th>Table 2 Methodology</th>
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<tbody>
<tr>
<td><strong>Direction of research</strong></td>
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<td><strong>Research Strategy</strong></td>
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<td><strong>Empirical Data Types</strong></td>
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3.1 Methodological Tradition

Research methods classification vary in many ways (e.g subjective VS objective research), however one of the most common distinctions is between qualitative and quantitative research methods (Myers, 1997).

Quantitative research methods, examples of which include survey methods, laboratory experiments, formal methods (e.g. econometrics) and numerical methods such as mathematical modeling were primarily developed in the natural sciences to study natural phenomena (ibid.)

On the other hand, qualitative research methods enable researchers to study social and cultural phenomena in the social sciences. Examples of these methods are action research, case study research and ethnography. Qualitative data sources include observation and participant observation (fieldwork), interviews and questionnaires, documents and texts, and the
researcher’s impressions and reactions (Myers, 2013 as cited ibid.).

A combination of these two research methods in one study is possible and is called triangulation, where one method precedes the other or are conducted in parallel (Jokela, 2016b).

As Myers (1997) puts it, all research (either quantitative or qualitative) is based on some underlying assumptions about what constitutes ‘valid’ research and which research methods are appropriate. Qualitative research can be positivist, interpretive, or critical.

Positivists generally assume that reality is objectively given and can be described by measurable properties which are independent of the researcher and the instruments used. Positivist studies generally attempt to test theory, so as to increase the predictive understanding of phenomena.

Interpretive researchers start out with the assumption that access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings. Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them.

Critical researchers assume that social reality is historically constituted and that it is produced and reproduced by people. Although people can consciously act to change their social and economic circumstances, critical researchers recognize that their ability to do so is constrained by various forms of social, cultural and political domination. Their aim is via social critique to bring to light the restrictive and alienating conditions of the status quo (Myers, 1997).

As illustrated in Table 2, this is a qualitative research aiming to examine social reality, the work and the worker in the digital era. Interpretation of the meanings assigned to the studied phenomenon is attempted.

### 3.2 Methodological Approach

The current study will conduct a qualitative research. As noted in (Myers, 2013 cited in Myers, 1997) qualitative research methods are helpful for researchers to understand people and the social and cultural contexts within which they live.

I have decided to find answer to a specific research question formulated in the beginning of the research process. The degree project creates a frame of reference, which is used to gather and investigate empirical material. It also draws conclusions from empirical data based on the frame of reference.

This approach serves the exploratory direction of this research (view Table 2), as the objective is both to explore and understand the current situations in workplaces, as well as to draw conclusions about the issues encountered. Qualitative and quantitative research studies can be linked to one or more of the five research objectives (Onwuegbuzie and Leech, 2006 as cited in Doody and Bailey, 2016). These five research objectives are ‘exploration’, ‘description’, ‘explanation’, ‘prediction’ and ‘influence’. ‘Exploration’ involves using mainly inductive methods to discover a concept, construct, phenomenon or situation and advance understanding, hypotheses or generalisations. ‘Description’ involves identifying and describing the antecedents,
nature and aetiology of a phenomenon. ‘Explanation’ involves developing theory for the purpose of explaining the relationships among concepts or phenomena and determining reasons for the existence of events. ‘Prediction’ refers to using pre-existing knowledge or theory to predict what will occur at a later point in time. ‘Influence’ relates to manipulation of the setting or variable to produce an anticipated outcome (ibid).

3.3 Data Collection Methods

This thesis uses primary data together with secondary data (view Table 2). The primary data collected through interviews to extract their view and opinion on what degree have old skills been replaced by new skills due to AI and how the work challenges related to this new reality. The reason why interviews were performed is to receive arguments that are up to date. In addition, primary data are complemented with the use of publications and reports from institutions and companies and bridge between the literature and the interviews data. In many of these documents, other data are used, so indirectly this research is based on secondary data analysis even if it does not take advantage of them systematically and in depth. Document analysis is a social research method and is an important research tool in its own right (Research Methodology in Education, 2018). Analyzing documents incorporates coding content into themes similar to how focus group or interview transcripts are analyzed (Bowen, 2009 cited in ibid). It was selected because it is an efficient and effective way of gathering data. They are a very accessible and reliable source of data always there to be reviewed as many times as there is a need for, remaining unchanged by the researcher’s influence or research process as put by Bowen (2009, p. 31 cited in ibid.).

As far as data gathering is concerned, the technique chosen was that of a qualitative and interpretative approach to ascertain stakeholder meanings and interpretations (Flynn & Du, 2012, p. 213 as cited in Jokela, 2016a). Semi-structured interviews with working people and in a company's premises with an hr executive were held. In case participants' permission was obtained, after signing a corresponding form, they were recorded. After the collection of the data/information was terminated, a rich picture was outlined and an analysis was conducted in order themes to be identified and patterns to be investigated. Interpretation assigned to the studied phenomena was attempted.

3.4 Data Analysis Method

Thematic analysis is selected as a method for analysing the data after their collection. It is a widely-used qualitative data analysis method and one of a cluster of methods that focus on identifying patterned meaning across a dataset (About thematic analysis - The University of Auckland., 2018). The reason for its selection is that it can produce an insightful analysis that answers particular research questions and that is an approach that enables flexibility (Braun & Clarke, 2006). The process entails particular steps/stages which are familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and finally, producing the report. In this thesis, thematic analysis is applied as an essentialist or
realist method, which reports experiences, meanings and the reality of participants rather than a constructionist method, which intends to confirm a theory (ibid., p 81).

An important consideration I had was identifying themes in the interview data I collected. What counts as a theme is that it is something which captures the key idea about the data in relation to the research question and which represents some level of patterned response or meaning within the data set, e.g an answer coming from many interviewees (ibid., p.82). Here the main requirement is to be consistent throughout the process of determining themes. As Braun and Clarke (2006, p.83) explain themes or patterns within data can be identified either in an inductive 'bottom up' way (citing Frith and Gleeson, 2004), or in a theoretical, deductive 'top down' way (citing Boyatzis, 1998 and Hayes, 1997). In my research, I coded the data for the specific research question I had formed; to be able to explore the document analysis findings the questions guide for the interviews were always more open-ended to begin with, followed by some semi-structured questions keeping the key points relevant to the research question adapting them to the respondents’ sectors and positions. The main categories and themes were identified from the data.

The procedure was a three-stage one as suggested in the literature (Creswell, 2007; Miles & Huberman, 1984 cited in Jugder, 2016): preparing the data for analysis by transcribing, reducing the data into themes through a process of coding and representing the data. Working through the data, more categories were developed and I tried to take account of emergent themes based on a process of induction.

3.5 Validity and reliability

Reliability was ensured by means of checking the transcripts and comparing my definition of categories and themes with other researchers’ work. The same was chosen as far as internal validity is concerned with pattern matching and explanation building, comparing my interpretations with other researchers’ findings. In terms of external validity, generalization of the results was not required but different options were discussed. Replication logic can be tested since multiple companies were interviewed and the question whether the findings are similar in different cases should be answered (Jokela, 2016c). Moreover, the set of secondary sources may also contribute to strengthen the report’s validity according to Le Duc (2007 as cited in Hellbe and Leung, 2015, p.19).

3.6 Ethical considerations

An information sheet and a consent form introducing me to the participants and explaining the purpose of the interview and its context was formed and sent before the interviews take place. They were also informed that is possible to be confidential. The respondents were notified that the data collected will be used only for study and not for commercial or other non-scientific purposes.
Interviews might be challenging. As supported by Alvesson (2011 as cited in Alvesson 2017) they may be seen as specific sites for data construction in a complex interaction between interviewer and interviewee involved in impression management, political action or identity work. I intended to overcome this challenge by making a choice for semi-structured interviews with open ended questions and by conceptualizing and using interviews by means of addressing the level of metaphor behind surface practice and technique, with the advantage of such an approach being that it challenges and inspires rather than suggesting a firm position (Gleadle, 2011).

Interviewees were informed that they could withdraw from the research any time, their data remains but possibilities of identification are eliminated. The finalized research along with its arguments, findings and conclusions will be also sent.

Document analysis also raises ethical issues. One major issue to consider, introduced by O’Leary (2014 as cited in Research Methodology in Education, 2018), is that of bias, both in the author or creator of the document, and the researcher as well. The researcher must consider the subjectivity of the author and also the personal biases he or she may be bringing to the research. The other one is the latent content revealed by the style, tone, agenda, facts or opinions that exist in the document. Therefore, he suggests two techniques of handling these challenges; the first one is the interview technique. In this case, the researcher treats the document like a respondent or informant that provides the researcher with relevant information. Ergo, I tried to locate this information in the whole text. The other technique is noting occurrences exploring the use of particular words, phrases and concepts.

