

INCLUSIVE FUTURES FOR EUROPE: ADDRESSING THE DIGITALISATION CHALLENGES

Vassil Kirov
Bagryan Malamin
Editors

● BEYOND 40



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BULGARIAN ACADEMY OF SCIENCES
INSTITUTE OF PHILOSOPHY AND SOCIOLOGY

**INCLUSIVE FUTURES FOR EUROPE:
ADDRESSING THE DIGITALISATION CHALLENGES**

BEYOND4.0 Scientific Conference Sofia 2021 Proceedings

Vassil Kirov
Bagryan Malamin
Editors

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PREFACE.

THE NEW CLARITY OR STILL EXPLORING THE LIMITS OF THE GAME?

Steven Dhondt

Ask any social scientist what will happen in the social domain; the answer will almost always be that it depends. Social scientists point to the influence of many factors and remain, at best, quite humble in their assertions.

It is, therefore, all the more surprising that in the domain of technology and work, the utopian deterministic thinking of Frey & Osborne (2017) (Leonard & Tyers, 2021) has become so prevalent in the last ten years. In fact, this study by Frey & Osborne started as no more than '*spielerei*' (it took another four years for the internal paper to be published in a peer-reviewed journal), but it quickly became a new 'clarity' about the future of work. It is not surprising that sociologists were pretty baffled by this new clarity. Work would disappear, technology would work autonomously, and only those with the skills to be social and creative would have a future. These statements were grist to the mill of employers and policymakers. The employee should not whine so much. The message was to move with the times instead of holding on to 'outdated' certainties.

In September 2021, the H2020 Beyond4.0 consortium organised its Scientific Conference. For the project team, this was a good moment to take the plunge and think about what is really going on in industry and service networks. We asked the research field what kind of work we would see in the future. Fourteen research papers were selected for this book. The authors have tried to see if we are now in an industrial and economic transformation with such clarity about the future as Frey & Osborne predicted. For these social scientists, some healthy doubt about such clarity remains.

The H2020 Beyond4.0 project suggests we need to look beyond the predictions about technology, work, and labour markets. We can do that in two ways: we can look at what is happening in front of the curtain ("what impacts of technology, etc. do we see?"), but it is also wise to look behind the curtain ("how did we come to those utopian predictions?"). The latter action still happens too rarely (see comments by Pfeiffer & Suphan, 2015; Dhondt et al., 2022). The social science field has been quite distracted by the possibilities offered by Frey & Osborne to deploy machine learning in social science research. Indeed, there are some important weaknesses in their reasoning that have not adequately been addressed to date. First of all, it is based on the assumption that managers will look for cheap and simple tasks and replace them with technology. In practice, managers work the other way around: which (relatively) expensive tasks are there, and how can I eliminate them? Secondly, the prediction that mainly social and communicative tasks will be required in the future is not very realistic. Ever since Jean-Jacques Rousseau wrote his *Emile* (1762), thinkers have been searching for the essence of 'man' and 'work'. The reasoning that the

essence of man lies in the social, communicative, and creative is attractive. Still, for quite a lot of work, such tasks are still of limited significance. Mostly, even in the new jobs that are emerging, work requires limited intellectual activity and is quite physically and mentally demanding. A final limitation is a methodological one. The reasoning that it is possible to deduce from the description of present work what will become dominant in the future is by definition unlikely. Tasks of the past do not accurately predict tasks of the future. The description of work with surveys such as PIAAC, BSS, etc. tends to indicate the division of labour used in organisations more than it does the new future work situation (Dhondt et al., 2021).

Frey & Osborne's predictions have let us down for the time being. Not one of their predictions has led to the predicted changes. On the contrary, we see that companies are having a hard time implementing Industrie 4.0 technology. Labour markets show major shortages of staff at all skill levels. Social and communicative skills do not lead to higher wages. These predictions are, therefore, far from reality.

The Beyond4.0 Scientific Conference provided a platform for research groups from across Europe to share their findings on work and the future. As indicated, most of the results look at what is happening in front of the curtain. What can we see in companies and labour markets? The fourteen research papers focus on both I4.0 and developments in the platform economy. The subjects vary from technology (AI), ecosystems, and education to employment relations, skills, and the labour market. The researchers gauge whether we can see a transformation of labour content and labour relations. They hesitate between a hard shock and gradual change. Is there any real change in the behaviour of companies? Several point out that opportunism is still central to managerial behaviour (see the chapter by Jeleva in this book). In fact, the researchers refer to broader and deeper developments in our economy. The progressive flexibilisation of labour relations still negatively affects work content. Some express the hope that there will be a change in work. Perhaps new technology will lead to a more controlled and monitored type of work, but Blauner (1964) already made this prediction in the 1960s. Perhaps hybrid work, as an outcome of the COVID-19 crisis, will lead to new perspectives. Researchers consistently point to the many conditions needed for real change.

The Beyond4.0 Scientific Conference provided the context for an open discussion about people and work. It is a warning that we should not run like lemmings all in the same direction. More nuanced conclusions are needed because policies must take into account many more circumstances than was previously thought. The new clarity does not, therefore, provide clarity. Social scientists are better off with "it depends". It makes sense for today's worker to hold on to his own certainties, especially when the predictions are very uncertain. The engagement of the participants in the Scientific Conference was therefore very welcome and useful. Thanks to Vassil Kirov, Bagryan Malamin, and the Bulgarian Academy of Sciences for publishing the research results.

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CHAPTER 1.

INTRODUCTION. INCLUSIVE FUTURES FOR EUROPE: ADDRESSING THE DIGITALISATION CHALLENGES IN EUROPE

Vassil Kirov

This book aims to present the findings of recent European research on digitalisation and its impacts. The collected chapters were presented at a large scientific conference held in Sofia under the framework of the European BEYOND4.0 project on 30 September and 1 October 2021.¹

THE PROJECT

BEYOND4.0 aims to help deliver an inclusive European future by examining the impact of new technologies on the future of jobs, business models, and welfare. BEYOND4.0 addresses the general priorities of the H2020 Work Programme (2018-2020) “Europe in a changing world – Inclusive, innovative and reflective societies”. The project will provide insights and measures that help address poverty, equality, and decent work by formulating an alternative, “low road” Industry4.0 approach. The project objectives are the following:

- To provide new, scientific insight into the technological transformation.
- To render this insight into company strategies dealing with the technological transformation.
- To examine the impact of the technological transformation on quality, content, work distribution, skills, education, and value creation.
- To identify policy options for: a) fiscal policy, e.g., robot taxes; and b) welfare policy, e.g., basic income.
- To develop social investment approaches and tools for inclusive growth.
- The project includes partners from Bulgaria, Germany, Finland, France, the Netherlands, Spain, and the United Kingdom.

¹ The programme is available at: <https://beyond4-0.eu/events/scientificconference>

THE BEYOND4.0 SCIENTIFIC CONFERENCE “INCLUSIVE FUTURES FOR EUROPE BEYOND INDUSTRIE 4.0 AND DIGITAL DISRUPTION”

The conference was organised by the BEYOND4.0 Consortium and the Bulgarian Academy of Sciences, in collaboration with the European School of Social Innovation ESSI, the European Workplace Innovation EUWIN network, and other networks and projects such as Paradigms4.0 in order to give international researchers in the social sciences an opportunity to exchange the results of recent research in different fields concerning the effects of digital transformations on work and employment. The conference's aim was to present and discuss the project findings thus far. In addition, relevant contributions from other EU projects and research on the digital transformation were encouraged to synergize and synthesize results.

More than a 168 participants participated in the event, either in person in Sofia or remotely because of the travel difficulties related to the COVID-19 pandemic. Keynote lecturers included Prof. Mariana Mazzucatto (The Direction of Innovation: A Mission-Oriented Approach), Prof. Paul Osterman (The Changing Contours of Work: Implications for Employees and for Public Policy), Prof. Chirs Warhurst (For better or worse? The impact of digitalisation on future social relations at work), Prof. Steven Dhondt (Why Industrie 4.0 technology requires so much talent. Drilling deep into the entrepreneurial ecosystem results of Beyond 4.0), Dr. Glenda Quintini (Getting Skills Right: Changing Skill Needs for the Recovery and Beyond), Prof. Olli Kangas (How [and why] to plan a large-scale randomised field experiment?), and Prof. Jürgen Howaldt (Why Digital Transformation Needs Social Innovation: A New Twin Strategy for Sustainable Development and Inclusive Futures). In addition, 53 papers including 101 authors were presented and discussed at this scientific forum.

THE DIGITAL TRANSFORMATION AND THE BEYOND4.0 APPROACH

There are many definitions of digitisation. In a narrow sense, it is the integration of digital (digitised) technologies into everyday life through the digitisation of anything that can be digitised, or “the process of converting anything into digital form” (Merriam-Webster Dictionary). In a broader sense, digitisation is seen as “the economic and social transformation brought about by the mass adoption of digital technologies for generating, processing, sharing, and exchanging information” (Katz et al., 2014). This concept is still evolving in both academic and policy debates, with no consensus on what should or should not be included. In any case, the general acceleration of the pace of technological change in the economy is due to the enormous expansion of our capacity to store, process, and transmit information using electronic devices. The digital transformation is thus profoundly modifying many aspects of our lives: the way we buy, sell, connect, communicate, participate, create, consume, and – of course – the way we work (Meil &

Kirov, 2017). In this sense, digitisation also raises questions about the future of work and employment (Kirov, 2022).

The basic premise of our analysis, in the spirit of our work on BEYOND4.0, is that technology, including digital technology, is not deterministic but socially negotiated by key actors at different levels: of firms, sectoral, regional, national, and EU. This process of digital transformation involves two main manifestations or organisational models, Industrie 4.0 (Industry 4.0) and platformisation, often referred to as Uberisation (Warhurst et al., 2019). Their emergence and their initial disruptive effects are fundamental to understanding the impact of digital transformation.

To a large extent, however, the implications of these two manifestations of the digital transformation are still hypothetical and/or speculative. They are mostly based on econometric modelling and prescribed values (Dunlop, 2016). With that in mind, the present book offers a large variety of empirical contributions, filling the void.

THE PROCEEDINGS

While initially it was not planned for the papers presented at the conference to be published, the organisational committee decided to address the wishes of several participants through a joint collection of papers and conference proceedings. The call was launched at the conference, and several researchers indicated their interest to contribute.

The contributions in this book come from 25 researchers from a number of European universities and research centres in Belgium, Bulgaria, France, Germany, Hungary, Italy, the Netherlands, Portugal, and the UK. These contributors have developed their analysis in the framework of several disciplines – sociology, organisational studies, labour law, employment relations, economics, philosophy, and future studies, among others. The presented chapters have been proofread. However, the proceedings consist of contributions that have not been peer-reviewed and were accepted as they were prepared by their authors.

They cover a wide variety of topics related to the two main dimensions of the digital transformation. Some chapters focus on changes in manufacturing, while others look to platforms. Several authors interpret empirical results from specific country studies, e.g., the deployment of Industrie 4.0 in Belgium, the automotive industry in Portugal, or translation companies in Bulgaria, while others offer a more abstract reflection on particular topics related to the digital transformation, e.g., the future of skills or the collaboration between humans and robots. More concretely, the content of every chapter is presented in the following paragraphs.

In their chapter, Smith et al. (2022) argue that the implementation of digital technologies changes not only tasks, jobs and organisations but even the composition of the labour market. The authors underline the fact that the empirical evidence of how technology possibly affects working conditions is scarce. Their analysis, based on 25 cases studies of Belgian organisations, concludes that the organisation is the determining mediating actor. In the case of Belgium, it is expected that job content will mainly shift to control and monitoring as opposed to performing tasks. Since the organisational context is crucial for the workability of these newly adapted jobs, the study of Smith et al. (2022) looks at the role of the middle manager in the design process. In their conclusion, the authors express their understanding that it would be beneficial for future research to include other sectors and to open up this perspective from a sole focus on technical features to the potential interaction between technology and people in the context of an organisation.

The chapter by Möwis et al. (2022) focuses on how Industrie 4.0 technology is changing the way manufacturing companies create value. According to the authors, in this specific context, transactional interactions with supply chain partners are evolving towards long-term relationships across a network of strategic partners that is necessary for realising digitally enabled value propositions. In their methodological approach, the Delphi method has been used to let academics, industry experts, and practitioners reflect on the current and expected future role of ecosystems for Industry-4.0-enabled value creation and the characteristics of their underlying relationships. The authors have also tested a recently established typology to examine its relevance in this context and allow for the categorisation of different logics for leveraging ecosystems. Based on an extensive literature review and the Delphi method, this study contributes to the literature on ecosystems by enhancing insights about their prevalence and characteristics as well as how they are formed for the implementation of Industry 4.0 technology. Furthermore, the authors make a contribution to the literature on Industry 4.0 by demonstrating different trajectories for leveraging ecosystems that support manufacturing companies in their digital transformation, allowing them to generate new value, and examining how these ecosystems evolve.

The chapter of Candeias et al. addresses another question related to the state of the art of research on Industry 4.0. Amid fears about the future of work, their analysis focuses on changes in employment within the automotive sector that have accompanied recent automation trends in Portugal. The empirical work is based on cases from the automotive and components industry combined with data from Portuguese R&D projects on robotics, machine learning, collaborative tools, human-machine interaction, and autonomous systems, all supported by European structural funds. The chapter concludes that employment did not decrease in the automotive sector in Portugal during the period 2010–2017, despite the implementation of digital technologies. In some cases, efficiency and productivity increases derived from the implementation of digital technologies have even led to the creation of new jobs. In the case of Portugal's automotive sector, digital technologies – including AI – seem not to be replacing workers but augmenting their

capacity to perform tasks. Changes in work organisation due to digitalisation are expected to undergo a displacement effect in some occupations, while in others that are associated with the adoption of new artifacts, a qualification of work will follow, as the current workforce lacks the skills to operate these new technologies.

Industry 4.0 and the adoption of new digital technologies require the acquisition of new skills. The overarching aim of the chapter by Tamasi (2022) is to present new research that sheds light on the impact of new technologies' adoption on skills requirements in Scottish manufacturing small and medium enterprises (SMEs). The research highlights the need for a more nuanced view on technologies when examining the impact of the technological transformation on organisations and skill requirements. To gain a better understanding about the homogenous effects of different technologies, the implementation of three types of technologies, and their consequent effects on skill requirements in manufacturing SMEs, the author compares Enterprise Planning Systems, Factory Acceptance Test systems, and hard automation. The research also emphasises the importance of organisational context, which can be studied through exploring the interplay between technologies and skills in an SME. Overall, the chapter contributes to discussions on skills development initiatives in the face of Industry 4.0 in the manufacturing sector, with a unique focus on small and medium enterprises. From a policy perspective, the research will identify sectoral best practices and inform current sectoral skills development initiatives addressing the unique needs of small and medium enterprises. This chapter presents the conceptual background of the research, introduces the studied technologies and their potential effects on skills, discusses the research context, and outlines the methodology of the research.

Todorova's chapter (2022) is also focused on skills in the context of the digital transformation, but in a broader, societal sense. She argues that the key trends leading to the change of educational systems are a result of the Fourth Industrial Revolution and the digitalisation of society. New skills beyond digital competences require more creativity, innovation, collaboration, and problem-solving skills in the so-called self-actualizing economy, where participants and economic systems are constantly improving themselves, mainly through new types of education systems.

The application of digital technologies and systems with artificial intelligence has been deployed not only in industry but also in services. The subject of this chapter by Parcheva (2022) is the innovative potential of information technologies for transforming work processes in specialised translation agencies and the role of workplace innovations. Changes in the workplace as a result of the functionalities of modern information technology solutions are theoretically analysed. The concept of "workplace innovations" is also discussed in the context of digitalisation, followed by a presentation of the results from an empirical study among translation agencies from the Varna district of Bulgaria. The survey data show that information technology has entered the activities of translation agencies, opened new market segments, and changed the job tasks, work processes, and

competences within the respective professional profiles: translators, order/project organisers, and marketing and administrative specialists. A prerequisite for higher productivity, efficiency, and quality of work is the combination of technological digital innovations with the participation of specialists and social innovations in the workplace. Lastly, she formulates conclusions and recommendations from the study.

As argued by Malamin (2022), artificial intelligence is one of the core technologies of the digital transformation. It is expected not only to lead to job losses, initially in occupations characterised by routine activities, but increasingly in creative professions. His chapter analyses the results of a recent empirical survey of graphic designers and copywriters in Bulgaria on their attitudes towards AI and their views on the future of their professions as they are influenced by the digital transformation. The majority do not perceive AI and automation as a threat. In their view, digital technologies and artificial intelligence are a favourable opportunity for both professions and will change them by taking away routine tasks and leaving creative activities to humans alone. Graphic designers and copywriters will engage in creative work, and their work will become more in demand because it is human. The research analysis shows that pessimistic scenarios of massive job destruction may not hold true. Expectations of a deterioration in the quality of work (Holtgrewe, 2014) as a result of digitalisation are also not borne out. This study is the first of its kind in this country to explore creative professions and their attitudes towards AI.

The digital transformation has been deployed in parallel to other megatrends, including climate change and the imperative for sustainability. This implies the introduction of new standards, as highlighted by Jeleva (2022). The focus of her analysis is Information Technology (IT) sustainability and reporting on sustainability dimensions within this sector. The latter is illustrated by the use of sustainability reporting platforms such as the Global Reporting Initiative and the German Sustainability Code. The analysis indicates the limited presence of IT companies in these databases. Such research cannot explain the motives/drivers for disclosing non-mandatory information on the sustainability performance of companies and their managers/owners. Further in-depth research is certainly needed in this respect. IT companies do benefit from sustainability reporting, which provides an opportunity to demonstrate strategic leadership in times when digitalisation is becoming predominant.

In her chapter, Riczu (2022) also addresses workplace innovation in the context of the digital transformation and its legal aspects. She argues that technological development leads to the transformation of employment relationships. Among these, she places the legal situation of the employer and the rights of command, direction, and control at the centre of her research and explores this issue by combining theory and legal practice. The author argues that the digital transformation is not an inevitable process, and its analysis should take into account the lessons learnt from previous industrial revolutions. The shaping of the digital transformation largely depends on decision-makers; in addition, labour law should be adapted to these new changes and challenges.

The issue of the adaptation of labour law is also developed in the chapter by Mélypataki (2022). He argues that the labour market and labour law regulations are being affected by many elements at the same time. In his analysis, he focuses on the use of robots in the workplace and in the labour market. But this issue cannot be analysed without taking into account the consequences of the Covid-19 pandemic. However, the issue of robotization needs to be paralleled with the pandemic. This is because it has exacerbated the speed of robots' introduction in Europe. In this context, the analysis develops with respect to labour market developments and the joint work of robots and human labour in light of new labour law regulations. According to the author, in labour law relations, the application of cheap robots will directly influence working conditions as well as issues like wage bargaining and the exercise of collective employee rights. This situation will require efforts from multiple stakeholders such as companies, the state, and employees themselves in order to improve competences among employees.

The COVID-19 pandemic has not only exacerbated the use of digital technologies; it has stimulated the rapid introduction of remote work, even in contexts where this was exotic before 2020, as in Central and Eastern Europe. Even in parallel to the benefits for employees, telework has also reinforced inequalities among different groups, including on the basis of gender. In their chapter, Yordanova & Kirov (2022) aim to examine the gender effects of telework on the work-life balance before and during the COVID-19 pandemic period. The literature shows that the introduction of telework can enrich the possibilities for combining parental and professional roles. But it has also been observed that telework is a factor in work-family conflict. The data analysis from two quantitative studies, conducted in Bulgaria in 2016 and 2020, shows that imposed telework exacerbates existing gender inequalities. The analysis underlines that in the context of CEE countries, where telework had been marginal until recently, these new and complex situations require public policies and employer practices to take into account employee preferences.

In the literature, it is evident that the digital transformation has also become an occasion to further develop atypical forms of work (Capelli & Keller, 2013) and undermine traditional employment relations. Klimentova (2022) highlights the results from research carried out on contemporary alternative forms of civic engagement in labour that emerge, manifest themselves, and develop without intermediaries such as unions, companies, employers, non-governmental organisations, etc. Free consultations on a Bulgarian Internet forum on labour matters were the subject of this research. The analysis shows that individual labour cases tend to give rise to certain acts of civic behaviour (free consultations), as they generate informal voluntary social relationships connected with taking a supportive position towards others. The thesis defended herein is that such relationships transform virtual spaces into efficient places for everyday civic engagement and civic culture.

Atypical forms of work also relate to the platform economy. In their chapter, Abel & Dieuaide (2022) revisit the notion of work platforms by focusing on the virtualisation concept borrowed from Lévy (1998), on the basis of interviews with both employees

working for the company Uber and drivers using the Uber app. Defined in a simplified way as a process combining programming and notification, virtualisation is mobilised in two ways. First, to propose an approach to work platforms as ‘work ecosystems’ and to reassess the notion of digital labour, as the latter is too often reduced to a click – presented as a continuous activity anchored in the digital and professional spaces in which drivers transmit and receive information. Second, from this perspective, it is argued that the virtualisation process refers to a productive world based on the idea of work prefiguration or representation (being virtual work). Furthermore, the authors build a typology of externalities or socio-spatial effects based on the interplay between the digital labour activity of drivers and the Uber platform. The chapter concludes by discussing the scope of this framework for understanding the clashes in terms of temporality and the inevitable social conflicts in which the Uber platform is both the scene and the object.

KEY MESSAGES

The key messages of this book could be summarised in the following directions:

- The implications of the deployment of the digital transformation and its technologies, such as AI, automation, or Industry 4.0, still require in-depth studies on industries, regions, organisations, and professions;
- Despite fears about the end of work and the massive job losses due to automation, initiated with the contribution of Frey & Osborne (2013), the contributions of this book are in line with the call from BEYOND4.0 for a more nuanced approach; they also witness job augmentation and job change instead of job destruction;
- Technologies are not deterministic, but socially shaped, and this requires adequate answers from stakeholders at different levels – company managers and employees, representatives of employees and of businesses, the state and its administration, educational institutions, and skills providers. Moreover, the social sciences can provide meaningful recommendations and messages in this perspective, as underlined in most of the chapters. Workplace innovation can bring valuable, mutually acceptable solutions in order to tackle the digital transformation’s consequences, together with the introduction of necessary changes to labour laws at a macro level;
- The digital transformation is developing in parallel to other societal mega trends, such as climate change or ageing, and should be analysed in this light;
- The platformisation of the economy and employment could lead to a variety of consequences, including increased atypical work and the emergence of particular

new forms of such work. A voice is needed for these workers and employees, and the new forms of collective action will represent an increasingly interesting field of research.

The publication of this book is certainly one of the milestones of the BEYOND4.0 project, but more will come in terms of scientific publications and messages to stakeholders in the following months.

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CHAPTER 2.

SUSTAINABLE EMPLOYMENT IN THE AGE OF DIGITALISATION: UNPACKING THE ORGANISATIONAL LEVEL

Ine Smits, Marine Franssen, Laura Beuker, Karen Van Aerden, Miet Lamberts,
Ezra Dessers

ABSTRACT

The implementation of digital technologies changes tasks, jobs, organisations and even the composition of the labour market. Whereas it is often theorised how technology possibly affects working conditions, there is only a limited number of empirical studies available. Moreover, the latter shows that actually, the organisation is the determining mediating actor. To understand how organisational choices affect the relationship between digital technologies and the sustainability of jobs, this chapter organises 25 case studies in Belgian organisations using digital technology, varying in size and sector.

Regarding the organisational level, it is clear that the implementation of highly innovative technologies can have far-reaching effects on the organisational structure. It also challenges leadership and HR policies and implies changes in job content, working environment and employment conditions. To cope with new technologies, the literature describes the need to adapt job design to adequately incorporate new tasks and responsibilities for employees. In the case of Belgium, it is expected that job content will mainly shift to control and monitoring as opposed to performing tasks. Since the organisational context is crucial for the workability of these newly adapted jobs, this chapter more specifically looks at the role of the middle manager in the design process.

Keywords: *Digital technology, digitalisation, job design, organisational design, employment sustainability*

INTRODUCTION

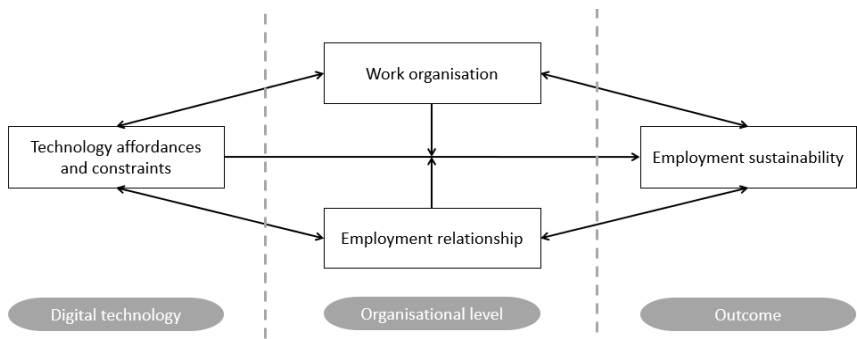
The increasing use of digital information and technologies, or digitalisation, influences our society on multiple levels. In addition to labour market effects, new digital technologies also challenge the current reality of work on the organisational and job level – affecting human-technology interaction, requiring new skills and imposing hierarchical changes (Veile et al., 2019). This chapter focuses on the organisational black box related to digitalisation, including organisational models and managerial practices that may promote

sustainable employment contextualised within technological innovation. We present a literature review discussing the state of affairs regarding the ‘organisational level’ as a defining intermediate factor between the implementation of digital technologies and job quality outcomes. The following paragraph (1) describes the conceptual framework for the literature review, defining four key concepts, and paragraph (2) presents the results of the literature review. Finally, we briefly elaborate on an action plan for upcoming research.

1. CONCEPTUAL FRAMEWORK

The interrelationships between the following four key concepts form the conceptual framework for the literature review. On the left-hand side, technology affordances and constraints represent the potential influence of digital technologies. Centrally, the organisational level is composed of work organisation and employment relationship, with distinction based on a conceptual model by Van Hootegem (2000). The first three concepts are defined in the next paragraphs. On the right-hand side, employment sustainability understood as the consequence of combining beneficial job features is mentioned as the outcome variable.

Figure 1. Conceptual framework



1.1 TECHNOLOGY AFFORDANCES AND CONSTRAINTS

The perspective of Technology Affordances and Constraints Theory refers to the potential of interactions between people and technology. The theory’s essential premise is that the impact of a digital tool can only be understood when considering the synergy between its specific technicities, on the one hand, and its organisational adoption and human experience, on the other hand. This synergy leads to so-called technological affordances and constraints. Technology affordances represent the action potential of new

technologies: how meeting a particular goal can be facilitated by the use of technology. For example, the combination of the technological features of a certain digital file-sharing platform and the personal skills of a group of employees using this platform leads to the technology affordance of “information sharing”. This is not inherent to the technological tool, nor is it characteristic of the group of individuals using the tool or the organisational context in which the tool is applied. “Information sharing” refers to what potentially can be reached when this platform is used and is thus a potential affordance resulting from the interaction between humans and the tool. This should, however, be distinguished from what is actually afforded by the technology. If, in the given example, employees use this platform for informal chatting rather than for sharing work-related content, “information sharing” is a technology affordance that is not afforded in reality.

Technology constraints, on the other hand, determine “ways in which an individual or organization can be held back from accomplishing a particular goal when using a technology or system” (Majchrzak & Markus, 2012: 1). A technology constraint of the file-sharing platform could, for example, be “decreasing direct communication”, as it limits personal conversations regarding file-sharing among employees.

1.2 WORK ORGANISATION & EMPLOYMENT RELATIONSHIP

According to Van Hooft (2000) and Huys et al. (2013), each organisation can be understood as the result of combined organisational choices in the field of its labour division and the employment relationship. In this model, organisational choices with regard to labour division include the production organisation (structure of the primary value-adding process), production technology (machinery and technology to produce outputs) and work organisation (grouping tasks into work packages to design workplaces). The combination of production organisation, production technology and work organisation results in a certain organisational structure within which specific jobs are defined (Huys et al., 2013; Van Hooft, 2000). In our conceptual framework, we have enlarged and renamed this concept to ‘work organisation’ to reframe the focus on how organisations deal with jobs and roles within an organisational structure. In this literature review, the concept of work organisation thus includes choices regarding production organisation and technology, as well as the creation of jobs, roles and an organisational structure. The connections between these elements and technology are described in the following paragraphs.

The employment relationship concept refers to aspects of the way humans fit into these jobs, discussing allocation, disciplining and industrial relations (Huys et al., 2013; Van Hooft, 2000). This also relates to the role of leadership, human resource management (HRM) and other managerial practices – elements that are also being formed by the

organisation's corporate culture. The following paragraphs present a literature review on the connection between digital technologies and the employment relationship.

Evidently, choices concerning the concept of work organisation affect the possibilities regarding employment relationships, and vice versa, as together these aspects comprise the organisation as a living organism. A conceptual framework, however, requires conceptual categories and definitions to allow for a fruitful analysis. Going forward we'll search for the optimal combination of elements in the work organisation and employment relationships to guarantee employment sustainability in the context of digital technologies.

1.3 EMPLOYMENT SUSTAINABILITY

Drawing on the concept paper by Eurofound (2015), two main components are distinguished within the broad concept of sustainable employment. The first component, "job quality", refers to the nature and quality of objective job characteristics and the work environment. However, to be able to meet the needs of the worker in the present without compromising his/her ability in future work requires more than the mere presence of high-quality working conditions in a current job (Eiffe, 2021). Therefore, a second component is distinguished – i.e., the "quality of working life". This term refers to a broader (and, to a degree, also more subjective) set of individual work outcomes such as social protection, job satisfaction, willingness and motivation to stay in (current) employment, opportunities for personal growth, health, well-being and the compatibility of work with other life spheres (Eiffe, 2021; van Dam et al., 2016). In other words: the "job quality" component is mainly related to the characteristics of one's current job, whereas the "quality of working life" component is broader and relates to the fit between job characteristics and individual characteristics/circumstances now and in the future (Eurofound, 2015). The distinction between both components also relates to the distinction between objective and subjective dimensions of work.

2. LITERATURE REVIEW

2.1 WORK ORGANISATION

Organisational structures are often understood in two categories: organic and mechanistic designs. Whereas the first is more flexible and characterised by decentralisation, empowerment, few rules and formalities, horizontal communication and collaborative teamwork, the latter is more rigid and known for stricter vertical and hierarchical regulations (Wilkesmann & Wilkesmann, 2018a). Regarding the fit between digital technologies and organisational structure, Shamim et al. (2016) argue that since the

digital transformation creates an unstable environment, the innovation and change management that is required fits best with an organic organisational design. Here, decision-making processes are faster, and both managers and employees are able to react more flexibly to the shifting challenges (Veile et al., 2019). In addition, a complex digital transformation affects all organisational processes, and rigid organisational structures are less likely to implement such profound changes (Fettig et al., 2018).

Nevertheless, Wilkesmann & Wilkesmann (2018) describe the different use of new digital technologies in organic as well as mechanistic organisation structures. Technologies in mechanistic organisational structures tend to reinforce the reproduction of routines and have employees filling the gaps, whereas technologies in organic structures mainly contribute to innovations. It is likely that path-dependency following the existing organisational structure steers the selection, implementation and use of new technologies (Lall, Seim, Torvatn & Knutstad, 2016). Reversely, new technologies necessitate a change in the way work is organised, leading to the emergence of and search for new forms of work and organisation (Van Hooetegem, 2016). For example, a technology that allows direct and immediate communication could create the technology affordance of “communicating across hierarchical levels”, impacting the traditional organisational hierarchy. Expert interviews with managers in technology-adopting companies stress the importance of simultaneously adapting the organisational structure to the use of digital technologies (Veile et al., 2019). In this regard, Cagliano et al. (2019) showed that enterprises tend to transition from a vertical organisation with a centralised decision-making structure to a flat, decentralised organisation when technical complexity increases.

Changes in the organisational structure imply changes on the job level regarding the combination of different tasks as well as the internal functional hierarchy. Veile et al. (2019) recommend that adaptations should be made in terms of job design to encompass new tasks and responsibilities as a result of working with new technologies. This includes the adjustment of relevant job characteristics to combat new job quality risks. Examples could include changes in compensation following task complexity or flexible working hours, updated training opportunities, efforts to instil teamwork, more flexible workplaces and attention towards social support from colleagues and managers to prevent isolation. Lacking to adapt job design can increase stress and affect well-being (Kadir & Broberg, 2020).

Naturally, the introduction of new technologies also affects the nature of tasks. Veile et al. (2019) observe that with increased automation, machines undertake routine tasks and leave employees with more intellectual demands such as decision-making. Moreover, Cagliano et al. (2019) explain that workers' tasks differ with the level of technological complexity that is introduced. When organisations apply automations of limited technological complexity, the remaining tasks are characterised by specialised manual activities. When organisations fully implement and integrate a large set of technologies, tasks shift to multitasking activities mainly related to the production, reparation or control

of the given technology, with a higher proportion of cognitive tasks (Cagliano et al., 2019). A technology that replaces manual activities could, for example, lead to the technological constraint of “diminishing low-educated work”.