In addition, the quality of the documents is evaluated in order to be prepared to encounter some challenges or gaps when employing document analysis; official reports from institutions or multinational companies are included so current concerns from the world of work to be recorded.

4. Empirical Findings

In this chapter, the gathered empirical data is presented. The chapter consists of two main parts. The first part contains the document analysis findings and consists of secondary empirical data from contemporary reports about the areas of changes explored. The second part provides an argumentation for the selected industries and occupations and contains primary empirical data from interviews.

4.1 Document Analysis

This section aims to act as a complement to the frame of reference and the interviews with secondary empirical data. The contemporary reports used were published by consulting firms and research institutes. They consist of studies based on interviews or surveys while others are less based on data and present opinions, views and lessons learned from projects carried out by the consultancy firms. Some reports in this section include a larger amount of secondary data, findings and methods are also described. The reason for the inclusion of these societal, technical
and economical reports was because an accurate contemporary image from the world of world would be ensured. As mentioned, some of them include secondary data, so the current thesis would be enriched and the opinions presented stem from writers and some organisations with a consulting role i.e with a settled and reliable view on the current trends. They all appear in Table 3.

**Table 3 Table of Documents**

<table>
<thead>
<tr>
<th>Author</th>
<th>Report</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manyika, et al, 2011</td>
<td>Big data: the next frontier for innovation, competition &amp; productivity</td>
<td>McKinsey Institute</td>
</tr>
<tr>
<td>The Economist Intelligence Unit, 2014</td>
<td>The evolution of the Work and the Worker</td>
<td>The Economist Group</td>
</tr>
<tr>
<td>IBA Global Employment Institute, 2017</td>
<td>Artificial Intelligence &amp; Robotics and their Impact on the Workplace</td>
<td>IBA</td>
</tr>
<tr>
<td>Finn and Donovan, 2013</td>
<td>PwC’s next generation: A global generational study 2013</td>
<td>PwC</td>
</tr>
<tr>
<td>Stokin, Ziser, Hohner, 2011</td>
<td>Made in America again. Why Manufacturing will return to America</td>
<td>BCG</td>
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**4.1.1 AI impact and skills**

The first report selected to be analyzed is conducted by the McKinsey Global Institute (MGI). As stated in (Manyika, et al, 2011), MGI, established in 1990, is McKinsey & Company’s business and economics research arm. Its mission is to help leaders in the commercial, public, and social sectors develop a deeper understanding of the evolution of the global economy and to provide a fact base that contributes to decision making on critical management and policy issues. MGI research combines two disciplines: economics and management. The partners of McKinsey & Company fund MGI’s research, which is not commissioned by any business, government, or other institution.

This report illustrates how Big Data is now part of every sector and function of the global economy and presents its business and economic possibilities of big data and its wider implications as important issues that business leaders and policy makers must tackle. Manyika, et al, (2011) have concluded to key findings that apply across sectors, talking about *tremendous untapped potential for creating value* sparked off by Big Data. Improvement of allocation and coordination of human and physical resources, cut waste, increase transparency and accountability, discovery of new ideas and insights are areas in organizations where Big data are found to be valuable. Regarding productivity rates globally traded computer and electronic
products and information sectors are those that have already posted very strong productivity growth and are set to gain substantially from using big data. Two services sectors—finance & insurance and government—are positioned to benefit very strongly from big data as long as barriers to its use can be overcome. Several sectors including construction, educational services, and arts and entertainment, have posted negative productivity growth, which probably indicates that these sectors face strong systemic barriers to increasing productivity. Globally traded sectors, such as manufacturing, wholesale trade tend to have experienced higher historical productivity growth, while local services (e.g., retail, health care providers, accommodation and food) have achieved lower growth.

The researchers applied a map data methodology undertaking a brief modeling exercise to estimate the amount of data generated and stored in different sectors, both on an aggregate basis and on a per firm basis. They also took interviews with industry leaders about analytical talents (ibid, p.137). This research's findings were also leveraged in the formation and the analysis of the interview guide in the current research.

In 2013, PwC, the University of Southern California and the London Business School announced the results of a two-year global generational study. A wide range of data was gathered from PwC employees and partners of PwC firms around the globe involving people from different generations, career stages and cultural backgrounds. PwC is a multinational company providing audit and assurance, advisory, tax services.

According to this report, it is vitally important that organizations invest time and energy in both listening to their people, and conducting deep research and analysis into what drives and motivates them. Doing so will allow them to tailor their talent strategies to address these needs, and best position themselves for the future. In the light of the findings of this study about the next generation of employees, one of the key considerations an organization should think is technology. The rationale is that it gives employees more flexibility and it increases efficiency. The study claims that employees expect the best tools for collaboration and execution.

It should be clarified, as it is one of the core ideas of the report, that employees or employees of the next generation are the Millennials or the Generation Y. These employees represent a majority of employees; two out of three of PwC’s staff are in their 20s and early 30s. Within that group, most are unmarried (75%) and without kids (92%), and for three out of four of them, PwC was their first job out of college. The report had predicted that by 2016, almost 80 percent of PwC’s workforce will be comprised of Millennials.

Regarding the methodology, to pinpoint and compare the findings between Millennials and non-Millennials, a sub-set of employees at the same career stage (9,120 Millennials and 4,030 non-Millennials at the Senior Associate and Manager levels) was culled from the larger research for additional analysis. The data were collected between 2011 and 2012 and subsequently was compiled and analyzed.

The study presents the key learnings with percentages. Finn and Donovan (2013, p. 8) describe, among their findings that 71% of PwC Millennial employees (vs. 63% of non-Millennials) say that their work demands interfere with their personal lives. If they were able to make their current job more flexible, 64% of Millennials would like to occasionally work from home, and 66% of Millennials would like to shift their work hours. Across the board, 15% of male employees and
21% of female employees say they would give up some of their pay and slow the pace of promotion in exchange for working fewer hours. 41% of Millennials prefer to be rewarded or recognized for their work at least monthly, if not more frequently, whereas only 30% of non-Millennials would like that level of frequency. The authors also conclude that emotional engagement is the element which leads to employees’ retention.

Another key finding of the study regarding an organization’s considerations for its human resources, apart from the technology, is creating a flexible work culture and they suggest:

companies may elect to adopt policies that promote greater work/life balance, such as providing employees greater flexibility in their work location or schedule without having to execute a more formal flexible work arrangement.

Other suggestions include increasing transparency around compensation, rewards and career decisions, build a sense of community, accelerate a global mobility program, and evaluate the impact that Millennials may have on the contingent workforce strategy of the organization.

This report’s findings are presented in the document analysis as they are considered indicative for the new generation of employees and not strictly confined to the particular multinational company’s environment. They are interesting in the exploration of the research question. Their findings related to the flexibility of employees and their expectations were also used to form the interviews’ question guide and a comparison of the findings is made in the discussion section of the current project.

Brown, et al (2017) argue for the ‘Four Worlds of Work’ for 2030 which describe the many possible scenarios that could develop, and how an organization to best prepare for the future. In 2007, PwC worked with the James Martin Institute for Science and Civilisation at the Said Business School in Oxford to develop a map of the factors that were influencing business and those that would become more influential in the future. The exercise identified four main influential factors that are creating a ‘push and pull effect’: individualism against collectivism, and corporate integration against business fragmentation. These form the ‘four worlds’. This PwC report was selected to be presented because it outlines changes in work and workforce after AI became an established reality. As already mentioned in the first chapter, technological breakthroughs, rapid urbanisation, shifts in global economic power, resource scarcity and climate change are the trends that form the future world of world. The authors mentioned the three levels of AI: Assisted intelligence, widely available today, improves what people and organizations are already doing (eg. GPS navigation), Augmented intelligence, emerging today, and Autonomous intelligence, being developed for the future (eg. self-driving vehicles, when they come into widespread use). They also include data from a PwC survey of 10,029 members of the general population based in China, Germany, India, the UK and the US illustrating that 73% think technology can never replace the human mind. 37% are worried about automation putting jobs at risk – up from 33% in 2014.