These changes fuel both discussion and predictions about job losses. Certain job or task characteristics, however, seem to shield jobs and tasks from being replaced or profoundly changed by digital technology. For now, the disruptive impact of digital technologies is limited in jobs that demand complex and flexible decision-making or require a personal relationship, such as personal care or assistance (Brolis et al., 2018). Nevertheless, changes in task composition undeniably have direct and significant effects on skills requirements and the job quality of employees (see *infra*).

2.2 EMPLOYMENT RELATIONSHIP

Similar to the previous paragraphs, technology affordances and constraints are expected to affect how employment relationships are formed, and vice versa. The literature on this topic is limited and mainly focuses on the managerial preconditions for introducing new technologies, rather than on how employment relationships change as a result.

When implementing new digital technologies, companies step out of their comfort zone. Together with changing the general architecture of an organisation’s structure, Veile et al. (2019) emphasise the need for systematic cultural change when addressing a new organisational reality. This cultural change should be initiated by management (top-down approach) and conducted incrementally. The culture that enterprises should aim for is described in terms of willingness to learn, openness to new things, the promotion of creativity, idea generation and an entrepreneurial mindset (El Sawy et al., 2016). Kiel et al. (2017: 16) mention an “adaptable corporate culture convinced of the need to pursue the novel industrial paradigm”. This corporate culture is reflected in the disciplining and leadership style of managers, HRM practices with regard to allocation and training, and the context of employee involvement and industrial relations.

Considering leadership style, the most commonly discussed type of leadership in the context of digitalisation is the transformational leadership style (Shamim et al., 2016). Even though transformational leadership is mainly considered relevant during specific changes, in practice it might become a vested means of coordination due to the continuous change processes that confront organisations (Schoemaker et al., 2018; Imran et al., 2020). In the context of Industry 4.0, knowledge-oriented leadership is also put forward. This new construct focuses on the development, conservation and sharing of knowledge in the company by combining the ad-hoc flexibility of transformational leadership with the more stable fundamentals of transactional leadership (Shamim et al., 2016).

Disciplining in the context of a digital transformation should tolerate mistakes and focus on creativity to rapidly learn from failures (Veile et al., 2019). According to Self-Determination Theory (SDT) (Rigby & Ryan, 2018; Van den Broeck et al., 2016), an 'autonomy-supportive context' in particular will promote the autonomous motivation of employees and make jobs more resourceful, allow workers to have more control and teach them to apply new skills; these are crucial elements to successfully implementing a digital transformation (Tuckey, Bakker & Dollard, 2012; van de Voorde et al., 2016). Research shows a clear connection between an autonomy-supportive context and employee engagement and well-being, with employment relations as a guarantee for crucial preconditions (Gagné & Bhawe, 2010). Various new technological applications have strong potential to create this 'autonomy-supportive context', while some digital tools challenge traditional autonomy-supportive HR and leadership practices (Hertel, Stone, Johnson & Passmore, 2017). For example, an application to change work schedules anytime and anywhere allows the technology affordance "flexible scheduling". Whether this affordance leads to better or worse job quality outcomes for employees (e.g., regarding work-life balance) depends on how the organisation approaches this technology. The organisational context thus serves as a moderator in the relationship between a technology affordance or constraint and employment sustainability.

Looking at allocation, leading members of the firms interrogated by Horváth and Szabó (2019) stated that the absence of a leader with appropriate skills and experience to pilot Industry 4.0 projects was mainly an issue in smaller businesses. This is in line with studies on HRM in small and medium enterprises which show that these businesses traditionally operate more in a flexible and informal manner, where both managers and employees are less likely to receive formal training and companies encounter difficulty attracting and retaining highly competent employees (Singh & Vohra, 2005). The appropriate digital skills to understand, handle and coordinate new technologies, however, are stated to be a necessary precondition for a digital transformation which can be met through training and education or attracting specialised employees (Brolis et al., 2018; Veile et al., 2019).

From the employee-side, employee involvement is frequently underlined as a precondition for the successful implementation of new technologies for several reasons. Employees are the ones who will apply and operate new technology (Veile et al., 2019), and since they are familiar with the current work processes and interactions, their involvement logically can help to improve them (Kadir & Broberg, 2020). Employee involvement also affects perceived well-being and operational performance (Kadir & Broberg, 2020; Tortorella & Fettermann, 2018).

On a macro-level, employee involvement is studied in the context of industrial relations and social dialogue. Recently, trade unions' attention towards the topic has also been sharpening. Eurofound (2016) affirms the key role of social partners in achieving win-win strategies for dealing with organisational change. In 2018, Voss and Riede (2018) stated that 65% of questioned trade union representatives and company-level workers mentioned

that digitalisation has risen as a topic of information and consultation. Recently, European cross-sectoral social partners have published a framework agreement to optimise the benefits and deal with the challenges of digitalisation in the world of work (Business Europe et al., 2020). In Belgium, digitalisation was also one of the topics of the 2017–2018 InterProfessional Agreement and was identified as an important societal challenge.

3. EFFECTS ON EMPLOYMENT SUSTAINABILITY

With regard to the effect of digital technologies on employment sustainability, an ambivalence can be found between enhancements due to the decline in physical tasks and work being upgraded in terms of intellectual tasks (Eurofound, 2019), on the one side, and scenarios of increased polarisation leading to worse work and employment conditions or unemployment among the low-skilled workforce (Ghobakhloo, 2020), on the other. Empirical analyses show how the use of specific technologies both positively and negatively affects sub-elements of the broad concept of employment sustainability. For example, increased physical health risks include visual fatigue caused by augmented screen time and more musculoskeletal problems due to sedentary tasks (EU-OSHA, 2017; Tran & Sokas, 2017). By contrast, robots that are used for alleviating the lifting of heavy weights lead to fewer injuries (Brolis et al., 2018). In addition, the technology affordance of ‘working anytime anywhere’ allows flexibility, which could lead to a better or worse work-life balance, depending on how organisations, managers and employees approach this. The same applies to scheduling tools that optimise the allocation and timing of tasks, as they lead to more efficiency but may also diminish rest periods and thus increase workload (Brolis et al., 2018). A direct communication tool can increase the level of autonomy but also the level of control, depending on its application. As regards up-to-date skills, Brolis et al. (2018) stipulate that even though some technologies do not seem complex (e.g., asking cleaners to use a smartphone for work schedules), all workers should receive training to acquire the necessary numerical or computer skills. Lastly, various research highlights how the use of technologies, especially in the platform economy, can lead to the isolation of workers (EU-OSHA, 2017).

The separate effects on sub-elements of employment sustainability are expected to be amplified because different types of tasks tend to systematically bundle together (Fernández-Macías et al., 2016). Intellectual and social tasks are often combined, while physical demands co-occur with routine tasks and the use of machines. This implies that certain jobs and sectors currently deal with an enormous impact from the increased use of technologies, whereas others are rather untouched. The fact that the impact of new technologies is unequal over jobs and sectors leads to an increased difference in job quality, and job polarisation may be close at hand (Peña-Cases et al., 2018).

More importantly, the large majority of research concludes that the impact of digital technologies on job quality depends on the context in which these innovations are applied and how they are used. The role of managers and HRM practises is thus crucial. For (middle) managers, the most prominent questions in the context of digitalisation relate to employee autonomy, control mechanisms and standardisation of processes (Cagliano et al., 2019). This refers to the difficulty in instilling an autonomy-supportive environment to increase employee engagement and well-being. For this to happen, elements of work organisation as well as employment relationships are crucial.

Cagliano et al. (2019) have observed a strict prescription of work procedures and limited autonomy in so-called “process-automated factories”, i.e., organisations with a low number of digital technologies that are integrated mainly at the level of production phases. In “smart factories”, on the other hand, a high number of digital technologies are fully integrated in operation processes, and workers experience autonomy in work procedures in terms of control, problem solving and working methods. Cirillo et al. (2019) find that the introduction of Industry 4.0 artefacts can cause diverse effects on employees’ autonomy levels. Some practices increase employee discretion, while others facilitate strict managerial control mechanisms. An example of the latter is the use of software to check if employees are performing their tasks in a designated amount of time (Kadir & Broberg, 2020) or task allocation through a digital system including which operations workers have to perform, as well as when and in what order (Wilkesmann & Wilkesmann, 2018b). In personal care, for example, technology allows employees to optimise their work schedule. On the one hand, this allows them to better arrange their working hours, while, on the other hand, it might lead to more time pressure (Brolis et al., 2018).

The type and use of digital technologies, as well as the organisational structure in which they are installed, thus determine certain job characteristics and employees’ job quality. Butollo et al. (2019) declare that the projects currently being implemented tend to increase standardisation and work control. This might be explained by the desire for control as a significant driving force for people in a leadership position (Horváth and Szabó, 2019). Research shows that, rather than the technology itself, different forms of organisational design impact results and workers’ perceptions of working with digital technologies (Wilkesmann & Wilkesmann, 2018b). Nevertheless, the literature on this topic is limited.

CONCLUSION

This literature review has shown the overwhelming impact of digital technology on all aspects of an organisation. In the work organisation as well as in employment relationships, the recurrent advice is to align strategy, technology and organisation to create optimal outcomes, both financial and related to well-being. Nevertheless, the vast majority of research on digital technologies consists of theoretical papers, far outweighing

the empirical research on organisational contexts (Cagliano et al., 2019; Frank et al., 2019; Kadir & Broberg, 2020). Future research should therefore focus on data collection in order to specify the precise requirements for shaping different elements in work organisation and employment relationships, as well as how to align them.

In addition, the digitalisation of the manufacturing sector is especially being studied from a technical point of view. Implications of technological innovation in terms of labour and employment relations is still a relatively young field (Habraken & Bondarouk, 2017; Vacek, 2016). It would be beneficial for future research to include other sectors and to open up this perspective from a sole focus on technical features to the potential interaction between technology and people in the context of an organisation (as described in the TACT).

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CHAPTER 3.

LEVERAGING ECOSYSTEM PARTNERSHIPS FOR INDUSTRY 4.0 ENABLED VALUE CREATION: A DELPHI STUDY

Gabriel Möwis, Bieke Struyf, Paul Matthyssens, Dirk Stegelmeyer

ABSTRACT

Industry 4.0 technology is changing the way manufacturing companies create value. Transactional interactions with supply chain partners are evolving towards long-term relationships with a network of strategic partners necessary to realise digitally enabled value propositions.

The Delphi method has been used to let academics, industry experts, and practitioners reflect on the current and expected future role of ecosystems for Industry 4.0 – enabled value creation and the characteristics of their underlying relationships. We have also tested a recently established typology to examine its relevance in this context and allow for the categorisation of different logics for leveraging ecosystems.

Based on an extensive literature review and the Delphi method, this chapter contributes to the literature on ecosystems by enhancing insights about their prevalence and characteristics and how they are formed for the implementation of Industry 4.0 technology. Furthermore, we add to the literature on Industry 4.0 by demonstrating different trajectories for leveraging ecosystems that support manufacturing companies in their digital transformation and allow them to generate new value as well as how these ecosystems evolve.

Keywords: *Industry 4.0 ecosystems, innovation ecosystems, Industry 4.0, value co-creation*

INTRODUCTION

In the past two decades, ecosystem research has proliferated in the business and management literature (Thomas & Autio, 2020). Since Moore (1993) introduced the analogy of biological ecosystems for business networks, many different interpretations of the term have emerged (Järvi & Kortelainen, 2017). These concepts have in common that they consist of “[...] a community of hierarchically independent, yet interdependent heterogeneous participants who collectively generate an ecosystem output” (Thomas & Autio, 2020: 16). A driver for the growing attention towards ecosystems comes from

digitalisation, opening new ways for companies to connect to each other (Thomas & Autio, 2020).

Dyadic relationships, where technology is exchanged based on transactions, are therefore shifting towards networks in which competencies and complementarities are exchanged to co-create Industry 4.0 (I4.0) solutions. The ecosystem perspective makes it interesting to explore I4.0 value creation (Benitez et al., 2020). As I4.0 is considered key for organisations to stay competitive in the future (Müller et al., 2018), they may benefit from having a clear strategy on how to manage ecosystems.

Currently, however, insufficient insight exists on how ecosystems can be leveraged to co-create I4.0 enabled value (Benitez et al., 2020). The large number of concepts has led to confusion (Möller & Halinen, 2017; Thomas & Autio, 2020), which hinders cross-case comparison and the ensuing accumulation of knowledge. To counteract this, we have investigated the role of I4.0 ecosystems as well as the relationships between ecosystem partners and the capabilities they need to develop for successful I4.0 ecosystems. The typology of Tian et al. (2021) comprises the starting point from which different potential ways of leveraging I4.0 ecosystems are explored. We asked ourselves:

What are the characteristics of ecosystems used for Industry 4.0 enabled value creation, and what role do they play, currently and in the future, in the creation of new value?

Using a literature review and the Delphi study, we have applied this typology to reveal the roles and potential evolutions of I4.0 ecosystems.

By pointing out the role of I4.0 ecosystems for value creation, further research could explore not only the differences between such networks more deeply, but why they emerge and how they evolve. Furthermore, demonstrating different types may benefit practitioners in choosing among various starting points for using ecosystems to offer I4.0 enabled value creation.

THEORETICAL BACKGROUND

Industry 4.0 as enabler for value creation

Since the launch of the concept in 2011, I4.0 has risen to become one of the most important strategic topics in manufacturing, leading to large numbers of studies in a range of subject areas such as business, the social sciences, and health professions (Liao et al., 2017). The widespread use of the concept in various contexts has led to diverse definitions (Agostini & Filippini, 2019). Frank et al. (2019: 343) define it as “[...] a new industrial maturity stage of product firms, [...] where the companies’ products and process

are interconnected and integrated to achieve higher value for both customers and the companies' internal processes".

So far, resource productivity and efficiency gains have been two of the most popular areas of interest (Liao et al., 2017). However, I4.0 also supports creating new digital added value for customers (Matthyssens, 2019). Such value-adding strategies help companies to differentiate and avoid margin-narrowing price competitions (Matthyssens & Vandenbempt, 2008). I4.0 enables the creation of new products, services, and combinations of them that add new value for customers (Kiel et al., 2017).

To carry out such strategies, companies can opt to digitalise back-end processes and front-end processes (Coreynen et al., 2017; Matthyssens, 2019). The back-end describes the operational processes that customers do not get to see but which enable the effective creation of offerings. Its digitisation allows for strengthening and reworking supply-oriented processes to enable new value additions (Tian et al., 2021). The front-end defines the processes facing customers and aims to deliver solutions that allow them to reach their own goals better (Coreynen et al., 2017; Pawar et al., 2009). Digitalising front-end processes offers improvements in customer interaction, as well as developing digitally enabled offerings that allow for new streams of value capture (Coreynen et al., 2017; Matthyssens, 2019).

However, manufacturing companies are still struggling to execute the digital transformation (Deloitte, 2018). Rapid changes in technological innovation and digitalisation have forced organisations to become more dynamic (Linde et al., 2021). Companies collaborate with partners that provide them with complementary skills that would be very demanding to build from the ground up, resulting in complex networks for the creation and capture of value (Matthyssens, 2019; Pawar et al., 2009). Furthermore, providing digitally enabled products and services requires closer relationships, as the offerings are shifting from transaction-based exchanges to relational engagement with multiple actors for the co-creation of value (Coreynen et al., 2017; Kamalaldin et al., 2020).

Co-creation of Industry 4.0 enabled value

Previous linear supply chains with relatively independent technological contributions are currently changing towards complex networks where products and services are co-created (Benitez et al., 2020). Having the capabilities to co-create value serves as a central cornerstone for the successful introduction of value-adding strategies for I4.0 implementation (Struyf et al., 2021). In order to obtain essential resources and skills from external firms, it has become imperative for companies to operate within networks of alliances (Sluyts et al., 2011). Schreiner et al. (2009) argue that partners need to align their structures and identify individual tasks, build trust and confidence in their partnerships, and develop psychological links and common goals. Karpen et al. (2012)

stress the importance of facilitating interaction between partners, as well as sharing sensitive knowledge and competencies. Hence, organisations must be capable of forming close partnerships to enable co-creation.