Regarding the skills sought-after in a world of innovation, specialism, career, built from individual blocks of skills, experience and networks are not defined by an employer or institution. The prospects are that organizations will constitute of a few pivotal people using
technology, the supply chain and intellectual property, rather than human effort and physical assets, to generate value. As the authors put it, the commercial value of learning takes precedence; a university degree is seen as less valuable than specific and relevant skills or experience. Workers know that the most sought-after skills will mean the biggest reward package (ibid, p.13) and they are responsible for their careers. Society divides into those with a corporate career – and those who don’t have access to the same level of financial rewards, healthcare and benefits (ibid., p. 18).

4.1.2 New forms of organising/strategizing and changing working patterns

The IBA Global Employment Institute was formed in early 2010 for the purpose of developing a global and strategic approach to the main legal issues regarding human resources for multinationals and worldwide institution. This report illustrates certain changes and trends on the future labour market. According to IBA (2017, p.52) the factors that render it easier for companies to relocate fields of activity or service sectors to other regions (outsourcing) are the increasing globalisation and digitalisation of society and the huge range of services offered by independent contractors on the internet. Typical examples of outsourcing are production facilities, call centres or warehouses situated in low-labour cost countries or weaker economic areas or awarding contracts for software and programming services to foreign freelancers is also a typical example of growing outsourcing practice in the digital sector. As an example for the production sector the researchers mention the approximate 1.5 million jobs that have disappeared because of the cheaper production possibilities in China.

They also argue that it is not only the bigger companies that are responsible for outsourcing jobs, but also employees who ask for more autonomy. As they support (ibid., p.52):

*The global trend is that Work 4.0 will take place outside traditional employment structures with a rise in self-employment. Highly qualified young employees, in particular, like their independence and will focus their work on the development of creative solutions for a changing client base. The digital worker of tomorrow will no longer want to work in hierarchically structured companies and to do the same work every day. They will be less dependent on only one employer.*

The report also does not fail to mention the legal aspects regarding which laws are applicable in cross-border cases or implications with the ‘gig’, ‘sharing’ or ‘work-on-demand’ culture that is the sharing of the economic risk between employer and employee. They also mention ‘attractive’ government measures in order to counteract outsourcing by enabling greater flexibility and lower costs for standard employment. Having adopted the three economic sector approach the report reaches its conclusions. They support that automation and digitalisation affects jobs not only in the production sector but also in the service sector. Therefore, the only alternative would appear to be the unemployment or targeted training of the affected individuals within the tertiary sector, stating that training is likely to make sense only in the area of IT. As they put it (ibid., p.119):

*Not only employees, but also companies that have to date had little to do with IT and data processing in the form of big data will have to adapt to the technical innovations to remain competitive.*
However, as long as the rise of productivity, initiated by the introduction of AI and robotics, leads to a growth in orders and profit, employees will not be dismissed. For many employers, a smart factory without human employees is not an option. Moreover, the report underlines that there is not a consensus among the experts about the time scale of the phenomenon since some support these changes will take place in a five-year period while others in twenty or thirty years. They suggest an individual examination of the relevant sector, country and region to make more precise statements, however the report sees clearly that both blue and white-collar sectors will be affected by a potential loss of jobs and that the digitalisation (and automation) of services is a global phenomenon.

Examining organizing and strategizing couldn't exclude outsourcing, which always have been an option for companies in terms of reduced cost. Studying (Sirkin. Zinser, and Hohner, 2011) it can be concluded that great investments in automation preserve a cost advantage, since automation reduces a product’s labor content. This is the main reason for outsourcing in manufacturing, which is an attractive choice when automation is not updated and low labor cost is sought after. This was a BCG report suggesting and analyzing why some kind of manufacturing now outsourced in China will return to the USA, especially for products intended to be sold in North America. It was studied partly, only in the specific scope of this project.

The Economist Intelligence Unit is a specialist publisher serving companies establishing and managing operations across national borders. For almost 60 years it has been a source of information on business developments, economic and political trends, government regulations and corporate practice worldwide. One of the four ways the Economist Intelligence Unit delivers its information is through research reports. The firm is a member of The Economist Group.

The Economist Intelligence Unit (2014) conducted a research report as part of a program to identify and analyze critical trends likely to affect the workplace in the next 5-10 years. As it is stated their research indicate that technology will continue to play a pivotal role, supplanting mid-skilled jobs and obviating the need for expensive offices and enabling cross-border teams to flourish and predicting that the profile of the average worker will continue to evolve (Economist Intelligence Unit, 2014, p.9). Their report consists of four sections; the changing nature of the worker, the changing nature of the work, conflicting expectations of the worker and the workplace, challenges for human resources management and global business strategy. Their key findings include the following: demographic shifts pose conflicting challenges, young populations neither in education nor in employment will elevate concerns of a lost generation and the potential for social and political unrest in the near future, burgeoning workplace diversity requires sophisticated managerial response, disconnect between educational standards and organizational demand, services sector on the rise globally at the expense of agriculture and industry, technology transforms workforce composition and culture, wage expectations conflict with increased focus on stakeholder value, inequality on the rise as technology decimates the mid-skilled tier, companies balance pros and cons of investment in new regions of development (ibid., pp.6-7).

The particular report was assessed as suitable for the exploration of the research question since it provides the reader with a detailed picture of the changes in progress as far as both work skills and emerging work forms are concerned. The research estimates that mid-skilled jobs are
susceptible to automation or offshoring and this choice will be enabled by increased technology sophistication and globalized markets (ibid., p.29). They identify these jobs as the ones which involve information processing, routine transactions and repetitive tasks. They predict that an increasing number of jobs that rely on human interaction are likely to be conducted virtually either because of the individual worker’s choice or because the employer will impose telework to save on the cost of the premises (ibid., p. 18). They support that telework or telecommuting depends on a variety of factors such as size of the company, geography and class. The research report also supports that workers would choose this kind of work to reduce the drudgery of commuting and work in a more convenient location whereas employers would benefit from increased productivity, lower property costs, the reduced absenteeism and turnover rates among workers (ibid, p.21). One of the conclusions drawn are that the growing phenomenon of crowdsourcing (the research defines it as the sporadic services of a large number of people, either paid or unpaid, typically via internet) derives its potential from the massed ranks of workers with the ability to work wherever they want (ibid, p.21). The report also conveys the fears of many experts who claim that this kind of temporary jobs will be commoditized leading to fewer stable job relationships for jobs that can be performed remotely, as well as a labor-cost race to the bottom (ibid, p.26).

4.2 Interviews

Eleven (11) interviews were conducted in order to gather the primary empirical data (view Table 4).

4.2.1 Companies and Industries included

Below descriptions and argumentation for the sectors the interviewees were derived from can be found.

Energy Sector
Energy sector investments in big data and artificial intelligence have ballooned by a factor of 10 in 2017, according to a new report on the sector. Traditional energy players are looking to analytics and automation to improve operations and manage distributed resources (Deign, 2017). It can also be included among the globally traded sectors, such as manufacturing, wholesale trade that tend to have experienced higher historical productivity growth (Manyika, et al, 2011).

Constructions
This sector is among them which have posted negative productivity growth probably indicating that these sectors face strong systemic barriers to increasing productivity (ibid., 2011, p.101). Big data can enable productivity increases even in these sectors if these barriers can be overcome. In specific, the interviewee's occupation (civil engineer) was indicative as it was used in Frey and Osborne's research (2013, p. 58) as one of the non computerizable occupations used to train their model.
IT sector
Ahlemann (2016) formulates ten theses about how the next digital trends in IT industry will change IT and supports that IT is the indispensable driver and enabler of value creation, tomorrow’s IT functions will follow the paradigm of Innovate-design-transform. According to the author, shadow IT becomes normal: IT innovations are developed through joint interdisciplinary teams in the business departments, digital partnerships and digital innovation networks will become more important, future IT will be lightweight, characterized by agile development processes, and free from too many architectural and organizational constraints. It will allow developers to focus on user needs and user feedback. In the future, data centers will no longer be necessary, and corporate IT will completely be based on public cloud offerings, with very few exceptions. The growing use of IT—even as parts of products and services—will increase dependency and vulnerability. IT architectures will be standardized, modular, flexible, ubiquitous, elastic, cost efficient, and secure. The IT department will shrink significantly, because fewer infrastructure experts are required (owing to the use of cloud services) and the move of IS specialists to the business. Digital transformation requires specific qualifications and skills that are currently fairly rare and even in the future, with new study programs at universities (e.g. for data science), it is likely that the professionals required will be scarce.