Intentions behind this co-creation, as stated in the literature, could be the exchange of knowledge and capabilities (Saunila et al., 2019), asset and cost efficiency (Lambert & Enz, 2012), increasing the speed and scalability of business models (Molly et al., 2019), the creation of radically new value (Sklyar et al., 2019), or sensing new opportunities and threats in markets (Teece et al., 1997). Thus, the possible drivers for enabling co-creation are manifold. These intentions for co-creation and co-creation capabilities are the subject of our study.

Ecosystems

The term ecosystem has become a buzzword for several research streams about the forming of strategic networks (Möller & Halinen, 2017). The impetus for building ecosystems is companies' limited resources and capabilities; they aim to obtain these resources from collaborations with other actors to realise complex value propositions which a single firm would not be able to achieve (Järvi & Kortelainen, 2017; Thomas & Autio, 2020). An initial study by Moore (1993) lacks a clear definition of the concept; thus, the vague explanation of ecosystems in strategic management has led to varying prefixes and conceptual proliferation (Adner, 2017; Thomas & Autio, 2020). Thomas and Autio (2020) investigate the different approaches and find four patterns that describe all ecosystems and distinguish them from other studies about collectives of organisations. The first characteristic is *participant heterogeneity*, which explains that ecosystem actors cannot be broken down into buyer-and-supplier relationships but are complex structures that cross industry boundaries. Among the actors mentioned in the literature are: Suppliers, complementors, and research institutions (Aarikka-Stenroos & Ritala, 2017); customers and competitors (Moore, 1996); and horizontal cross-industry partnerships (Thomas & Autio, 2020). The second characteristic is the *ecosystem output*, which describes actors' joint effort to deliver an output that encompasses a single firm's abilities. The *interdependence of participants* characterises the partnerships that actors form in order to co-create the ecosystem output and makes them reliant on each other. Lastly, Thomas and Autio (2020) observe *non-contractual governance* in ecosystems, which means that interactions between participants in the ecosystem are coordinated by co-aligning their structures with the help of a mutual platform, rather than relying on formal contracts.

As there is no shared definition for ecosystems, we follow Adner (2017: 42) to define them from a structural point of view for this study as "[...] the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize". This definition focuses on the value proposition which one or several focal

actors aim to realise and allows for drawing clear boundaries around the architecture of an ecosystem to analyse the needed actors and their interaction.

Typology

So far, the lack of a shared definition and the absence of mapped out structures of the investigated ecosystems for I4.0 purposes hamper the combination of knowledge from different cases. To counteract this, Tian et al.'s (2021) typology is introduced to examine how I4.0 ecosystems are built and how they evolve.

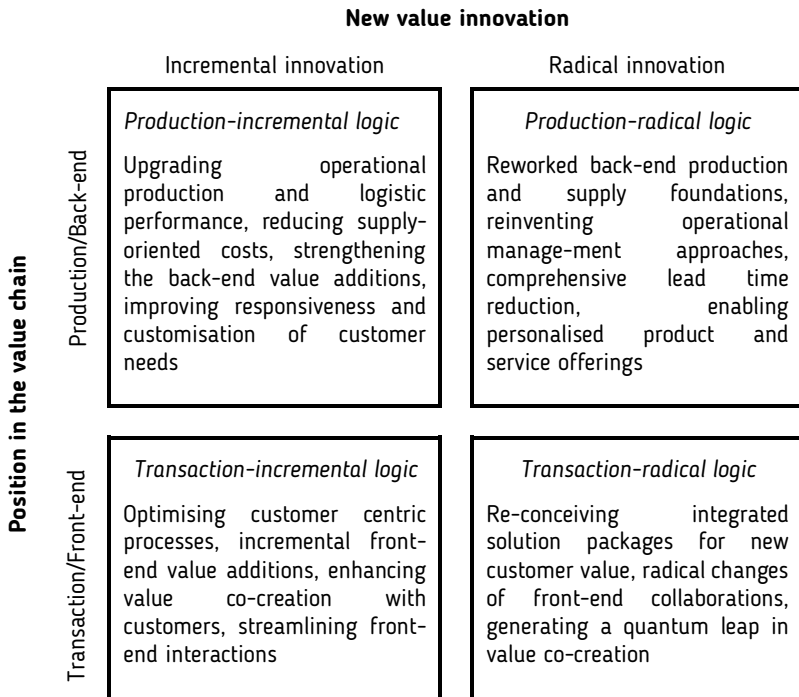


Figure 1, Typology for platform ecosystems in the I4.0 context by Tian et al. (2021)

Tian et al. (2021) study how platforms can be leveraged to implement digital technology into manufacturing companies and have developed a framework to distinguish between different platform logics. The first dimension of this typology is the *position in the value*

chain, which divides concepts into back-end and front-end applications. The second dimension, called *new value innovation*, partitions platform outputs into incremental innovation – that is, technologies that enhance the status quo – and radical innovation, which describes technology that rearranges patterns of consistency and results in new products, industries, or markets (Koberg et al., 2003). The two forms of each dimension result in four platform logics for the digitalisation of industrial companies (see Figure 1).

Although the studied cases from Tian et al. (2021) prove that platform ecosystems pose an approach that can effectively leverage I4.0 technology for creating added value, not every company that faces I4.0 seeks a platform strategy. Therefore, we aimed to test if the described logics in the typology hold up, not only for describing platform ecosystems but also ecosystems for I4.0 enabled value creation in general.

METHODOLOGY

Delphi study

The Delphi technique is a social research method that aims to obtain group opinions by structuring the assessments of experts who can contribute valuable insights about a problem (Landeta, 2006). It is a widespread technique across many domains, such as engineering, medicine, psychology, and business (Barrios et al., 2021; Hirschhorn, 2019), and is suited to developing knowledge about issues where empirical evidence is scarce or predictions about the future are of interest (Barrios et al., 2021; Flostrand et al., 2020).

The Delphi method consists of multiple rounds of questionnaires that are sent out to a predetermined group of experts who, after answering the panels, are provided with anonymous and aggregated summaries of the responses (Hirschhorn, 2019). Such summaries, called controlled feedback, allow the experts to reflect on their opinions and adjust them if necessary (Hsu & Sandford, 2007; Landeta, 2006). The sought outcome of Delphi studies is either consensus or stable dissensus (Belton et al., 2019; Hsu & Sandford, 2007). There is no shared definition for consensus. Mostly, it is defined by certain thresholds of agreement about the controlled feedback (Barrios et al., 2021). Furthermore, there are no general guidelines for the Delphi method, which makes it a flexible one (Hirschhorn, 2019). It is generally considered a rigorous method (Flostrand et al., 2020) but can suffer in its rigor and reliability if inconsistently performed (Loë et al., 2016). To avoid this, we applied the method according to the six-step approach from Belton et al. (2019) to ensure maximum rigor of the process.

In this study, the addressed topics revealed the current and future role of I4.0 ecosystems and how they evolve with the help of the introduced typology. Furthermore, the

characteristics of relationships are of interest. The structure of the surveys was developed based on the theoretical background (see Table 2).

The response options consisted mainly of ranking ordered scales; this study followed the recommendation to use 7-point Likert scales (Belton et al., 2019; Weng, 2004). The remaining others were categorical in order to assess the issues with *yes/no/don't know or relevant/irrelevant* answers.

The next step, nominating the experts, is critical because their competencies greatly influence the quality of the outcome (Devaney & Henchion, 2018). Belton et al. (2019) and Rowe and Wright (2001) claim that between 5 and 20 experts are sufficient to obtain valid results. In our case, a group of 10 experts composed of academics, industry experts, and practitioners involved with the digital transformation participated in the whole study (see Table 1).

Table 1, Participants in the Delphi study

	Expert category	Position	Geography	Activity
#1	Industry expert	Expert, digital innovation	Belgium	National
#2	Practitioner	Managing director of podiatry supplies manufacturer	Belgium	National
#3	Practitioner	Vice president, global performance of communication technology manufacturer	Belgium	Global
#4	Practitioner	Operations manager, chemical manufacturer	Belgium	Global
#5	Industry expert	Open innovation and tech transfer expert	Belgium	National
#6	Academic	Assistant professor in artificial intelligence for industry	Belgium	Global
#7	Industry expert	Senior expert, advanced manufacturing	Belgium	National
#8	Academic	Associate professor of business marketing	Italy	Global
#9	Industry expert	Digital transformation expert	Belgium	National
#10	Practitioner	Product manager (Industry 4.0) of indoor climate technology manufacturer	Belgium	International

Regarding the controlled feedback, there are no agreed-upon guidelines for its delivery; however, following the common practice (Barrios et al., 2021), our statistical summary consists of graphs complemented by the median and IQR to show the distribution of opinions.

Table 2, Structure of Delphi questionnaire

Survey sequence	Content
Prevalence of I4.0 ecosystems	<ul style="list-style-type: none"> • Determining prevalence of I4.0 ecosystems today & in the future (Assessing 0-100% on a 5-point Likert scale) • Intentions to engage in I4.0 ecosystems (response options derived from theoretical background): see Table 4 • Actors in I4.0 ecosystems (response options derived from theoretical background): see Table 5
Testing of typology	<ul style="list-style-type: none"> • Rating of statements about the different logics in the typology of Tian et al. (2021) (Assessing on a 7-point Likert scale: strongly disagree, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree, strongly agree) I4.0 ecosystems support....: <ul style="list-style-type: none"> ○ Back-end: reducing lead times; realising customised products and services; boosting efficiency in back-end processes ○ Front-end: developing solutions that boost efficiency on the customers' end; improving the quality of customer relationships; responding quicker to changing customer needs ○ Incremental innovation: improving production processes; improving quality of the delivered products and services; improving firms' ability to market products and services; improving existing products and services ○ Radical innovation: developing innovative business models; boosting adoption of radically new value propositions; developing 'total solutions' (product-service combinations) to solve multiple customer problems; developing radically new solutions
Evolution of I4.0 ecosystems	<ul style="list-style-type: none"> • Prevalence of back-end and front-end applications today & in the future (7-point Likert scale: only/mostly/more back-end, equally back-end & front-end, more/mostly/only front-end) • Prevalent output (incremental/radical innovation) today & in the future (7-point Likert scale: only/mostly/more

Survey sequence	Content
	incremental, equally incremental & radical, more/mostly/only radical)
Relationships in I4.0 ecosystems	<ul style="list-style-type: none"> • Hierarchical nature of relationships (7-point Likert scale from only vertical to only horizontal) • Closeness of relationships (7-point Likert scale from only transactional to only close) • Co-creation capabilities in successful I4.0 ecosystems: see Table 6

In terms of the timeframe between rounds of controlled feedback, the recommendations vary from two to eight weeks (Belton et al., 2019). The number of rounds in a Delphi study should ideally depend on the degree of agreement, as well as stability, which describes the consistency of opinions between iterations (Gracht, 2012). Yet it is also argued that three rounds are usually sufficient to reach stability in the answers (Gracht, 2012; Hsu & Sandford, 2007; Rowe & Wright, 2001). These criteria of a Delphi study should be individually defined a priori (Belton et al., 2019; Gracht, 2012). To keep the duration short, three iterations served as termination criteria for this study, and the time between iterations was set at two to three weeks (see Figure 2).

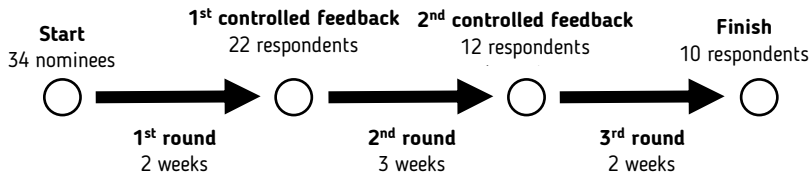


Figure 2, Execution of Delphi study

Following other studies, consensus about the ranking ordered scales was defined with the IQR (Gracht, 2012; Landeta, 2006; Vet et al., 2005); that is, an IQR of ≤ 1 is the threshold for consensus, while 75% agreement for the categorical response scales is considered consensus, being a common threshold (Barrios et al., 2021; Lange et al., 2020).

RESULTS

Table 3 shows that 78% of the mapped issues ended up in consensus, according to the defined thresholds. This was already true for many of the statements and questions after

the second round, and some of these even had a higher rate of agreement than in the third one. However, stability then at 45% made a third iteration feasible, which resulted in an increase to 60%.

Regarding the content of the Delphi study, the rate of organisations engaging in I4.0 ecosystems today is assessed to be 20-40%. The experts observe that a significant but not predominant portion of organisations already operate in I4.0 ecosystems at present, but 90% of them agreed that there will be a major increase in the future. They evaluated that 60-80% of companies will engage in I4.0 ecosystems; hence, it seems that the importance of ecosystems is on the rise and most organisations will eventually be part of such strategic networks. Reasons stated by respondents were that firms are “forced by markets and customers”, that there is “no other way to behave in the market”, and that “it is the only way to truly innovate and create value. It is necessary to survive”. However, their assessments also imply that not all companies will do so and that there will continue to be a portion of organisations operating without using ecosystems.

Table 3, Level of consensus reached in the Delphi study

Question	2 nd round			3 rd round		
	AR	Mdn	IQR	AR	Mdn	IQR
1.1 Prevalence of I4.0 ecosystems today	-	2	0.25	-	2	0
1.2 Prevalence of I4.0 ecosystems in the future	-	4	1	-	4	1
2.1 Reasons to engage in I4.0 ecosystems (average)	78%	-	-	91%	-	-
2.2 Ranking of reasons to engage in ecosystems (average)	-	-	0.1	-	-	0.25
3.1 Actors in ecosystems (average)	71%	-	-	96%	-	-
3.2 Ranking of actors	-	-	0.5	-	-	1.3
4.1. Typology: Back-end	-	6	1	-	6	1
4.2. Typology: Front-end	-	6	1	-	5	1
4.3. Typology: Incremental Innovation	-	6	1	-	5	1
4.4. Typology: Radical Innovation	-	5	1	-	5	1.25
5.1 Rate incremental/radical innovation today	-	2	1	-	2	1
5.2. Rate incremental/radical innovation in the future	-	4	2.5	-	3.5	2.25
6.1 Rate back-/front-end today	-	3	1	-	3	1

	2 nd round			3 rd round		
6.2. Rate back-/front-end in the future	-	4	0.75	-	4	0
7. Hierarchical nature of relationships	-	3	1	-	3	1
8. Closeness of relationships	-	5	0.25	-	5	0
9.1 Co-creation capabilities (average)	86%	-	-	84%	-	-
9.2 Ranking of co-creation capabilities (average)	-	-	2.3	-	-	1.8

Consensus measurement: For categorical response options: AR (agreement rate)

For Likert scale responses: IQR (Interquartile range), Mdn (Median)

The next sub-topic, reasons to engage in I4.0 ecosystems, was rated with a high degree of consensus among the experts. In addition to the ones provided by the facilitators of the study, the reasons *green transformation* and *diversification* were added. All displayed options were evaluated to be relevant reasons with high rates of agreement, and there was consensus about ranking them from most to least frequent. Table 4 shows that the motivations to leverage I4.0 ecosystems can be manifold, ranging from the efficiency trajectory to following the value-adding strategy by creating radically new value and combining offerings from different actors.

Table 4, Most frequent reasons to engage in a I4.0 ecosystems

Rank	Reason	Agreement to relevance	Ranking results	
			Mdn	IQR
1	Access to external knowledge & capabilities	90%	1	0
2	Combining offerings to enhance customer value	100%	2	0.75
3	Improving asset and cost efficiency	100%	3	1
4	Increasing speed & scalability of new digital solutions	90%	4	0
5	Creating radically new value propositions	80%	5	0.25
6	Increasing ability to sense new opportunities & threats	80%	6	0
7	Other: Green transformation	100%	7	0
8	Other: Diversification	90%	8	0

The next issue, which covers the actors in I4.0 ecosystems, shows that many different parties can engage in these strategic networks. The outlined actors from the literature review are, as reported by the experts, all relevant (see Table 5). They can be more traditional in regard to typical vertical buyer-supplier-relationships, but they can also involve more uncommon horizontal relationships with competitors and complementors.

Table 5, Most frequent actors in I4.0 ecosystems

Ranking	Actor	Agreement to relevance	Ranking results	
			Mdn	IQR
1	Technology provider	90%	1	0
2	Suppliers	100%	2	0.75
3	Research institutions	90%	3	3
4	Consultants	90%	4	1
5	Competitors	100%	5	0.75
6	Customers	100%	6	1.75
7	Complementors	100%	6.5	2

When it comes to ranking the actors according to the frequency of their participation in I4.0 ecosystems, four of the displayed options achieved consensus. *Technology providers* and *suppliers* seem to be the most frequent actors. *Competitors* and *consultants* are understood to be relevant, as well, but have a smaller presence. Hence, all displayed actors can be found in I4.0 ecosystems, according to the experts, but there is some uncertainty about which ones are more present than others.