Arts
Arts and entertainment, as mentioned previously, have posted negative productivity growth, which probably indicates that these sectors face strong systemic barriers to increasing productivity (Manyika, et al, 2011). Indicatively, as for their computerization susceptibility, Frey and Osborne (2013, p.59-60) give dancers, choreographers, Art directors, multimedia artists and animators along with Music directors and composers 0.13, 0.0042, 0.023 and 0.015 respectively. As the interviewee from this sector said 'there is that sacred that humans have which cannot be replaced'.

Education
It is a field that requires care, what Frey and Osborne (2013, p.26) classify in social intelligence along with negotiation and persuasion, and viewed as such it cannot be substituted by artificial intelligence. Nevertheless, it can be valuable help in terms of reaching decisions and supporting students and teachers.

HR executives
Recent estimates are that CEOs want CHR executives to take part in the strategic planning however they think that they lack the business knowledge required. Analytics are supported to be the bridge to this knowledge.

Directors
Frey and Osborne (2013, p.59-60) attribute Chief Executives 0.015 computerization risk and are used as the training data for non computerizable positions in their model, however big data analytics proper harnessing may change their position in terms of fewer or different responsibilities. However, more detailed examination for their role is out of the scope of this assignment, since managerial positions are not considered workers’ positions. The main interest
for conducting this interview in the scope of this degree project was to gain insights from a company’s perspective in order the picture formed to be thorough.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Company</th>
<th>Occupation/position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance sector</td>
<td>International Audit &amp; assurance, advisory, tax services company</td>
<td>finance auditor</td>
</tr>
<tr>
<td>Energy &amp; Infrastructure Sector</td>
<td>International Engineering, Procurement &amp; Construction Company</td>
<td>mechanical engineer, proposal engineer</td>
</tr>
<tr>
<td>Information Technology &amp; Telecommunications</td>
<td>International Information &amp; Telecommunications Company</td>
<td>software developer</td>
</tr>
<tr>
<td>Services</td>
<td>MOT/ Road Vehicle Test</td>
<td>mechanical engineer, vehicle auditor</td>
</tr>
<tr>
<td>Constructions</td>
<td>International constructions company</td>
<td>civil engineer</td>
</tr>
<tr>
<td>Metallurgy Industry</td>
<td>General Mining &amp; Metallurgical Company</td>
<td>rotary electric blast furnace operator</td>
</tr>
<tr>
<td>Education</td>
<td>European Education Corporation</td>
<td>teacher</td>
</tr>
<tr>
<td>Education</td>
<td>European Education Corporation</td>
<td>secretary</td>
</tr>
<tr>
<td>Services</td>
<td>Lift Installation &amp; Maintenance Company</td>
<td>lift maintainer</td>
</tr>
<tr>
<td>Arts</td>
<td>Dance &amp; Theatre Schools</td>
<td>choreographer-dancer, theatrologist</td>
</tr>
<tr>
<td>Education</td>
<td>European Education Corporation</td>
<td>academic director-recruiter</td>
</tr>
</tbody>
</table>

All companies and individuals were contacted by e-mail or telephone and the main criterion for their selection was either their role as recruiters or working people from various sectors that have concerned other studies and reports. They all had both an operational and IT perspective of business which were considered most relevant to interview. The opportunity to set up an interview also played a role for the selection of the particular sectors, although there was a concern both manual and cognitive, routine and non routine tasks to be explored. The other method applied, document analysis, was useful to cover the gaps.

An interview guide was prepared beforehand for semi-structured interview. The guide consists of a list of subjects and questions based on the exploration framework. It must be noted that it acted out as a compass for the areas to be investigated however adjustments according to the sector, the profession and the role were made. For instance, ‘targeted’ questions, inspired by quotes or opinions about specific sectors expressed in the literature were made. Questions upon interviewees’ remarks to allow them to elaborate more on their thoughts were made and, on the other hand, when there was a need to clarify what was asked close-ended questions were posed, all of the interviews were performed semi-structured. All interviews were performed via phone or Skype except for two which were conducted at the respondents’ office. The duration ranged from 20 minutes to an hour if clarifications were asked or broader thoughts were expressed. In the beginning of the interview, the respondent was oriented by the author about the topic and purpose of the interview. Time to ask clarifying questions was given before the start of the interview.
4.2.2 Thematic analysis of Interview data

It is already explicated in the section 3.4 that thematic analysis was being selected as the method to categorize the interviews data and that I coded the data for the specific research question I had formed. To be able to explore the document analysis findings the questions guide for the interviews were always more open-ended to begin with, followed by some semi-structured questions keeping the key points relevant to the research question adapting them to the respondents’ sectors and positions. The main categories and themes were identified from the data. There were lots of themes, some already ‘expected’ to be formulated and others were not. The former were the ones gathered when followed by the more structured questions in the interview guide (see appendix C) such as those related to skills, working hours and agreements, wages, education that were inspired and intended to check the frame of reference. However, there were also answers/data collected that were ‘unexpected’ because they were not initially met in the frame of reference. This is estimated as normal, because the occupations and the sectors are various and manual-cognitive, routine-non routine tasks distinctions occurred. For instance, the safety and health protection theme or the age gap theme were not met in the literature frame in the first place. Hence, new themes were also formed from the raw data.

With regard to the research question the following question areas were designated in the interview guide: AI and skills, and the crowdsourcing and crowdworking as other forms of strategizing and working (viewed by both angles of a company and a worker). The themes generated here are *deskilling, time and productivity improvement, working hours and agreements, wage inequality, additional training due to technological advancement & education as a solution to unemployment, age gap and technology, safety and health protection, cost, crowdsourcing & crowdworking*.

As for *deskilling*; new developments in technology were considered as a threat by the interviewees in positions involving many routine tasks (the vehicle auditor) in contrast to the interviewees conducting mainly cognitive tasks and considering it more as aid than threat. An interesting element here is that not all the workers in routine tasks were sharing the same opinion because they did not perceive the same threat of automation (vehicle auditor vs lift maintainer, who testified in favor of the next category). The ‘middle-income’ interviewee- to adopt a term from the literature- that is the secretary did not feel either threatened by deskilling although she expressed the opinion that some of her duties may be computerized but not in the immediate future (as she mentioned not in the next five years).

Referring to the skill set required due to the digital trends the interviewee in the procurement company (energy and infrastructure sector) noted that:

> Generally in the engineering field, definitely in the production area, automation has absolutely changed all the concept of industrial processes. for my job that I’m mostly at the design part than of the production it’s a powerful tool that it is absolutely necessary in order to be competitive but no it hasn’t yet replaced some positions
completing his reply later estimating that the automation his position’s tasks (engineering design) can take has been fulfilled and supporting that human intervention is and will be absolutely required. His final remark was that digital tools are a great assistance, but human treats like critical thinking, evaluating, finding the optimal solution are irreplaceable. As he puts it:

An IT tool will always need inputs from the user and the inputs will define what the outputs will be

An exactly same statement was made by the civil engineer, perhaps due to similarities at the tools applied or not.

Moreover, the same element came from a different domain, the educational, with two of the interviewees not recognising it as a possible 'threat' due to the nature of their occupation entailing emotions and learning disabilities, as the teacher interviewee put it. Reflecting on the possibility of a robot educator -a timid attempt already done nowadays-, she notices:

I can't imagine a robot doing a whole lesson, I think it would be fun as a sidekick maybe..it's frightening actually if you think that a robot might take over a classroom

On the contrary, the secretary at the language school, although stating it is outside her main concerns and fears about her job, could imagine this prospect more easily in some years from now, but not at the close future. The one who expressed an immediate concern for the close future was the vehicle auditor judging from the developments in car industry and telling it is a matter of time the car inspection line to be automated and replaced by a belt. She also referred to the recent technological upgrading of the road vehicle test centers in Greece implying that these procedures are not out of discussion and do take place.

The IT sector interviewee regarding the skills zone interview questions made a really interesting comment, in particular due to the sector. She supported that the human factor is always being needed to connect the individual sub-applications, which constantly change, since they are automated after some period of time. However, the human factor is always required. Regarding the new emerging skills related to the ICT changes at the workplaces, the interviewees referred to willingness to learn new things constantly and lifelong learning, resourcefulness and willingness to communicate with one’s colleagues so as new knowledge to be shared. Arguing about the latter, the software developer supported that this is an existing need in the workplaces:

depending the programmer every code has a different rationale and altogether must be in functionality

Time and productivity improvement was a pattern almost in every interview. The interviewees, across the sectors included and the pertaining tasks brought into the discussion the matter of time economy.
Starting from the production line example in this study, the metallurgy company, the interviewee said that before 1994 an error indication occurred in the blast furnace might take hours or even a whole day to be located, investigated and restored whereas today there is an indication on one of the monitors he handles and the whole procedure is simpler.
From the Education sector, the Academic Director mentioned that the usage of the web information management platform is time-saving in terms of gaining insights useful for management purposes, communication purposes among teachers -parents- students-administration.

From the Services, the vehicle auditor supported that the whole testing procedure is less time-consuming. A similar testimony from the lift maintainer supporting that previously it might take a whole working day to identify a damage and the appropriate spare part.

Referring to the IT sector, the software developer argued for a rise in productivity due to the augmentation of tools in her field.

The Constructions sector interviewee, the civil engineer, was negative about the deployment of Big Data in his work despite the fact that he works in a big multinational construction company.

**Working hours and agreements**

The issue of work-life integration enabled by the technological trends was explored during the interviews. Most interviewees strongly praised work-life balance emphasizing that the advantages outweigh the disadvantages.

As the interviewee from the IT sector said the integration of work-life, enabled by technology, has only microscopic benefits.

On the other hand, the teacher considered this side of the technology helpful due to the nature of her work, that it entails planning ahead and preparation, as she argued. However, when she referred to crowworking, she mentioned that the expansion of the working hours is counterproductive. As the teacher said:

> there are difficulties if you make yourself available all the time, you cannot be productive all the hours (especially if you are collaborating in different time zones [referring to educational web platforms were lessons take place overseas] and you have already completed a working day.

From the same sector, the secretary put it more directly entering the sentimental dimension into discussion:

> Limits should exist. However, I wouldn't have problem to take work home if the atmosphere with my colleagues and employer was good.

The inputs from the Energy and Constructions sectors were aligned; the interviewees supported that there is no working time agreement but project-based agreements. However, practically, working 40 hours per week must be a full time employee agreement, since there is no such flexibility of a freelancer.

**Wage inequality**

None of the interviewees connected the remuneration with their technical skills in their distinctive field, either evaluating it as low or high. Almost everyone connected their answer with the 'general scenery' or even made statements that are getting lower payments compared to the work they actually feel they produce, but no connection to the technology applied was made.
Additional training due to technological advancement & education as a solution to unemployment

Ideas collected from the interviews about additional training in order skills to be updated according to the current digital trends were that training is essential and certifications update, too. From the energy and infrastructure sector, the mechanical engineer supported that fundamental education stays the same but updating is required so that it can follow the current trends, because some applications have become obsolete, and is especially needed for the new professionals. In the finance sector, the inputs from the finance auditor were that this is an ongoing reality in her job; annual seminars take place so as employees to be familiarized with the updated versions of software. The administrative staff interviewee pointed out that in most cases ICT certifications are required by employers. However, she also brought into discussion that automation means replacement and in some cases training is not applicable.

Age gap
This issue was raised by an interviewee from the education sector, the teacher. When asked about the ICT skills required in her job she said:

*The technology applied is based on experience, mostly for someone being able to use a computer or certain software. Older teachers may have difficulties using new technology.*

Safety and health protection
This is a theme entered by the worker in the mining and metallurgy company. As he claimed, the percentage of the human intervention to the blast furnace has been reduced by 40% and this can only be considered as positive since previously the workers were more exposed to toxic minerals harmful for their health.

Cost
From the education sector, the academic director argued for the cost effectiveness of the usage of the platform as a means of effective communication. On the other hand, the vehicle auditor supported further technological advancement and automation of procedures has not progressed yet due to the cost it entails. However, she considers herself being threatened in the close future due to the advancements in her sector. The mechanical engineer working for the procurement company, when asked if he estimates that the IT related investments are at a satisfactory level in his company argued that they could be better because of the reduced amount of licenses for the software needed and the special permissions from the managers’ required to be obtained. He attributed this reality to the high cost, when asked later in a follow-up question.

Crowdsourcing &crowdworking
Crowdsourcing is a kind of outsourcing so outsourcing, as the overlying category was initially explored with the intention to enter the interviewees into the main idea of the questions and the researching interest. Functionalities such as cleaning, building security service, accounting and payroll services were mentioned by many interviewees. A different datum was the one given by
the finance auditor in a multinational company about training seminars outsourced by other companies.

Although personal experience, apart from the software developer interviewee, was scarce, all the interviewees were familiarized with aspects and forms of the concept. The software developer mentioned that she undertook small pieces of work such as small applications or websites design. The interviewee connected her experience as a crowdworker not as a side work for supplementary income, but as her 'main' job at times of unemployment when she was younger, in her twenties. She supported that the income gained was ranging from low to high at times. Recalling this period of her life, she repeated her previous comment about work-life integration and said:

\[ \text{the boundaries between professional and personal life are blurred. You miss weekends, holidays and you start working as a ‘small business’} \]

From a business' perspective, another aspect of crowdsourcing, the one related to product design, was also brought into by the interviewee. She stated that employees and corporate customers are being asked their opinion about the products. Crowdsourcing was also explored during the interview with the Academic director after a supplementary communication with the commercial department of the corporation. The inputs were that the main reason this approach is adopted was to promote the idea of recycling to the students since students of all branches are asked to make their contribution by bringing tins in order the goal of 1.000.000 tins to be achieved and the robot educator to be brought in Greece.

5. Discussion

In this chapter, the gathered empirical data is analyzed in a structured way. Primary data from interviews is analyzed based on the frame of reference. The data examination aims to confirm or contradict the literature or to provide insights that extend beyond the frame of reference. The data is also examined in correlation with the secondary empirical data from contemporary reports. This analysis is conducted with the objective to increase the amount of data and to extend the frame of reference with connections and knowledge presented in the reports.

In Fig.2 the process of the discussion section is illustrated.
5.1 Research question: How has the work and the worker changed in the digital era?

This is the central and core research question to be explored. In order to gather the essential data (documents) a lot of publications, previous researches quoted by many other researchers (eg. Frey and Osborne, 2013), official reports from foundations and multinational companies were studied, filtered by patterned prevalence topics avoiding the most specialized ones or examining them on a smaller scale. Emphasis was placed on skills sets required for working positions today and the ‘threat’ of automation, occupations and the performance of cognitive-manual, routine-non routine tasks. Consequently, this exploration on work was enlightening for the worker today, too. Legal implications, working time changes occupied the research secondarily. However, outsourcing and mostly crowdsourcing as various forms of strategizing and working (viewed from a worker's angle) were examined.

5.1.1 What changed

First of all, the base for starting examining the evolution of work and worker was the entrance of Artificial Intelligence in terms of Machine Learning and Big Data in the workplaces. This is a major change itself and the starting point for other transformations. Focus was given to each specific sector from these examined in the interviews and those derived from the document analysis.
**Deskilling**

Reflecting on how the interviewees replied regarding the skill set required due to the digital trends the sense of heterogeneity prevails. The interviewee in the procurement company noted that in the engineering field, definitely in the production area, automation has absolutely changed all the concept of industrial processes and regarded technology as a powerful tool of great assistance without seeing positions having been replaced by it since human intervention and treats like critical thinking, evaluating, finding the optimal solution are irreplaceable. A related statement was made by the civil engineer, perhaps due to similarities at the tools applied or not. Moreover, the same element came from a different domain, the educational, with two of the interviewees not recognising it as a possible 'threat' due to the nature of their occupation entailing emotions and learning disabilities, as the teacher interviewee put it. The possibility of a robot educator -a timid attempt already done nowadays- cannot be seen by the teacher.

These data conform with Frey & Osborne (2013, p.42) in the frame of reference where it is supported that unlike middle-income occupations, high-skill and high-wage occupations are the least susceptible to computer capital.

On the contrary, the secretary at the language school, although stating it is outside her main concerns and fears about her job, could imagine this prospect more easily in some years from now, but not at the close future. The one who expressed an immediate concern for the close future was the vehicle auditor judging from the developments in car industry and telling it is a matter of time the car inspection line to be automated and replaced by a belt. She also referred to the recent technological upgrading of the road vehicle test centers in Greece implying that these procedures are not out of discussion and do take place.