The next sub-chapter deals with the validation of the typology. There was consensus about the statements regarding I4.0 ecosystems' support of the optimisation of back-end processes for industrial companies. Likewise, there was consensus that ecosystems facilitate value creation in the front-end, albeit to a lesser extent (see Table 3). One explanation for that could come from the following issue with the distributions of front-end and back-end applications today and in the future. Table 3 shows that the current I4.0 ecosystems are assessed as being used more frequently in the back-end, while their front-end usage is less common in the industry. In the future, though, front-end cases are expected to be as prevalent as the back-end applications of I4.0.

Regarding the second dimension, innovations in I4.0 ecosystems, agreement about incremental innovation was equal to the front-end logic. Hence, almost half of the experts (strongly) agreed about I4.0 ecosystems facilitating the creation of incremental innovation,

with only a few objections. As far as the other extreme of this dimension, radical innovation, there was less common understanding, which is why this part did not end in consensus after the third round (even though it did after the second iteration), and 78% of the experts at least *somewhat agreed* with the statements.

Unsurprisingly, the experts consistently observed incremental innovation to be mostly present today (see Table 3). When looking into the future, though, it becomes less clear. There was a high discrepancy over the innovation to be generated in future I4.0 ecosystems, leading to dissensus after the third round.

The results about the typology mostly indicate that I4.0 ecosystems can be categorised within the two dimensions. Additionally, when all responses to the statements are aggregated in one chart, more than half (strongly) agreed to the dimensions. The resulting distribution of opinions would lead to consensus (IQR=1) and a high agreement rate (median *Agree*), suitable to confirm that the typology holds up to categorise I4.0 ecosystems. However, the missing consensus about the *radical innovation* component prevents a full confirmation.

Regarding the last sub-topic, characteristics of relationships, the overarching opinion is that I4.0 ecosystems today mainly consist of more vertical relationships than horizontal ones and that these relationships are more transactional than close (see Table 3). These observations by the experts remind us of conventional relationships with suppliers and customers based on contracts. The alignment of organisations and their reliance on each other, something that is argued as necessary in ecosystems, seem to be subordinate here. However, when it comes to the co-creation capabilities that are important for successful I4.0 ecosystems, there was a high level of agreement that organisations need to be capable of forming alliances with vivid interaction. The co-creation capabilities describe organisations that intertwine with other organisations for co-creation. Table 6 shows that the experts agreed that almost all capabilities make up a successful I4.0 ecosystem, which is somewhat contradictory to the characteristics of contemporary relationships.

Table 6, Agreement rate to co-creation capabilities in I4.0 ecosystems

Co-creation capability	Agreement rate
In successful I4.0 ecosystems...	
Common goals are formulated to facilitate co-creation.	100%
Actors share sensitive information with their partners to boost the potential for value co-creation.	89%
Relationships are built on trust.	89%

Co-creation capability	Agreement rate
Interaction between the ecosystem actors is facilitated and coordinated.	67%
The information flow between partners is structured.	78%
Tasks and roles of participants are specified.	78%

DISCUSSION

The results show that most of the issues addressed did end in consensus. In turn, stability after the third iteration was at a rather low level, even though it is often argued that three rounds are sufficient to receive stable results (Gracht, 2012; Hsu & Sandford, 2007; Rowe & Wright, 2001). However, as most Delphi studies neglect to define thresholds for consensus or consider the stability of responses (Barrios et al., 2021), the rigor of this study was higher than the majority of Delphi studies. As the timeframe of this study only allowed for three iterations, the quality of these results can be considered satisfactory for this study. However, a few issues reached neither consensus nor stable dissensus after the third round, which leaves questions about them.

The experts' assessments unveil several indications that most I4.0 ecosystems are in an early stage of their evolution. First, the majority of organisations are not involved in such networks today, but the experts assessed that most organisations will eventually engage in them. The rationales for this increase in the future give the impression that the estimated 60-80% are not sufficient. They create a picture that ecosystems will become imperative to successfully perform the digital transformation and stay competitive in the age of I4.0. Nevertheless, as 90% believe the rate will increase, I4.0 ecosystems mostly seem to be in their development phase.

Next, ecosystems are argued to consist of divergent partnerships with cross-industry actors (Aarikka-Stenroos & Ritala, 2017) based on their interdependence to realise joint ecosystem outputs (Thomas & Autio, 2020). These characteristics do not fit with the conventional nature of relationships that the experts observe today. On the other hand, they evaluated almost all co-creation capabilities to be important, signalling that I4.0 ecosystems are progressing towards these close partnerships. This observation is supported by Benitez et al. (2020), who discovered in their longitudinal case study about an *I4.0 innovation ecosystem* that, in its birth stage, relationships were more dyadic and based on exchange, further evolving over time towards a logic of value co-creation.

Another point is that I4.0 ecosystems are mostly operated in the back-end but are forecasted to graduate to equal numbers of back-end and front-end applications. It is also estimated that mostly incremental innovation is carried out; this is in line with the findings of Tian et al. (2021). They found that platform ecosystems in the industrial context are

initially used to follow a back-end incremental logic and gradually evolve to more radical innovation and take on front-end processes.

The similarity of our observations with the findings of Tian et al. (2021) are a sign that the typology should also be suitable for our context. This appears plausible against the backdrop in which platform ecosystems can be viewed as one form of ecosystems (Järvi & Kortelainen, 2017). There was still confusion about the radical innovation part after the third round. However, the experts agreed that creating radically new value propositions is a relevant reason to engage in an I4.0 ecosystem (see Table 4). Furthermore, the literature states that ecosystems facilitate the creation of radical innovation (Aarikka-Stenroos & Ritala, 2017).

Accordingly, we argue that the typology is appropriate to categorise different ways to leverage I4.0 ecosystems based on our preceding argumentation. The aggregation of all opinions to each component highlights this argumentation, as they show that most experts generally agreed with the statements about the dimensions. Most cases might follow a back-end incremental logic now in their early phases, but we assert that the typology is well suited to cover all possible types and take their evolution into account. However, more research is needed to ultimately affirm this claim and gain deeper knowledge about the various types.

CONCLUSION

In this chapter we set out to investigate the current and future role of I4.0 ecosystems and the characteristics of their inherent relationships. Overall, the following overarching contributions to knowledge were developed.

Even though the typology could not be comprehensively confirmed, we could argue that it still holds when categorising I4.0 ecosystems. According to the rates of agreement, they mostly follow a back-end incremental logic, but we argue that other logics will also become more prevalent eventually.

Furthermore, we found new insights about the formation and evolution of I4.0 ecosystems. The group opinions showed that they are not yet prevalent but will become more important as most firms engage with them in the future, due to a multitude of motivations and consistent of many diverse actors. However, these relationships nowadays are observed to be more conventional. It is argued that this will change in the future with the evolution of ecosystems, as well.

The overall picture created by this study is that most I4.0 ecosystems are in an early phase of their evolution and that they are important for being able to perform the digital transformation and tailgating competitive advantage in the digital future.

MANAGERIAL IMPLICATIONS

Our research shows that ecosystems are becoming more important for industrial companies to generate new value based on I4.0 technology in collaboration with ecosystem partners. The experts of this study assessed that most companies will engage in such partnerships in the future due to a multitude of motivations. Even though these partnerships are more conventional today, they can consist of new partnerships that cross industry boundaries and are expected to evolve into close alliances, based on co-creation logic.

For making progress in the digital transformation, organisations mostly leverage ecosystems to strengthen the back-end and generate incremental innovation, but we argue that this back-end incremental logic evolves over time towards more front-end purposes and more radical innovations.

All in all, there is general agreement that I4.0 ecosystems will play a major role, which makes having a strategy to effectively leverage them useful in terms of opportunities for higher financial performance.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Building on the literature and on the Delphi study, this chapter provides insights into how firms make use of I4.0 ecosystems. The tested typology could not be conclusively confirmed. Therefore, further testing of the framework is needed to confirm or to question our argumentation about the classification of approaches to leveraging I4.0 ecosystems.

As our results are based on the expertise of an expert group, they are on an abstract level and create a picture that reflects the general trend of I4.0 ecosystems. However, profound data about specific cases could be generated by conducting qualitative research that leads to more fine-grained pictures of the various types of I4.0 ecosystems. This would support practitioners to formulate more specific ecosystem strategies and gain new knowledge for strategic research about I4.0.

Though our study is of a quantitative nature based on the knowledge of a group of experts, it cannot claim generalisability because most of the experts that took part in this study come from the Belgian region. We therefore urge researchers to test the results on an international scale.

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CHAPTER 4.

DIGITAL TRANSFORMATION IN THE AUTOMOTIVE SECTOR IN PORTUGAL: DATA ANALYSIS OF INDUSTRIAL R&D PROJECTS

Marta Candeias, António Brandão Moniz, Nuno Boavida

ABSTRACT

This chapter answers the following questions: Is employment in the automotive sector changing alongside recent automation trends in Portugal? What are the expectable changes in work organisation due to digitalisation in the automotive sector, including the introduction of new players in the automotive value chain? Are there signs of work qualification to go with increased automation? Has Industry 4.0 impacted labour relations? Our empirical work is based on cases from the automotive and components industry combined with data from Portuguese R&D projects on robotics, machine learning, collaborative tools, human-machine interaction, and autonomous systems, supported by European structural funds. The paper concludes that employment is not decreasing in the automotive sector in Portugal, despite the implementation of digital technologies. In some cases, efficiency and productivity increases derived from the implementation of digital technologies have even led to the creation of new jobs. Digital technologies, including AI, seem not to be replacing workers but augmenting their capacity to perform tasks. Changes in work organisation due to digitalisation are expected to undergo a displacement effect in some occupations, while in others that are associated with the adoption of new artefacts, qualification of work will follow, as the current workforce lacks the skills to operate these new technologies.

Keywords: *Artificial Intelligence; automotive cluster; digital transformation; labour relations; Portugal; cyber-physical systems; Industry 4.0*

INTRODUCTION

New technologies, sustainability policies, protectionism and consumer preferences are pushing for the reorganisation of the automotive cluster (ILO, 2021). Due to recent technological advances derived from the application of digital technologies in the domains of autonomous driving, connectivity, automation, and robotics, the automotive sector is evolving from the traditional, linear, product-oriented value chain to a mobility and service-oriented one which includes new players (ILO, 2021). In recent years, several centres for digital competences were established in Portugal and have been supplying the

automotive sector. Changes have been put in place to enhance product quality, control costs, and improve productivity. In several instances, they have included major elements of the Industry 4.0 strategy. This product shift is also meant to respond to new regulations on environmental protection and to enable the control of emergent market niches.

The term “Industry 4.0” originated in a high-tech strategy paper elaborated by industry leaders and politicians to promote the computerisation of manufacturing and energy in Germany. Originally, the term intended to make an ex-ante claim of a shift from the former production system to a planned 4th industrial revolution through the implementation of emergent technologies, such as advanced robotics, artificial intelligence, cloud computing, the Internet of Things (IoT), big data, 3D printing, and platforms to assist motor vehicles (Lasi et al., 2014). Most importantly, Industry 4.0 involves a new level of organisation and control over various supply chain industries and their product life cycle, as the production system is more optimised and oriented towards individualised customer needs (Majeed & Rupasinghe, 2017).

This campaign towards “Industry 4.0” was started by the state, business associations, and trade unions. France followed the German example with a similar program under the name *Industrie du Futur*. The Obama administration in the United States initiated the *Advanced Manufacturing Initiative*, and now the Biden administration will develop this concept with a major investment incentive program. China, as well, has started a huge program named *Made in China 2025*, which includes a high number of sub-initiatives ranging from efforts to develop cutting-edge technology in automation and industrial IoT to programs aiming at modernising traditional labour-intensive industries by introducing conventional ICT-related concepts to production environments. In 2017, Portugal launched a national initiative to promote its industry and economy called *Iniciativa Industria 4.0*.

The transformation of the present regime into a more efficient, flexible, and individualised production system needs to be understood as a paradigm shift that affects broader society (Geels, 2011). The implementation of new production concepts promises to bring radical changes to labour processes, workplace design, and even newly raised themes in the social dialogue, but forecasts differ in their predictions of the nature of these changes. For instance, an industrial robot may be complex and expensive to implement and might replace a few workplaces, while a software algorithm can be relatively simple and inexpensive to implement and might swiftly generate unemployment. The implications in work and employment brought about by each technology will also depend on national innovation institutions (Geels et al., 2016), the industrial relations system (Freeman, 1995), and the type of capitalism (Hall and Soskice, 2001). Moreover, the effects of technological change can be differently spread, depending on the institutional framework that each society sets for itself (Eurofound, 2018).

One emergent technology within the Industry 4.0 concept is Artificial Intelligence (AI), which is also an umbrella term that integrates several industrially applied technologies,

numerical control (NC), robotics, and cyber-physical systems. AI can be defined as a computer system that performs tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, or translation (Pettersen, 2019). It involves the system's ability to interpret external data, to learn, and to use those learnings to achieve specific goals and tasks through flexible adaptation (Hall and Soskice, 2001). Although AI research and applications have existed for years, due to the rise of Big Data and high-performance computing, the development of broad-spectrum algorithms in AI will have a significant technical, economic, and social impact.

The introduction of AI is expected to meaningfully transform the organisation of work within firms – with tasks being developed at workplaces alongside the skills and qualifications necessary to cope with challenges (Hall and Soskice, 2001; Autor, 2014; Fine et al., 2018) – leading to a wave of innovation in organisational design and changes to institutionalised workplace norms (Schildt, 2017). These advanced algorithms may have a wide range of applications and generate interest among firms because they may produce significant technical, economic, and social effects. However, to avoid speculation, these systems have to be in an advanced development phase of the European Technology Readiness Levels (TRL). In other words, there must be a system prototype demonstration in an operational environment first (TRL7).

We will focus on AI (cyber-physical systems, intelligent automation, robotics, and IoT) as the most relevant emergent technology for understanding the digital transformation in the automotive sector (Moniz, 2018), as well as on Industrial AI, which is a “systematic discipline focusing on the development, validation, deployment and maintenance of AI solutions (in their varied forms) for industrial applications with sustainable performance” (Peres et al., 2020). The relevance of intelligent manufacturing in the automotive sector has also been extensively documented in terms of working conditions, qualifications, and skill requirements (Moniz, 2018).

This chapter will contribute to findings on the relation between employment and automation. We inquire if employment in the automotive sector has changed with the recent automation trends in Portugal as forecasted. We also want to know what the expectable changes in work organisation are due to the emergent digital transformation in the automotive sector and new players specialised in ICT activities (e.g., software development, digitalisation, data analytics, cloud computing, AI, cybersecurity, and blockchain) as part of the automotive value chain in Portugal. A question that needs an answer is if there are signs of improved qualification with increased automation. Our paper will, finally, obtain information about whether the application of Industry 4.0 concepts in the automotive sector has impacted labour relations.

Most reports estimating the impact of AI are based on quantitative modelling of employment according to occupation (Frey and Osborne, 2017) or tasks (Autor, 2015). In Europe, the impacts of AI have been estimated to lead to a reduction of millions of

positions by 2030. In Portugal, one study reports that AI could eliminate 1.1 million jobs and suppress 50% of working hours by 2030 (Nova SBE and CIP, 2019).

Current approaches mainly use quantitative models that feature drawbacks associated with occupations (Frey and Osborne, 2017) and tasks (Autor, 2015). One way to refine the implications of automation in work and employment is to select a technological innovation (e.g., automation, including Artificial Intelligence) and to study its impact on companies in a given society (in this case, those of the automotive sector in Portugal). The automotive sector is a high-tech industry and leads investment in R&D projects related to AI. Thus, our approach used mixed methods to conduct statistical analyses of relevant databases and interviews with experts on Portuguese R&D projects related to AI implementation to allow for a closer examination at company level of the ways in which work is being redefined and what the future expectations may be.

Our empirical data are based on initial case studies from the automotive and components industry, combined with data from Portuguese R&D projects – supported by European structural funds – in robotics, machine learning, collaborative tools, human-machine interaction, and autonomous systems. The implications for industrial productivity and employment are discussed in relation to automation trends in the automotive sector.

METHODOLOGY

Building on the work done by Boavida & Candeias (2021), and using the same approach based on mixed methods so that qualitative analysis can support findings in a quantitative analysis of the available data on the automotive sector in Portugal, further interviews were conducted alongside case studies. The technological effects of each AI project were validated by innovation experts, technology managers, and experts on organisational change and labour processes in order to reveal details about the effects on work organisation and the requisite skills and qualifications. Industrial relations partners also provided expertise about impacts on the existing system.