This area is also recognized in Frey & Osborne 's (2013, p.44) model which predicts that most workers in transportation and logistics occupations, together with the bulk of office and administrative support workers, and labour in production occupations, are at risk. As for the latter, the blast furnace operator underlined that his position demands 'sound concentration and clarity of mind', but according to the literature this is an ambiguous statement; it may mean either a human attribute, included in the manual and non routine tasks, which for the time being are not computerized or an attribute that can be perfectly computerized with improved sensors enabled by Big Data with the advantage of eliminating human bias (eg. fatigue). However, this is unlikely for the next one decade or as it is a perception and manipulation task. All in all, as Frey & Osborne (2013, p.27) put it:

> while sophisticated algorithms and developments in MR, building upon with big data, now allow many non-routine tasks to be automated, occupations that involve complex perception and manipulation tasks, creative intelligence tasks, and social intelligence tasks are unlikely to be substituted by computer capital over the next decade or two

**Time and productivity improvement**

This was definitely a pattern met almost in every interview as already presented in the fourth
section of the current thesis. Starting from the production line example in this study, the metallurgy company, the interviewee said that before 1994 an error indication occurred in the blast furnace might take hours or even a whole day to be located, investigated and restored whereas today there is an indication on one of the monitors he handles and the whole procedure is simpler.

The Academic Director mentioned that the usage of the web information management platform is time-saving in terms of gaining insights useful for management purposes, communication purposes among teachers -parents- students- administration. The vehicle auditor supported that the whole testing procedure is less time-consuming. A similar testimony from the lift maintainer supporting that previously it might take a whole working day to identify a damage and the appropriate spare part. The software developer argued for a rise in productivity due to the augmentation of tools in her field, too. This statement seems to be in line with the data collected in the document analysis. Manyika (et al, 2011) confirm it when talking about strong productivity growth and substantial gains from using big data for the information sector. It could be indirectly derived that the civil engineer interviewee also confirmed the same report which included the construction sector among these which have posted negative productivity growth, attributing the fact to facing strong systemic barriers to increasing productivity. This correlation is made because of the negation of the interviewee about the deployment of Big Data in their work despite the fact that he works in a big multinational construction company.

Regarding the finance sector, there was no confirmation nor falsification for the literature frame of reference by the interviewee, apart from the workforce analytics, which is crucial enough; To repeat what mentioned previously, Manyika, et al, (2011) supported that this sector derives strong benefits from big data as long as barriers to its use can be overcome.

Working hours and agreements

Another aspect of time, mostly a darker one, is the one of work-life integration enabled by the technological trends. Most interviewees strongly praised work-life balance emphasizing that the advantages outweigh the disadvantages. As the interviewee from the IT sector put it:

It is convenient if you examine them [the advantages of work-life integration] microscopically. But personal and professional life are blurred. It absorbs your thought and takes on a part of your personal and family life.

The above statement opposes to the frame of reference where it is supported that working time models can be adapted to fit personal needs much better than the previous standardised working time models (IBA, 2017, p.71). It also opposes to the Finn and Donovan (2013) insight where it is stated that if they were able to make their current job more flexible, 64% of Millennials would like to occasionally work from home, and 66% of Millennials would like to shift their work hours. However, it is in accordance with their finding that 71% of PwC Millennial employees (vs. 63% of non-Millennials) say that their work demands interfere with their personal lives. It seems that the flexible work culture presented to the companies’ reports as the solution to this dissatisfaction of the employees is not compatible with their sayings at the interviews. They view this flexibility as the root of the problem instead of the solution.

The teacher considered this side of the technology helpful due to the nature of her work, that it
entails planning ahead and preparation, as she argued staying aligned with IBA report (2017, p.70) stating that the breakdown of the boundaries for working hours also makes it possible to implement working life models that benefit the work-life balance. However, while answering the crow working area of questions the same interviewee raising the time theme referred to the working person being counterproductive. From the same sector, the secretary answered that she wouldn’t have problem to take work home if the atmosphere at work, with the employer and colleagues, is good. This also correlates with a conclusion in (Finn and Donovan, 2013) that emotional engagement is the element which leads to employees’ retention, as stated in 4.1.1 of the current thesis.

About the working hours, some empirical data are not aligned with the frame of reference since IBA (2017, p.68) argues that to benefit from the advantages of Work 4.0, employees and employers might either not conclude specific agreements on the scheduling of working hours, or expressly agree on the flexible management of working hours.

The mechanical engineer, working in the engineering company supported that there is no working time agreement but project-based agreements. However, practically, working 40 hours per week must be a full time employee agreement, since there is no such flexibility of a freelancer. Same case is the civil engineer’s. This statement partly agrees and disagrees with the quote of the IBA previously cited in the frame of reference; self-employment has raised, but a freelancer status is actually on papers and not in the real working life.

Wage inequality
None of the interviewees connected the remuneration with their technical skills in their distinctive field, either evaluating it as low or high. Almost everyone connected their answer with the 'general scenery' or even made statements that are getting lower payments compared to the work they actually feel they produce, but no connection to the technology applied was made. These data correspond with Gin’s (2018) findings where it is estimated that wages underpay contribution in several cases.

However, regarding the shifts at wages due to technology, the interview data are also perfectly aligned with Card & DiNardo (2002, p.774), where it is supported that this was actually the case in the 1980s and early 1990s and where they attribute the shift to other plausible—albeit more mundane factors.

Additional training due to technological advancement & education as a solution to unemployment
Ideas collected from the interviews about additional training in order skills to be updated according to the current digital trends were that: training is always essential (as the mechanical engineer put it fundamental education stays the same but updating it is required so that it can follow the current trends, because some applications have become obsolete, and is especially needed for the new professionals).

The finance auditor stated that this is an ongoing reality in her job. Annual seminars take place so as employees to be familiarized with the updated versions of software. However, the administrative staff interviewee brought into discussion that automation means replacement and in some cases training is no applicable. This underlines a difference between routine and non routine tasks. However, the frame of reference describes in darker colors the situation for white collar jobs stating that sometimes they prefer the job turnover in jobs demanding lower skills than theirs. As Frey & Osborne, (2013, pp.13-4), cite:
For example, Beaudry, et al. (2013) document a decline in the demand for skill over the past decade, even as the supply of workers with higher education has continued to grow. They show that high-skilled workers have moved down the occupational ladder, taking on jobs traditionally performed by low-skilled workers, pushing low-skilled workers even further down the occupational ladder and, to some extent, even out of the labour force. This raises questions about: (a) the ability of human labour to win the race against technology by means of education; and (b) the potential extent of technological unemployment, as an increasing pace of technological progress will cause higher job turnover, resulting in a higher natural rate of unemployment (Lucas and Prescott, 1974; Davis and Haltiwanger, 1992; Pissarides, 2000).

Regarding the document analysis inputs, they seem to conform with the frame of reference. In Brown (et al., 2017) we see the above described reality to be confirmed when discussing about future organisations constituting of a few pivotal people using technology, the supply chain and intellectual property, rather than human effort and physical assets, to generate value. An administrative staff interviewee’s statement about ICT certifications being required by employers seem to be similar to the author’s saying about the commercial value of learning taking precedence at the expense of a university degree. Workers know that the most sought-after skills will mean the biggest reward package (ibid, 2017, p.13) and that they are responsible for their careers.

**Age gap**

An issue opened by the teacher when asked about the ICT skills required in her job was the one of age. The ICT applied is mainly interactive whiteboards, educational software and learning management systems. She stated that its usage is based on experience, mostly for someone being able to use a computer or certain software. She commented that older teachers may have difficulties at this. However, the teacher’s statement seems to oppose indirectly the finding in (Cruz-Jesus, et al, 2016) where high educated Europeans better adopt ICT than other EU citizens with lower educational level and directly opposes to the findings in Neves et al. (2018) where it is stated that:

*it is clear the age-based assumption of non-use (and even types of use) cannot be universally applied and should be contested. The interplay of contexts and agentic and structural processes means the digital divide is intersectional (including gender, social class, living settings, practices, norms, etc.) and not merely age-related (or 'grey' as often ageistically defined).*

**Safety and health protection**

This is a theme entered by the worker in the mining and metallurgy company who claimed that the percentage of the human intervention to the blast furnace has been reduced by 40 % and evaluated this as positive since previously the workers were more exposed to toxic minerals harmful for their health. This theme did not interest the current degree project from the beginning as a matter that merely
refers to the manual working duties. However, I discovered in literature that Health and safety are becoming the key issues for global worries. In many studies, effective management of occupational safety and health found to play a pivotal role in running a successful business. The global issue for sustainable development for the citizen is the health and the safe working groups at their workplace (Jilcha & Kitaw, 2017, p. 372).