The methodology consisted of a literature review, analyses of international and Portuguese databases of R&D projects, and fieldwork with R&D experts on automation projects in the automotive sector to investigate the implications of AI in employment, work organisation, qualifications, and labour relations. Desk research included a review not only of systematic literature but also grey literature (reports, official documents, newspapers), as well as exploratory interviews with three experts on industrial productivity and employment.

Fieldwork included exploratory, in-depth interviews and non-structured interviews with technology providers in the automotive sector, automotive component companies, and work organisation and labour experts. This research was carried out from September 2020

to November 2021. Some initial data has already been published by Boavida & Candeias (2021).

Our findings resulted from a discussion around several cases from the current activities of interviewees. The implications for employment, work organisation, and qualifications stem from the demonstration of AI applications on the factory floor. The cases are the following:

Case number	Description
CobAE	Cobots for assembly and production line of an original equipment manufacturer (OEM);
AEglue	Automated glue bead inspection systems (computational vision and predictive analysis) – after the dispensing process, automatically for all produced parts at tailgates in an OEM;
IntZip	Computational vision system for quality inspection of zippers for the automotive industry, in a textile company;
RobSun	Welding robotic cell;
InspSVA	Automated inspection system;
SunCob	Cobots for production line of a supplier of parts.

RESULTS AND DISCUSSION

Employment

To assess changes related to employment in the automotive sector due to the recent automation trends in Portugal, we analysed Gross Fixed Capital Formation (connected with ICT, machinery, electronics, electricity, and construction) as a proxy for investments in automation and Gross Fixed Capital Formation in ICT (ICT equipment, software, and databases) as a proxy for investments in AI for the period 2010–2017 (Figure 1). For the same period, the number of employees in the automotive sector was also analysed (Figure 2). From 2013 to 2017, employment in the automotive sector increased at an average annual growth rate (AAGR) of 6.19%. This was significant when comparing to the 1.92% growth in total employment over the same period. By 2017, the automotive sector represented 1% of total employment in Portugal, which translates into a notable volume within the country but is still lower than in comparable countries (Spain, Italy, France,

Belgium, the Netherlands, United Kingdom, and United States), even with the growth positive trend witnessed since 2013 (OECD Statistics – STAN).

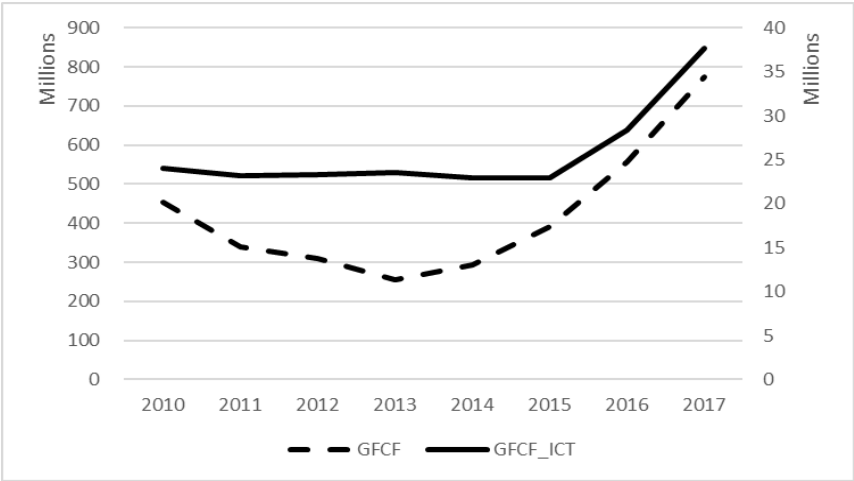


Figure 1. Evolution of the Gross Fixed Capital Formation (GFCF), current price (€), in the automotive sector (NACE 29/30.99) in Portugal, 2010–2017. Source: OECD STAN Industrial Analysis (2020 ed.).

It can be observed (Figures 1 and 2) that investments in automation technologies have followed employment trends in the automotive sector. A detailed analysis shows two different periods: from 2010 until 2013, a negative trend can be observed with an annual average growth rate (AAGR) of -17% in GFCF and -1% in total employment; and from 2013 to 2017, a positive one, with an AAGR in GFCF of 32% and of 6% in total employment. AI investments started to grow only from 2015 onwards (Figure 1), with an AAGR of 28% between 2015 and 2017. These data suggest that digital technologies are not decreasing employment in the automotive sector in Portugal.

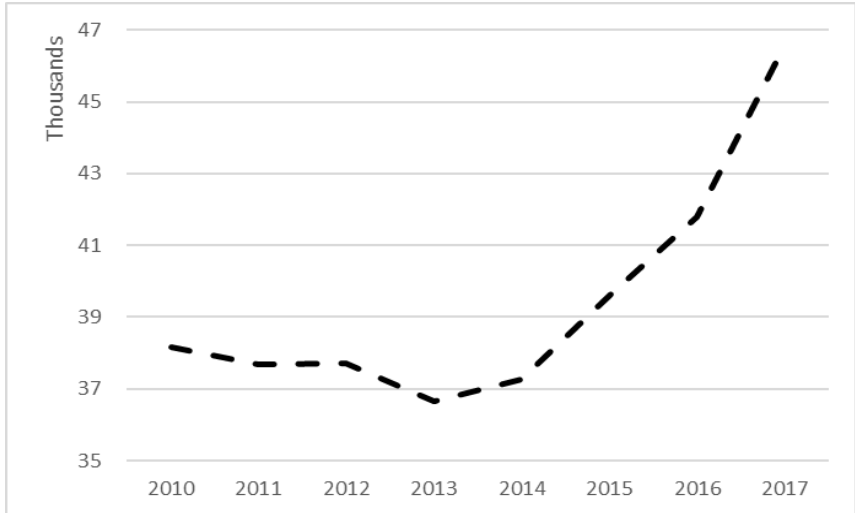


Figure 2. Evolution of total employment in the automotive sector (NACE 29/30.99) in Portugal, 2010-2017. Source: OECD STAN Industrial Analysis (2020 ed.).

Evidence from the interviews suggests that computer vision, human-machine interaction, and predictive analysis are changing operators' tasks but are not resulting in the dismissal of workers from companies. Technologies are more efficient than humans in some tasks, but they still have limitations that maintain humans as essential in overall process performance. Companies perceive the need to automate, but – despite being more open to adopting these technologies – they are faced with a lack of available human resources, skills, and/or access to knowledge. According to the innovation manager of the company with applications in the cases CobAE, AEglue, and IntZip, the overall expectation is that the adoption of robotics, automation, and computational vision will be widespread in one to two years. However, cloud computing, plug & produce, blockchain, and AI will take longer to be implemented because they involve connectivity, monitoring, data collection, and automated decision-making.

In another set of interviews, and according to the head of innovation in the cases RobSun, InspSVA, and SunCob, that company had been increasing its number of employees before the pandemic. His view is that there were fewer workers by cell, and that was a reason for increases in productivity and efficiency. However, the cases became more competitive and thus more able to attract new business contracts, originating the need to install new cells and recruit new employees. Overall, this corporate group has been experiencing productivity and reliability increases with the adoption of automation technologies – which

have been important for competitiveness and winning future projects, according to the same interviewee who is responsible for innovation in the group.

Work organisation

R&D projects in the automotive sector related to AI, funded by the European Regional and Development Fund in Portugal (ERDF), were analysed. For the period from 2008 to 2020, 19% of R&D investments in Portugal were for AI projects. Specifically in the automotive sector, it was 43% (Boavida & Candeias, 2020). Interviews on the selected projects and companies were conducted in order to collect qualitative evidence. Our findings suggest that new technology-based systems, in essence, assist operators as they manage to make detailed analyses that are more adequate to task objectives, increasing the efficiency of the process. Thus, expectable changes in work organisation due to the ongoing digital transformation in the automotive sector may have an effect of displacement, the disqualification or qualification of work, and operators' augmented performance of their tasks.

In the case CobAE, dealing with robots for the assembly and production line of an OEM, it was possible to identify two different situations. One was where the robot picks up and places the parts, and human intervention is only needed if a part is in a wrong position that prevents the robot from performing its task, resulting in a displacement effect; whereas in the other situation, related to car inspection, this task cannot yet be performed by the robot alone due to limitations on its time cycle and is performed by a human-machine collaboration, augmenting the operator's performance.

In the case AEglue, the quality inspection system developed in the project is completely automated, from detecting the most typical defects in glue beads to the automatic diagnosis of the equipment status through historic data processing and automated correction of correctable bead defects. Although the system can complete its tasks autonomously, it still needs human intervention to add any additional features or to solve any obstruction that may arise in the production line, leading to the displacement of the operator to conduct control and supervision tasks.

In the case IntZip, due to the complexity of inspection requirements, automated artificial vision systems are an added value because they can perform quality assessment more efficiently than humans. Still, human presence continues to be necessary to deal with the new system and add new features, which may lead to a qualification of work. However, in this case, the manager was reluctant to implement a new solution due to the lack of people with adequate knowledge to do this at the outset. Even though the systems are designed with easy-to-interact interfaces, being integrated in cyber-physical systems, in a data network through which it is possible to receive support from anywhere in the world,

it is nevertheless a challenge for a person without the basic knowledge/training to program the system to incorporate a new requirement.

In the case RobSun, the system performs tasks more efficiently than a worker until a certain point of the process from which it lacks flexibility to do so. Workers' knowledge and experience are necessary to finish the task at high quality standards, thus leading to an augmentation of the operator's work.

In the case InspSVA, the quality inspection of parts is done by an automated system, which automatically rejects the part and registers it in a database that allows for efficiency, traceability and the part's remanufacturing – leading to an increase in productivity, reduction of costs and a displacement effect. However, since these systems are only implemented for high-quality products, the displacement effect may not affect the organisation of work.

In the case SunCob, in response to increased production volume, production line capacity and productivity also had to be increased. This new process for design and robotic programming was made internally, with only one machine being acquired externally, leading to a qualification of work.

Qualifications

To assess the effects of automation on workers' qualifications, the evolution of low-skilled workers and unskilled workers in the Portuguese automotive sector from 2012 to 2019 was analysed. Only this indicator was used because the statistical definition for the classification of “qualified and highly qualified” workers in the statistical database of the Ministry of Labour is not precise. Most workers classified as “semi-skilled” become “skilled” after a few years of professional activity in a company. Even the training access to the level of qualification is vague.

The results suggest that automation technologies are not inducing disqualification, since there has been a reduction of this kind of workers in companies from 2015 and 2016 onwards (Figure 3). The weight of low-skilled workers in the automotive sector has tended to decrease in the last 5 years, even though semi-skilled workers represent almost one third of the total number of employees. Although the volume of employment in this sector is increasing, job entry happens mostly at higher levels of qualification. In this group, as of 2019, 43% were classified as “skilled workers”, 8% as “highly skilled”, 5% as “team leaders” and 6% as managers among the more than 47 thousand employees in the sector.

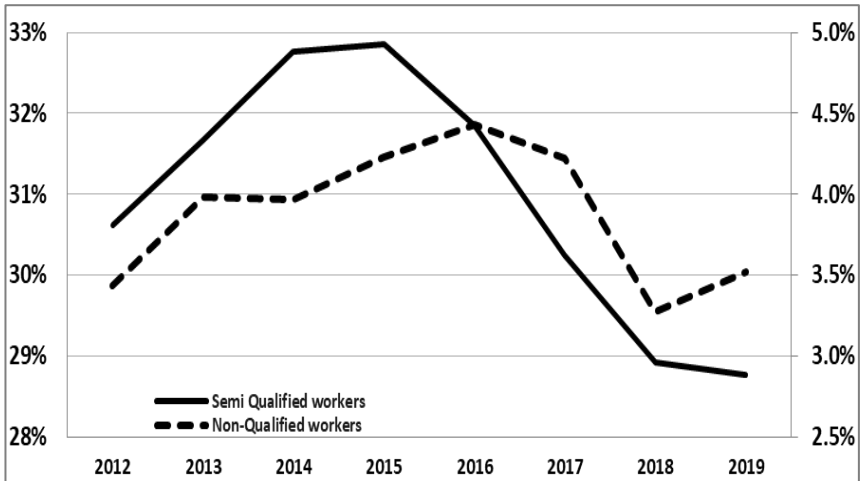


Figure 3. Variation of the weight of low-qualified workers in the employment structure of the Portuguese automotive sector between 2012 and 2019. Source: Quadros de Pessoal 2012, 2013, 2014, 2015, 2016, 2017, 2018 and 2019, Ministry of Labour (MTSSS).

Since there is usually no knowledge or competence among the workforce about new artefacts, the introduction of a new technology may lead to a new work qualification. The adoption of new systems increases productivity and creates the demand for new labour, usually with further qualifications. According to Quadros de Pessoal of the Ministry of Labour, between 2012 and 2019, the schooling level in the automotive structure gradually shifted. It has progressed from a workforce with mainly basic, compulsory education (elementary and primary school) to a workforce concentrated at the secondary school level (37%), with a slight increase in workers who had obtained a tertiary level degree (10% with a bachelor's and 2% with a master's degree) by 2019.

In summary, the rate of low-skilled workers has been decreasing over time, and the qualification structure in automotive companies is moving towards an increased share of workers with higher levels of schooling. However, based on evidence from the interviews, there is still a lack of workers with the skills to deal with automation and AI technologies.

In the cases RobSun, InspSVA, and SunCob, according to the head of innovation, young workers usually have a good schooling level (secondary school) because of the company's policy to hire workers that have at least a secondary diploma or vocational training, who are expected to learn very fast. However, due to the high demand for this kind of profile, he reported some difficulties in maintaining qualified personnel or hiring new ones to

respond to the increasing need for new jobs – ones created due to the high number of contracts gained based on the efficiency and productivity derived from automation technologies being implemented in the company.

In cases CobAE, AEglue, and IntZip, according to the executive manager, while companies want to invest in new solutions, they do not have the skilled personnel to work with them, neither on their workforce nor in the market. And even when they have one or two people with the basic competences to be trained in new technologies, there is always a set of unforeseen events (illness, change of jobs, retirement, etc.) that can affect availability and access to knowledge/skills.

Labour Relations

At the national level, trade union density is down from 21.7% in 2004 to 16.3% in 2016, according to the ILO (2018). Portugal has a significantly low level of employees reporting the existence of a trade union, works council, or similar body (Eurofound, 2017b). Collective bargaining coverage is low, declining from 80.2% in 2004 to 72.3% in 2015.

According to the Portuguese Ministry of Labour, there are 11 Collective Bargaining Agreements (CCTs) and one Company Agreement (AE) established for the automobile sector. This AE was established between the company Fico Cables and the trade union National Union of Industry and Energy (SINDEL). The other CCTs were established mostly between the Industrial Association of the Metal Sector (AIMMAP) or the National Association of Electric and Electronic Industries (ANIMEE), among others, and the Union Federation of Metal (FENAME), SINDEL, the Metal Union, and the Union Federation of Industry and Services (FETESE). Most of those agreements were established to focus on salaries and working conditions.

Most larger companies have company labour agreements, but the presence of trade unions in this sector is decreasing. There is the case of Volkswagen AutoEuropa (closely related to the studied cases CobAE and AEglue), which is singular in Portugal: the workers council is involved in decision processes, following the German model of labour relations. In the Portuguese electronics sector, the Bosch case approaches this model, as well. The other case is that of CaetanoBus (more related to the cases RobSun, InspSVA, and SunCob) and Mitsubishi Fuso, which still feature partial influence from the Japanese labour relations model where workers' involvement is part of quality management processes.

It is in this context that the government recently issued a new document that would focus on the digitalisation process and its effects on the manufacturing sectors. A main goal of the Portuguese Green Book on the Future of Work (issued by the Ministry of Labour in 2021) is for it to be a tool that can help transform the uncertainties related to the future of work into new opportunities on the labour market regarding skills and productivity, working conditions and salaries, remote work, stability of jobs, equality, and social

protection. Almost nothing is proposed about the digitalisation of work in manufacturing industries. Many robots have been recently introduced, especially in the automotive industry, but the implications of this have not been tackled.

Regarding recommendations, the book mentions that algorithms should be regulated, especially in labour relations. It highlights the need for further legislation on the “autonomous behaviour of AI”. However, until now, no further legislation has been proposed or even approved on this. Besides, social partners have no concrete proposals on the process of digitalisation and its impact on employment, apart from the need for further training. Similarly, further legislation on the autonomous behaviour of AI, although necessary, is not expected.

CONCLUSIONS

Based in our findings so far, we can conclude that employment in the automotive sector in Portugal was not decreasing during the period of 2010–2017, despite the implementation of digital technologies. In some cases, there were efficiency and productivity increases derived from the implementation of digital technologies that even led to the creation of new jobs. Digital technologies, including AI, seem not to be replacing workers but rather augmenting their capacity to perform their tasks. Changes in work organisation due to the digital transformation in the automotive sector are expected to have a displacement effect in some occupations; in others, a qualification of work related to the adoption of new artefacts. This is because the current workforce lacks the skills to operate these new technologies. In fact, between 2012 and 2019, investments in digital technologies did not lead to the disqualification of work, since the numbers of low-skilled and unskilled workers had been decreasing in the automotive sector for the past 5 years.

Although several implications of Industry 4.0 need to be addressed, nothing is being proposed by the government about the digitalisation of manufacturing, even after many robots have been introduced. Social partners have no concrete proposals on the impact of the process of digitalisation on employment – apart from the need for further training, that algorithms should be regulated, and that further legislation should be issued on autonomous AI behaviour. Besides these topics, unions propose the need for stable jobs in the context of digitalisation, and employers the need for further legislation and incentives for investment.

These conclusions cannot be generalised because they are based on specific cases of a sample that is not representative of the entire automotive sector in Portugal. Nevertheless, it gives valuable insights about possible changes and the effects of implementing digital technologies in these industries. Further research is needed concerning new players in the automotive sector, specifically the digital competence centres established in Portugal in

recent years. Their existence in the Portuguese market is very recent, and, therefore, there is very little data available about their activity and impacts to draw conclusions from.

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CHAPTER 5.

TECHNOLOGY ADOPTION AND SKILLS DEVELOPMENT IN SCOTTISH MANUFACTURING SMALL AND MEDIUM ENTERPRISES (SMES)

Fanni Tamasi

ABSTRACT

The overarching aim of this research is to understand the impact of new technology adoption on skills requirements in Scottish manufacturing small and medium enterprises (SMEs). The research highlights the need for a more nuanced view on technologies when examining the impact of technological transformation on organisations and skill requirements. To gain a better understanding on the homogenous effects of different technologies, the implementation of three types of technologies and their consequent effects on skill requirements in manufacturing SMEs are compared, namely: Enterprise Planning Systems, Factory Acceptance Test systems; and hard automation. The research also emphasises the importance of studying the organisational context, through exploring the interplay between technologies and skills in an SME context. Overall, this chapter contributes to discussions on skills development initiatives in the face of Industry 4.0 in the manufacturing sector, with a unique focus on small and medium enterprises. From a policy perspective, the research will identify sectoral best practices and inform current sectoral skills development initiatives addressing the unique needs of small and medium enterprises. This chapter presents the conceptual background of the research, introduces the studied technologies and their potential effects on skills, discusses the research context and outlines the methodology of the research.

Keywords: *technology adoption, skills development, small and medium enterprises, manufacturing*

INTRODUCTION

Technological progress has been a constant companion of human progress all throughout our history. Our current era is no different, and it has witnessed an exponential growth in technological innovations, for example in the fields of advanced robotics, Artificial Intelligence or Machine Learning. With the ever-increasing possibilities due to technological advancements and the falling costs of computing, technology has gained prominence in the world of work. These changes have created an anxious narrative on the fear of increasing levels of technology-driven unemployment (Morgan, 2019), as new

technologies are now able to perform a wide range of tasks that were previously unique to humans. New technologies have the potential to make humans' roles obsolete in performing certain tasks in workplaces (Frey & Osborne, 2017). At the same time, they carry the potential of creating new and different jobs. However, the most widespread effect of new technologies will be making changes in existing jobs. New technologies can change all aspects of work organisation – from what tasks the job involves and who carries out the tasks, to where and how those tasks are performed. All these changes have the potential to alter the skill requirements of the tasks and ultimately, jobs. In order to cope with the potential changes, workers need to possess and utilise the 'right' skills to unlock the benefits of the current wave of technological change.

It is, however, important to note that technological feasibility does not equal technology adoption – as there are a wide range of factors influencing adoption originating from companies' technological, environmental and organisational contexts (Nguyen, 2009; Ramdani et al., 2013). Therefore, deterministic discussions on the impact of technological change on work may be misleading. Even if new technologies are adopted, various technologies have different effects on job roles, tasks and skills. Therefore, to understand the nuances of the multifold changing skill requirements that new technologies might bring, research must closely examine technology adoption in workplaces (Bessen et al., 2019).

The research introduced in this chapter has two main objectives – to explore the adoption of various new technologies in small and medium enterprises (SMEs) in Scottish manufacturing, and to understand their influence on skill requirements. This chapter will outline the conceptual framework of the research. First, it will discuss the relevant literature on technological innovation in the 21st century and its effects on skill requirements. This interplay between technology and skills is then illustrated through three different types of technologies: Enterprise Planning Systems, Factory Acceptance Testing systems and Automated Guided Vehicles. The following section includes a discussion on the importance of studying the organisational context, as it has significant influence on both technology adoption and skills development. This study examines technology adoption in Scottish small and medium enterprises (SMEs). Therefore, the main characteristics of small and medium enterprises are introduced and their implications for skills development and training are discussed – along with barriers to technology adoption and skills development in SMEs. The penultimate section of the chapter outlines the research methodology, which is followed by a summary on the main objectives of the research and its contribution to theory and practice.

TECHNOLOGY, WORK ORGANISATION AND SKILLS

Recent research on technological change, such as the OECD study by Arntz and her colleagues (2016) or the widely debated study by Frey and Osborne (2017), discusses digital technology as either a homogenous entity, or only covers the effects of AI and robotics. This neglect of the heterogeneity of technological manifestation, however, often leads to generalised, pre-deterministic assumptions about the potential effects of new technologies. It is important to highlight that different types of technologies will have different effects on task complexity, work organisation and ultimately, skills requirements. Dhondt and his colleagues (2019) discuss five different types of technologies based on their effects on work organisation: hard automation, human enhancement technology, communication technology, information technology and management systems, which are outlined below.

Hard automation refers to the classic automation process where, by translating complex work processes into programmable tasks, new technologies reduce the amount of human labour required to perform tasks (Autor & Dorn, 2013). This can lead to the disappearance or the redistribution of tasks in the organisation, which can mean that certain skills will become obsolete (Bessen, 2016; Bessen et al., 2019). However, new technologies might require new skills, such as digital skills for using the technology itself or cooperation skills for enabling human-machine interaction. A further potential skill effect of automation might be that due to the automation-enabled improved efficiency and productivity in the organisation, workers engage more intensely in other tasks that are included in their job.

Human enhancement technology shows the augmentation effects of new technologies as they support workers in the execution of their tasks. This can enlarge operator capabilities and increase productivity in the workplace. Similarly to automation, the skills effects of this type of technology can be that workers require new skills for using the technology or they will use more of the same skills, which they previously did, but at an increased intensity. Another potential skill effect of human enhancement technologies might be that the nature of a given skill changes. For example, professionals may require different kind of presentation skill at face-to-face events, from what they would use during an online or a hybrid event. Here, both delivery types require presentation skills, but the change of the platform might alter the nature of the required skill.

Communication technology (CT) is often discussed as synonymous with information technology (IT) in the literature. However, as Bloom and his colleagues (2014) argue, information and communication technologies have distinct effects on work organisation. Communication technologies focus on the communication between different actors in organisations and facilitate specialization. This is because communication technologies reduce tasks variety performed by individual workers, since they can rely on other actors in the organisation better with the help of these technologies (Bloom et al., 2014). This leads to the strengthening of hierarchy in organisations, as decision-making is pushed

‘upwards’. Since CT enables task specialization and reduces task variety, it has a deskilling effect on workers.

Information technology increases the accessibility of information in organisations, which has an empowering effect. With the help of IT, workers can handle more problems without relying on others, and therefore, can take on more responsibility (Bloom et al., 2014). Contrary to communication technologies, information technologies might lead to decentralization in organisations and broaden task variety. In this way, IT has an upskilling effect on workers, as the technology enables them to perform more tasks.

The final type of technology that Dhondt and his colleagues (2019) discuss is management systems. Management systems include technologies that enable standardization in organisation (Dhondt et al., 2019). Other technologies, such as communication technologies, might help in this process, too. Standardization in organisation leads to task specialization, which, similarly to communication technologies, has a deskilling effect on workers.

As the above discussion shows, different types of technologies will have significantly different effects on tasks, work organisation and skills in organisations. However, it is important to note that these categories of technologies are not mutually exclusive, and one piece of technology can fulfil multiple roles and functions. This research aims to explore these heterogeneous effects of three different types of technologies, which are introduced below.

Enterprise Resource Planning systems

Enterprise Resource Planning (ERP) systems are software systems that integrate several data sources and processes into one unified system (Bloom et al., 2014). ERP systems can be classed as an information technology which helps to store, retrieve and share information on any aspects of an organisation’s operation in real time. In this way, ERP systems can enhance quality and productivity in the workplace and allow a common workflow and transparency all throughout the organisation. As Bloom and his colleagues (2014) state, ERP systems are typically the largest IT investment in manufacturing businesses. These systems have been in use for around two decades, and thus, may not be classed as ‘new’ technology. However, for small and medium enterprises at the beginning of their technology journey, ERP systems are often the first significant technology investment, which bring considerable changes to tasks, work organisation and skills in the organisation.

By connecting the full organisation’s operation and enabling information sharing, ERP systems empower workers across the organisation to make decisions and take on more responsibility. Therefore, ERP systems have the potential to broaden task variety and can have an upskilling effect in the organisation. With the implementation of these systems,

employees might require additional skills such as: digital skills to use the system; information literacy skills to fully utilise the available data sources; and collaboration skills along with communication skills, as ERP systems enable cross-functional cooperation.

From a work organisation point of view, ERP systems allow the tracking of activities in the organisation. By sharing information across the different functions and empowering workers to make more decisions independently, ERP systems also decrease the need for micro-management in organisations. Hence, they free up time for managers that can be used for more strategic activities. This way, ERP systems can have an upskilling effect on managers, too.

Factory Acceptance Testing

Factory Acceptance Testing (FAT) is a process that evaluates equipment during and after an assembly process by verifying that it is built and operating in accordance with design specifications. Software performing this testing process acts both as a human enhancement technology and as a management system.

As discussed above, human enhancement technologies support workers in the execution of their tasks and can lead to increased productivity and quality. By monitoring the quality all throughout the production process, FAT systems can help workers with cost and time saving, customer relations and after-care processes. Due to the close monitoring of the production process, FAT systems also act as a control mechanism and can identify fault in these processes.

By setting quality standards for production processes, FAT systems can lead to process standardization in organisations. From a skills perspective, these testing systems do not necessarily change the content of jobs or tasks in the production process; they rather enable workers to verify that the output of their work is of high quality. Nevertheless, this technology still might require additional digital skills for workers to use the software, and written communication skills to record the production process and to engage with customers in the after-care process.

Automatic Guided Vehicles

Automatic Guided Vehicles (AGV) are load carriers that travel along the floor of a facility without an on-board operator or driver. Their movement is directed by a combination of software and sensor-based guidance systems. Their applications include the transportation of raw materials, work-in-process and finished goods in support of manufacturing production lines and storage/retrieval or other movements in support of warehouse picking.

These autonomous vehicles can be classed as hard automation, in which sophisticated software replaces human labour. The introduction of these machines leads to the disappearance of tasks in the organisation, as there is no need for an on-board operator or driver to run this equipment. However, their implementation and use still require new skills in the organisation. For example, workers may require collaboration skills to work alongside these autonomous vehicles, and the maintenance of machines may require technical skills.

Overall, these three examples illustrate the need for a more nuanced view on technologies in the literature, as different types of technologies have different levels of complexity and will introduce various changes to organisations. Moreover, these examples show that the effect of technological change on skill requirements will not be straightforward or universal in a sector, nor in the labour market as a whole.

It is also crucial to remember that technologies are not standalone entities in organisations. New technologies get adopted into established workplace environments. The organisational context has significant impact on work organisation, tasks and skill requirements, as well as the technology adoption process itself. In fact, in most if not all cases, technologies are a vehicle for managerial goals (e.g., cost effective labour or performance efficiency), and their design is biased towards managerial structures. Therefore, it is highly important to consider the organisational context when we study the interplay between technologies and skills.

ORGANISATIONAL CONTEXT

This chapter studies technology adoption and skills development in Scottish manufacturing SMEs. Small and medium enterprises play a pivotal role in Scotland's economy. Nevertheless, the Scottish government has identified SMEs as a hesitant population when it comes to adopting technological innovation and developing digital skills for its workforce (Scottish Government, 2019). In order to best support them, it is vital to understand the issues that these organisations face when it comes to technology adoption and skills development.

The term 'small and medium enterprise' incorporates a very diverse range of organisations, ranging from family-owned micro-organisations to companies with over two hundred employees. These differences will, of course, show in the work organisation and management structures. However, this chapter discusses SMEs in only general, broad terms and will not include a discussion on the nuances between various SME sizes.

Compared to large organisations, SMEs have a more flexible organisational structure with horizontal linkages in them; they also tend to use more informal procedures than large organisations would (Kurochkina et al., 2019). This organisational structure also has

implications for skills development. Due to the relatively small number of employees in these organisations, individual workers often have multiple roles and responsibilities in their companies, leading to undefined job roles and unclear boundaries around responsibilities (Nolan & Garavan, 2016).

As for skills development in SMEs, training and development activities are characterised by informal, ad hoc learning; and are often a response to immediate business needs (Harney & Alkhalaf, 2021; Wapshott & Mallett, 2015). These informal training activities frequently go unreported, and they can be difficult to capture in research. Hence the need for a closer, more qualitative exploration of these organisations. It is also important to remember that since SMEs' organisational structure can significantly differ from that of large organisations, prescribed HR practices, policy recommendations and sectoral best practices might not work in these organisations (Wapshott & Mallett, 2015). Therefore, we need to consider the unique needs of SMEs in the development of various national- and industry-level skills initiatives.

When it comes to barriers that SMEs face in relation to technology adoption and skills development, there is a considerable overlap between these two areas of research. According to the literature, the lack of strategic planning and limited financial, time and human resources, various rules and regulations and ever-changing grants and support initiatives have all been mentioned by owner-managers of SMEs as challenges hindering innovation and skills development in these organisations (Harney & Alkhalaf, 2021; Idris et al., 2020; Muller et al., 2019; Nolan & Garavan, 2016). This overlap illustrates that organisational structure affects all parts of a business. Therefore, it is crucial to contextualize research on the interplay between technology adoption and skills development – which is one of the aims of this chapter.

RESEARCH METHODOLOGY

This research studies technology adoption and related skills development in the Scottish Advanced Manufacturing and High Engineering sector, 80 per cent of which is composed of SMEs. Lack of SME engagement with Industry 4.0 was a problem pre-Covid-19 that created tension between SMEs and large organisations in supply chains (SDS, 2019). Industry bodies since then have argued that Covid-19 accelerated technology uptake in the sector, but skills development is still essential for unlocking the potential of new technologies (Valero et al., 2021).

The research uses qualitative case study research design, and data collection is underway at the time of publishing this chapter. It involves multiple case studies with manufacturing SMEs, who have recently adopted any of the above listed new technologies, covering several topics: the drivers behind technology adoption; the consequent changes in tasks and skill requirements in the organisation; and the related training and skills development in SMEs.

These topics are discussed with the owner-managers of the case organisations, managers, workers, whose jobs have been directly or indirectly affected by the technology implementation, and representatives from the technology companies where the case organisations purchased their equipment. Moreover, the research includes interviews with relevant external stakeholders in the sector who provide a useful, broad overview on the sector's health, the support available for organisations and their views on collaboration with SMEs in the sector.

SUMMARY

Overall, the study will seek to improve understanding of the perceived benefits and challenges of technology adoption and related skill requirements from multiple stakeholders' perspectives. This research makes two theoretical contributions to the literature on technology adoption and skills development in the context of SMEs. Firstly, it adopts a nuanced view on the impact of technology on work and considers the heterogeneous effects of different types of technologies on tasks and skill requirements in organisations. Secondly, the research emphasizes the importance of the organisational context when it comes to studying the interplay between technologies and skills. From a policy perspective, the research will inform current sectoral skills development initiatives on the unique needs of small and medium enterprises that can encourage a more widespread technology uptake in Scottish manufacturing SMEs.

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CHAPTER 6.