Most of the companies focus on productivity improvement, technological build up and profit maximization of the industries than workplace safety and health innovation, although it is common knowledge nowadays that occupational accidents and diseases can have a major impact on the productivity, competitiveness, reputation of individual enterprises, livelihoods of individuals and their families. Recent studies have shown that technology along with culture and politics are among are the modern world's elements of sustainable development and occupational safety and health (ibid, p.376). The occupational safety and health programs indirectly affect the society, technology, innovation, culture, economy, politics and environment in the long term. On the other hand, without social and economical sustainability, safety and health would not be successfully managed and guaranteed (ibid, p.378). Technology is one of the pillars of sustainable development and approaches of safety and health.

Cost
The academic director argued for the cost effectiveness of the usage of the platform as means of effective communication.

As the vehicle auditor supported further technological advancement and automation of procedures has not progressed yet due to the cost it entails. However, she considers herself being threatened in the close future due to the advancements in her sector. Sirkin, Zinser, and Hohner, (2011), (mentioned previously in the literature of reference) argue about automation reducing the cost of human labor.

The mechanical engineer working from the procurement company, when asked if he estimates that the IT related investments are at a satisfactory level in his company argued that they could be better because of the reduced amount of licenses for the software needed and the special permissions from the managers’ required to be obtained. He attributed this reality to the high cost, when asked later in a follow-up question. Reflecting upon his statement, a consensus with Mayika et al. (2011, p.23-4) seems to exist. In the report IT capital investments are nominated as one of the two essential preconditions for IT to affect labor productivity, stating that they give workers better and faster tools to do their jobs. The other is investments in human capital and organizational change—i.e., managerial innovations that complement IT investments in order to drive labor productivity gains. The researchers observe a lag between IT investments and organizational adjustments and they support that the same applies to Big Data.

5.1.2 New forms of organising /working: crowdsourcing

Outsourcing was initially explored since crowdsourcing is a kind of outsourcing and there was an intention to enter the interviewees into the main idea of the questions and the researching interest. Functionalities such as cleaning, building security service, accounting and payroll services were mentioned by many interviewees. A different datum was the one given by the finance auditor in a multinational company about training seminars outsourced by other companies.
Personal experience, apart from the software developer interviewee, was scarce, although all the interviewees were familiarized with aspects and forms of the concept as described in the frame of reference. The IT sector is ideal for crowdworking and is a field that crowdworking has already flourished a lot. The reason is that small pieces of work such as small applications or websites design are applicable for this kind of working. The interviewee connected her experience as a crowdworker not as a side work for supplementary income, but as her 'main' work at times of unemployment when she was younger, in her twenties. She referred to the income gained as ranging from low to high at times.

Another aspect of crowdsourcing, the one related to product design, was also brought into. As the interviewee stated employees and corporate customers are being asked their opinion about the products.

From a business' perspective, crowdworking was also explored during the interview with the Academic director after a supplementary communication with the commercial department of the corporation. Recycling is an idea to be promoted to the students since students of all branches are asked to make their contribution by bringing tins in order the goal of 1.000.000 tins to be achieved and the robot educator to be brought in Greece.

Gatautis and Vitkauskaite (2013), in the thesis’ frame of reference, have already included this crowdsourcing form when referring to it being deployed in various marketing activities such as product management, distribution management, communications management and marketing research through application of various types of crowdsourcing opportunities. Digout, (et al, 2013), too. The latter researchers had also confirmed the most pertinent for this example; the customer becomes a source of innovation and this is almost the case in the empirical data gathered from the Academic director since students are actively involved in the process.

6. Conclusion

In Chapter 6 (Conclusion), a summary of the process and the significant findings from the analysis are presented in relation to the purpose and research question. Thesis contribution and directions for future research are also suggested.

6.1 Conclusion

To conclude, the problem discussion of the introduction and the research question are being reviewed.

In this master degree project, work is regarded as manual and cognitive, involving routine and non-routine tasks in any sector of economy. Indicative sectors and business departments that include manual (eg. mining company) and cognitive tasks (eg. IT departments/companies), routine and non-routine tasks, were examined. The technologies entered in the workplaces that are examined here is Artificial Intelligence, enabled by Big data and Machine Learning and the
time period is since 2000- starting from the period of the mobile devices and Web 2.0 until today. Consequently, worker is regarded as the person working in any business department of any sector doing these tasks, ranging in specialty, occupation, education and skills, excluding managerial positions.

The current assignment adopts the argument that it is (or soon will be) obsolete to discuss about the threat of deskilling and automation just in the middle-income occupations and positions or to categorize jobs by earlier income rates. As for the former, the argumentation is that, as noted by multiple secondary data and primary ones, the essence is laid in the skills, especially the cognitive, non-routine ones. These skills, as analyzed in the fourth section, can be found from the bottom to the top of the occupations pyramid. As for the latter, to the degree examined in this thesis, there is a tendency to deterioration for many high-skill jobs, so older ratings need to be renewed, although these separating lines are found to exist.

There is also a need to shed light and act on working agreements; which worker is considered employee or contractor, and which is not, according to the working terms. This thesis confirmed that there is a blurring in the terms of working agreements. A blurring of the working time was also observed, as far as crowdfunding was concerned and the working agreements issue is prevalent in these cases -especially if we reflect on another finding discussed in this project about being a main occupation for some workers. Crowdsourcing was also found to be leveraged for project design and marketing and communication purposes, enhancing the competitive position of a company.

It is also necessary to discuss the relevance of the findings in relation to the argumentation in the methodology (see section 3). Since the gathering of empirical material and analysis was performed as planned it is argued that the results do carry acceptable reliability and relatively high validity claimed.

In general, empirical data and the frame of reference were in unity without direct disagreements and some empirical data that brought up issues outside of the frame of reference, which was expected in the exploratory study. The empirical data was generally consistent, with the exception of some variations in terms of different priorities between industries, which is estimated as an expected and normal element. There was also an opposition between some findings in the interviews and some findings in the reports. For instance, one opposition concerned the work-life balance which was recognized as a current problem by both companies (as indicated in company reports examined) and workers (data from interviews), however the ‘solution’ indicated by the companies (flexibility) was the problem itself for the workers. This is indicated in the discussion section.

Reflecting upon the assignment, special cautiousness is shown in terms of generalization, however contradictions were revealed and cannot be overlooked. For example, a contradiction noticed and discussed previously was that, although it is common knowledge that Machine Learning, which enables automation, and Big Data may reduce cost, no such investments are done. It seems that cheap labor remains a solution for the big companies.

Questions generated in this research, probably to be answered in future research, are if this is
actually an “Information Society” or “Knowledge Society” or “Digital Age”. This is the reflection expressed: since we examine changes in the work and what is the profile of a worker, what would be truly beneficial on a societal level is to conclude if these changes technology has brought have ameliorated -or if the prospects are to ameliorate- the worker’s life. Or else, if the possibilities that are released are fully leveraged at the worker’s favor. The answer is likely to be negative. For example, contradictions like why there was wage rises in the 80s and today are not, at least as far as lots of workers and occupations are concerned can better be answered with economy terms and not with technology terms. The same goes with the intensification of work or the (prospective) unemployment. We can never blame the tool, but the hand keeping it. ML and Big Data can never be a threat provided they are at worker’s service. Human needs are augmented more and more thanks to the modern level of growth of the productive forces, the achievements of science and their applications on every sector (health, education, etc). These needs concern the decrease of the working time and the increase of the leisure time and aspects of our living standard, like our living and working conditions, environmental issues, confrontation of health problems with emphasis on disease prevention, increase of life expectancy, culture, etc. Developments in technology can be considered a useful ally, not a threat.

6.2 Contribution

This thesis was not engaged with a ‘new’ topic. Lots of researchers conducting qualitative and quantitative research and exploring various dimensions of the phenomenon and in different time periods have addressed similar issues raised in the current degree project. As already described in the introductory section there is a rich literature especially focused on technologies entered in the workplaces and the changes in work that might be attributed to them. Here, in the current project, the updating of previous research findings is achieved, since the digital era, in specific, was explored, i.e the application of Artificial Intelligence, enabled by Big data and Machine Learning and the time period to be explored is since 2000 until today.

6.3 Future Research

This study allows to build a foundation through which hypotheses and research questions of trends in the industry can be further developed and explored in a future study or survey. The impact of the social technologies in businesses or the working time would be some area of further exploration. Working agreements and relations, too. Such issues were involved in contemporary reports and articles that this current degree project included, however they can perfectly stand on their own and deserve deep and not epidermic research. Given that a tradition of measuring the various aspects of 21st-century digital skills has not yet been established, it is useful to carry out more smaller in-depth qualitative studies (van Laar, et al., 2017, p.582) perhaps examining historically the advancements in specific sectors of industry and economy. Another issue worth investigation is the new occupations emerging due to AI and Machine Learning. Additionally, the implementation of Workforce analytics i.e the exploration of the changes in work leveraging Big data, viewed as a branch of the evolution of businesses, is another area which deserves future research.
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The Economist Intelligence Unit, 2016. Use of Workforce Analytics for Competitive Advantage, SHRM Foundation

Appendices

Appendix A

Timeframe:

<table>
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<th>Task Description</th>
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<th>Q2</th>
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<tr>
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Appendix B
Informed Consent Form

Linnaeus University
Sweden

The following consent form partly follows the template of the Trinity Collage Dublin, the University of Dublin and is available at: https://www.tcd.ie/swsp/assets/pdf/Participant%20consent%20form%20template.pdf and the University of Edinburgh (https://www.ed.ac.uk/files/imports/fileManager/Interview_Consent_Form.pdf)

Informed Consent Form for working people, invited to participate in the research "The changing nature of Work and Worker in the digital era"

This Informed Consent Form has two parts:

• Information Sheet (to share information about the research with you)

• Participant Consent Form (for signatures if you choose to participate)

You will be given a copy of the full Informed Consent Form.

Part I: Information Sheet

Research Project Title: The changing nature of Work and Worker in the digital era

Invitation This research is being carried out by Eleni Georgaki, postgraduate student in Information Systems, Linnaeus University, in the frame of the course "Degree Project in Informatics at Master level". You are being invited to take part in this research project. Before you decide to do so, it is important you understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading...
What is the project’s purpose? This research project aims to investigate the ongoing changes in digital work and, consequently, in the workers, since Artificial Intelligence (AI), enabled by Machine Learning (ML) and Big Data has entered dynamically the workplaces. These developments shape the future of work as we know it impacting on various dimensions, such as deskilling, emergence of new skills, new forms of organizing and strategizing, such as crowdsourcing. It also aims to provide insights on how Big Data (workforce analytics) are leveraged for human capital purposes. This project builds on research previously carried out by other researchers and has been designed to allow comparisons with previous findings.

Why have I been chosen? You have been chosen because a person deploying ICT in your job, you will have knowledge about possible ways that these changes in work affect job skills.

Do I have to take part? It is up to you to decide whether or not to take part. If you do decide to take part you will be able to keep a copy of this information sheet and you should indicate your agreement to the consent form. You can still withdraw at any time. You do not have to give a reason.

What will happen to me if I take part? You will be asked to take part in an interview (phone/Skype or in your premises) which we estimate will take you 15-20 minutes. There are no other commitments or restrictions associated with participating.

What are the possible disadvantages and benefits of taking part? Participating in the research is not anticipated to cause you any disadvantages or discomfort. There are no immediate benefits for those people participating in the project, too.

Will my taking part in this project be kept confidential? All the information that we collect about you during the course of the research will be kept strictly confidential. You will not be able to be identified or identifiable in any reports or publications. Your company will also not be identified or identifiable. You can select this option in the quotation agreement included in the consent form.

Data collected may be shared in an anonymised form to allow reuse. These anonymised data will not allow any individuals or their institutions to be identified or identifiable.

Will I be recorded, and how will the recorded media be used? You will not be recorded without separate permission being gained from you.

What type of information will be sought from me and why is the collection of this information relevant for achieving the research project’s objectives? The researcher will ask you about your opinions and current practices in relation to the above described issues (see project’s purpose). Your views and experience are just what the project is interested in exploring.

What will happen to the results of the research project? Results of the research will be included in the degree project for which this research is carried out. You will not be identified in any report or publication. Your institution will not be identified in any report or publication. If you wish to be given a copy of any reports resulting from the research, please ask us to put you on
our circulation list.

**Who is organising the research?** This research is part of the course Degree Project in Informatics, Linnaeus University, Växjö, Sweden.

**Contacts for further information**

Degree project in Informatics, Linnaeus University,

researcher: Eleni Georgaki (contact information: eg222sb@student.lnu.se)

supervisor: Behrooz Golshan (contact information: behrooz.golshan@lnu.se)

**Any questions?**

Thank you for taking part in this research!

Part 2: Participant Consent Form

The current consent form is an agreement between the researcher and the research participant outlining the roles and responsibilities they are taking towards one another throughout the whole of the research process. The researcher will retain one copy of the consent form signed by both themselves and the participant. The participant will also be given a copy of the consent form as a record of what they have signed up to.

**The changing nature of Work and Worker in the digital era and new forms of organizing and strategizing**

**Consent to take part in research**

- I………………………………………. voluntarily agree to participate in this research study.
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.
- I have had the purpose and nature of the study explained to me in the Information Sheet and I have had the opportunity to ask questions about the study.
- I understand that I will not benefit directly from participating in this research.
- I do / do not agree to my interview being audio-recorded.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview.
which may reveal my identity or the identity of people I speak about.

- I understand that disguised extracts from my interview may be quoted in the researcher's above mentioned degree project.
- I understand that signed consent forms and original audio recordings (in case my permission is obtained) will be retained by the researcher for two years.
- I understand that a transcript of my interview in which all identifying information has been removed may be retained by the researcher for future research purposes such as publications related to this study after the completion of the study.
- I can request a copy of the transcript of my interview.
- I understand that the transcript of the interview will be analysed by Eleni Georgaki as research investigator and access to the interview transcript will be limited to academic colleagues and researchers with whom she might collaborate as part of the research process in the frame of the course 'Degree Project In Informatics'.
- I understand that under freedom of information legalisation I am entitled to access the information I have provided at any time.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

**Quotation Agreement**

I also understand that my words may be quoted directly. With regards to being quoted, please initial next to any of the statements that you agree with:

<table>
<thead>
<tr>
<th>I wish to review the notes, transcripts, or other data collected during the research pertaining to my participation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I agree to be quoted directly.</td>
</tr>
<tr>
<td>I agree to be quoted directly if my name is not published and a made-up name (pseudonym) is used.</td>
</tr>
<tr>
<td>I agree that the researchers may publish documents that contain quotations by me.</td>
</tr>
</tbody>
</table>

*Degree project in Informatics, Linnaeus University,*

*researcher: Eleni Georgaki (contact information: eg222sb@student.lnu.se)*

*supervisor: Behrooz Golshan (contact information: behrooz.golshan@lnu.se)*

*Signature of research participant*
Signature of participant

Signature of researcher

I believe the participant is giving informed consent to participate in this study

Signature of researcher

Date

Appendix C

Interview Guide Questionnaire

AI and skills

1. From your experience, do you think that skills required for existing positions in your sector are replaced by others due to IT-related changes?
   1.1 Which ones?
   1.2 How?
   1.3 In what pace?
   1.4 Which emerging skills do you value as more important? Why?
   1.5 Which attributes/skills of staff are much appreciated (by employers)? (related to ICT)
   1.6 about your position? Why? Why not?

2. From your experience, do you see some positions gradually become obsolete?
   2.1 Which ones?
   2.2 yours? Why? Why not?

3. What is the 'solution'?
   3.1 dismissals?

3.2 extra training?
   3.2.1 what kind of training?

3.3 other?

4. Is AI an aid to your work or your replacement?
   4.1 Are you in favour of work-life balance or work-life integration? What would be more helpful for you?

5. About the working agreements:
   5.1 What is the (approximate) percentage of the staff that are employees?
   5.2 individual contractors?
   5.3 staff on part time agreement?
   5.3.1 employees or contractors?
5.4 staff on full time agreement?
   5.4.1 employees or contractors?
5.5 other kind of agreements?

Other Forms of Strategizing: Crowdsourcing
6. Has your company applied outsourcing?
   6.1 what for?
   6.2 for how long?
   6.3 what are the benefits? any drawbacks?
7. Has your company crowdsourcing?
   7.1 what for?
   7.2 for how long?
   7.3 what are the benefits? any drawbacks?
8. Have you ever worked as a crowdworker (in a platform) or elsewhere?
   8.1 If yes, in your current profession?
   8.2 What for?
   8.3 Which were your exact duties?
   8.4 what about your working schedule?
   8.5 advantages/disadvantages?

Big Data used for workforce insights
9. Do you think that data analytics are used for workforce insights?
10. Do you think they are deployed in your business?
   10.1. what kind of data?
   10.2. for what purposes(recruiting, skills searching, turnover patterns, other?)?
11. Do you feel threatened about how Big Data are used for reaching decisions concerning the human capital?
   11.1 if yes, why?