DIGITALIZATION OF EDUCATION, THE ROLE OF DIGITAL TECHNOLOGIES AND ARTIFICIAL INTELLIGENCE IN BUILDING NEW SOFT AND HARD SKILLS. RISKS AND PROSPECTS

Mariana Todorova

Keywords: *digital technologies in education, AI, new skills, cognitive abilities*

The key trends leading to the change of educational systems are a result of the Fourth Industrial Revolution and the digitalization of society. If they do not follow their normal evolutionary course, it would be to the detriment not only of educational institutions but also all sectors concerning the nation-state itself. New soft and hard skills, among which digital competencies will be leading, will have to be validated frequently, in the shortest time every 6 months and in longer periods up to 2-3 years, and the educational sphere will have to actively respond to the new necessity and established normality of lifelong learning. The main goal of educational institutions is to prepare for the concept of a self-actualizing economy, in which participants self-actualize their knowledge and skills, ad hoc to emerging labour market needs and customized labour niches that workers themselves create and offer in the form of goods and services.

At the same time, as in many other fields, excessive digitalisation, robotics, automation and the entry of artificial intelligence can dehumanize education by changing its spirit of an existentially important and socializing factor around which to build part of our lives. When an ideological concept of a 'new world order' or a 'new economic or political paradigm' is born, humanity always develops its adaptive response, though without necessarily analysing whether these changes serve its well-being or are simply an unappealing trend. At the same time, one current trend is gaining in popularity: 'non-degree-seeking education', which is a fast track for acquiring knowledge in a certain field that is sufficient for practicing an emerging profession. This poses a great challenge to the education systems themselves, which must totally shift their philosophy and structure in order to survive. Elon Musk's Neuralink project is so successful because it offers people a still-unfulfilled dream, perceived by some as a desired utopia, in which human intelligence will be extended and improved through direct contact with a cloud system or artificial intelligence that will allow the existence of a global collective intelligence.

The key mega trends in education are digitalization, robotics, the introduction of artificial intelligence, the flipped learning model (learning the material at home and debating and stimulating critical thinking at school), an individualized

approach to each student, the mass digitalisation of higher education and monopolisation of master's and later bachelor's programs by the world's leading (American) universities, lifelong learning and a non-traditional combination of hard and soft skills.

DIGITALIZATION IN EDUCATION refers to the use of computers, mobile devices, the Internet, software applications and other types of digital technologies for the education of pupils, students and teachers of all ages. As part of the digitalisation process, there are smart classrooms that promote teaching opportunities by integrating learning technologies such as computers, specialised software, audience response technology, listening aids, networking and audio/visual applications. Smart classrooms, blackboards or the growing popularity of virtual (classroom) rooms are undoubtedly gathering interest in education among Generation Z. On another level, though, part of it includes commercialization through technology and the realization and overcoming of the visual over the verbal transmission of information and knowledge.

Digitalisation allows teachers and students to work together to develop digital competences, work with audio and video content, create interactivity, 'compete' with smartphones and surf the Internet, directing it to the educational process, build new soft skills (critical thinking and debate), facilitate the cognitive abilities of learning by doing, stimulate an individual approach and discover students' personal talents or difficulties, all leading to the elimination of the need for additional / private lessons, etc.

Opportunities that we highlight with this new technology-based phenomenon allow education to meet the challenges of the 21st century, not the rigid system that, according to Jack Ma, has not changed since the 19th century. Conservatism is healthy and ensures the sustainability of social systems, but today it is important that pupils and students acquire new skills aimed at individualizing education – rather than the mass approach – which gives them a chance to more accurately construct their interests and, thus, to invest in their future. There is already evidence¹ of the negative impact of screen time on physical health and the brain's cognitive abilities "closing in a digital world", exacerbated by the Covid 19 pandemic and the loss and reduction of many other skills: handicrafts, the arts, connection with nature, good social, communication and presentation skills, etc.

CODING AND PROGRAMMING are becoming key educational subjects. Countries such as the United States, China, South Korea, Japan, India and Estonia already introduce it as an official subject in primary education. Canada, Ireland, the Netherlands, Malaysia, Sweden and even Romania are implementing Computer Science in primary and secondary

¹ <https://www.ryeeyecare.com/can-too-much-screen-time-impact-childrens-health-and-vision/>

education. The business world, for its part, is not waiting on governments that cannot make decisions in this direction. A number of companies offer hybrid kits that combine traditional assembly with programming or require the site to be programmed first and then built from available components. In the Netherlands and the United States, children are taught ethical hacking so that they understand technology and can fix problems in the context of cybersecurity. Some of these skills are called 'cyber hygiene', which are in the field of creating good passwords, the legal and illegal use of data, harassment from intruders and identifying viruses. The ability to detect fake news through analysis of sources, fact checkers and algorithms is indispensable for raising children as responsible and sensible adults.

Such initiatives prepare learners for the future of inevitable collaboration with technology and programming, or at least an understanding of algorithms and the algorithmization of many work processes. Naturally, an earlier partnership with business is needed that, in addition to opening new market niches (educational products and services), helps to build future digital skills that will be necessary in the profile of employees.

However, shifting the focus of new concepts of education may come at the expense of the humanities and social sciences, the loss or underestimation of concepts such as emotional or cultural intelligence, empathy, etc. Research already reflects the trend of quantification and data-based evidence, without taking into account the culture of critical analysis and debate, highlighting a thesis, antithesis and synthesis. This, in its own way, 'algorithmizes' education and science but also distances us from the traditions of the Enlightenment.

VIRTUAL AND MIXED REALITY has also entered education through devices such as headsets and glasses, creating virtual classrooms with three-dimensional images suitable for studying, among many other subjects: biology (plants and animals), history (three-dimensional videos with historical events, battles), geography (visiting a museum and real geographical locations), space and molecular biology. In higher education, virtual reality is used to train medical students (with 5,300 cases of surgical simulations, more diverse than what students could ever practice in real life). Children can visit virtual museums at any time, whether they are 60 or 6,000 km away. Teormin² is the world's first virtual piano teacher. In co-development with Microsoft's HoloLens, holographic hands will play and train students. Mixed reality creates holographic images that mimic real teachers 'giving lessons' against the backdrop of a historical film or three-dimensional object.

Through virtual and mixed reality, students can obtain complex information, acquire specific skills and process a large amount of information through visualization and interactivity. At the same time, however, research shows that after 8 hours of being in

² <https://www.microsoft.com/bg-bg/hololens>

virtual reality,³ the brain stops noticing the differences in which environment it lives in, and only the conscious senses change. In fact, using this tool can only deepen addiction to digital technology and the refusal to live and take responsibility in the real world.

AI

Before discussing the impact of this technology (AI) on education, we will distinguish between existing and expected new manifestations of artificial intelligence. At the moment, so-called 'narrow artificial intelligence' is designed to address limited, single tasks. Many of the currently functioning artificial intelligence systems are narrow artificial intelligence, which performs a clearly defined task(s).⁴ It is a technology that allows high-performance systems to replicate and even surpass human capabilities in terms of assigned tasks. These include Watson (IBM's supercomputer), Apple's Siri and Microsoft's Cortana. Any software that uses advances such as data mining, machine learning, pattern recognition and natural language processing to perform simple solutions autonomously can be perceived as narrow artificial intelligence.

There are already platforms based on artificial intelligence across the spectrum covering pre-school to university teaching which, through feedback questionnaires, specify very precisely the educational levels and needs of their users. It was recently reported that reading books from Amazon on the Kindle device accumulates information about how the reader reacts to the reading, for example, which passages are read quickly or slowly, which book is of particular interest because it has been reread many times, etc. The same is expected from educational platforms, which can now read even facial emotions so as to predict whether the content is understood and to adapt it to the level of intelligence of each student who uses them. Artificial intelligence has led to the development of virtual educators to help students learn and prepare for tests.

The Georgia Institute of Technology has introduced its Jill Watson⁵ Virtual Teaching Assistant to offer students individual attention to prevent them from leaving school. This is a chat bot that answers various predictable queries, such as how to format an article. This virtual assistant is trained on a comprehensive database, complete with learner inquiries about the program, introductory emails and appropriate answers from teachers.

There is also a language learning tool that uses artificial intelligence to administer an exam. The test is adaptive, which means that it will change the questions based on the answers that the students have provided before. It asks clearer questions if they fail and

³ <https://www.theguardian.com/technology/2016/mar/19/long-term-effects-of-virtual-reality-use-need-more-research-say-scientists>

⁴ <https://searchenterpriseai.techtarget.com/definition/narrow-AI-weak-AI>

⁵ <https://dilab.gatech.edu/a-suite-of-online-learning-tools>

more challenging ones if they give the right answer. The complexity of the phrases and grammar used also affects the nature of the test given. It even has a feature that evaluates the patterns of mistakes many students make when practicing newly learned words.

There is now a personalized social network in which students can collaborate. In a specific case, students can discuss issues related to their tasks or gain access to new ideas from their peers. Another platform uses cognitive science and artificial intelligence to offer personalized lessons and live feedback to high school students. It assesses the content created by students and allows the teacher to see learners' progress. Another product based on artificial intelligence helps students learn mathematics. It offers many games and prizes that motivate learners and stimulate their engagement. The most constructive thing is that this application provides a training schedule, which is formed by the level of knowledge of each student. The learning platform offers individual maths lessons to students each week. The app shines in sparkling colours while enhancing student engagement and identifies the most effective ways to teach in the moment. Through artificial intelligence, it can evaluate recorded sessions and suggest the best teaching methods for both teacher and learner. In this case, artificial intelligence can prescribe whether a student shows signs indicating loss of interest. In the future, this tool intends to offer feedback, again guided by artificial intelligence, to teachers during each session. With this, teachers will be focused on slowing down if they speak too fast, and vice versa. But the excessive involvement of artificial intelligence in the educational process breaks the student/student-teacher relationship, dehumanizes it, individualizes it and directs it to interact with extremely circumstantial indicators of knowledge.

THE USE OF 3D PRINTING IN EDUCATION is a matter of 'exporting' objects from the computer screen to the real, physical world – and into the hands of students to check, analyse and initiate other processes in which they take advantage of an action or the ability to program a subject or make artificial intelligence do it. History students can print out historical artefacts to explore. And those in graphic design can print 3D versions of their artwork. During geography lessons, they can print topographic, demographic or population maps. Many more applications are possible in the production of models. The benefits of 3D and 4D printing are that it creates interest and enthusiasm in the work, complements the curriculum and opens up new learning opportunities. 3D printing gives students the opportunity to experiment with ideas, expand and develop their creativity, as it is not easy to make them understand things without taking advantage of visualization. Undoubtedly, this type of innovation also contributes a lot to bringing the educational process to a different level. At the same time, skills and activities are again 'closed' only in the brain. Design and three-dimensional thinking are stimulated, but this could eventually be done by computer programs, while people become passive observers with not only reduced cognitive but also physical abilities. According to various theories of our evolutionary path, long before the human species reached its current level of intelligence,

the cells in the body relied on data from its environment to adapt and make humans a sustainable and self-healing species. That is, what we perceive as intelligence is not just the use of symbols that represent the world itself. On the contrary, our world is revealed through our evolving and embodied needs as organisms.⁶ That's why neuroscientist Antonio Damasio in *Descartes' Error* (1994) concludes that we "think" with our whole body, not just our brains.

ROBOTS AND SMART DEVICES. In 10 years, robots will have a significant role in the educational process. For example, in the Finnish city of Tampere, schools are beginning to test a social teaching robot called Elias,⁷ used mainly for language and mathematics instruction. Since entertainment is becoming an important element of effective learning, Elias is programmed to dance and encourages students to sing and dance, as well. Elias can also speak and understand 23 different languages. So far, testing of this robot is going quite well, with most students reacting very positively to it.

The benefits that robots bring to school are that they would never judge or ridicule anyone for their mistakes. This is especially useful for children who are shy or do not learn as fast as others, allowing them to focus on learning without any shame or peer pressure. They do not get tired of repetition and never run out of patience, which allows children to feel free to learn at their own speed. Students can spend all the time they need to learn something new, making as many attempts to do something right as necessary, and the robot will never make them feel like they are taking too much time. Robots ask questions at the students' level and can personalise each child's learning. This is usually quite challenging, even for the most experienced teachers. They could also inspire students to participate. This feature is vital because motivating and engaging children helps them achieve their learning goals much faster. Last but not least, they give feedback to teachers on each student's progress, making them better informed and allowing them to make appropriate adjustments. This helps teachers to do their work more efficiently, which improves the overall learning process for students.

The presence of robots in the learning process seems to eliminate many problems related not only to cognitive processes but also to character traits and social skills. In fact, avoiding or postponing interaction with a test teacher or dialogue at school could worsen the situation of troubled children, who will increasingly feel more comfortable in the artificially 'safe nature' of the digital world. Teacher robots would create comfort, taking into account the characteristics of children, but would, on the other hand, deprive adolescents of

⁶ <https://aeon.co/ideas/the-body-is-the-missing-link-for-truly-intelligent-machines>

⁷ <https://www.eliasrobot.com>

multifunctional skills to navigate in complex and stochastic environments and find solutions to problems.

THE THEORY OF GAMIFICATION in education is that students learn best when they have fun. They also learn in the most effective way when they have goals and achievements to strive for, in a way that the learner still perceives as a kind of game. Due to the addictive features of video games that intrigue and attract children (and adults), it is only natural to have similar engagement results when these game-based elements are applied to learning materials. Gamifying learning involves using game-based elements such as collecting points, competing with peers, teamwork and scoreboards to boost engagement help students learn new information and test their knowledge. This method can be applied to subjects but is also widely used in self-learning applications and courses.

Students feel as if they are in control of the learning process. There is also a calmer atmosphere about failure, as they may just try again. They have more fun in the classroom, exploring different identities through different avatars or characters. Thus, they are more active and open to mistakes, and this allows them to think outside the box. But this approach also has its risks, among which is the belittling devaluation of the learning process and turning everything so much into a game that students may refuse to take responsibility and take the assimilation of what is learned seriously.

CONCLUSION

In the near future, education is expected to begin in early childhood (around the 3rd year of life) and continue into very old age. Curricula will not be fixed but will be adapted every five years. At the forefront will be the formation of the character and critical thinking of those trained to be able to adapt to the ever-changing situation of the labour market, within which they themselves will largely create new professional niches in the field of self-employed labour. New skills beyond digital competences require more creativity, innovation, collaboration and problem-solving skills in the so-called self-actualizing economy, where participants and economic systems are constantly improving themselves, mainly through new types of education systems.

At the same time, the process of digitalization in education, the introduction of more and more technologies and the shortening of training periods will be accelerated. There is increasing talk of highly qualified professions that do not require a university degree, as the necessary skills can be acquired through free or paid online courses or subsidized by the companies themselves, only for a shorter period of time. The acceleration that technology brings is compressing the time available to look for and find solutions, which can increasingly make people look for shortcuts – or so-called ‘heuristics’. However, we

develop linearly, not exponentially, and we could not easily skip over any stages of development because knowledge and skills also require the process of maturation that comes chronologically with life experience. Thus, we could lose not only cognitive and physical abilities 'facilitated' by technology but also human independence in terms of decision-making in more and more areas due to a lack of time.

In summary, we still do not know whether optimization and over-rationalization make it too easy for us to seek out and make decisions, nor whether thinking will be replaced by super-fast algorithms, with people increasingly relying on AI-based platforms and looking for shorter heuristic paths to achieve their goals, which is a denial of knowledge and critical reflection. It may happen that we will more actively adapt to digital technologies, rather than them having the role of maximum convenience in our lives. This could be accomplished by creating digital twins of any available material, social or cultural infrastructure and embodying them with data about human health, behaviour, educational systems, etc. Therefore, education should also be directed to resolve these new unprecedented cases.

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CHAPTER 7.

INNOVATIVE POTENTIAL OF DIGITAL TECHNOLOGIES AND SYSTEMS WITH ARTIFICIAL INTELLIGENCE FOR TRANSFORMING WORK PROCESSES IN SPECIALIZED TRANSLATION AGENCIES

Magdalena Parcheva

ABSTRACT:

In the conditions of a dynamic environment, rapid development and the application of digital technologies and systems with artificial intelligence, the impact of information technologies on the working world is becoming an increasingly relevant issue in research and for business practices: labour markets, professions, self-employment opportunities, labour processes, job tasks and the competencies of specialists. The subject of this article is the innovative potential of information technologies for transform work processes in specialised translation agencies and the role of workplace innovations. Changes in the workplace as a result of the functionalities of modern information technology solutions are theoretically analysed. The concept of “workplace innovations” is also discussed in the context of digitalisation, followed by a presentation of the results from an empirical study among translation agencies from the Varna district of Bulgaria. The survey data show that information technology has entered the activities of translation agencies, opened new market segments and changed the job tasks, work processes and competences within the respective professional profiles: translators, order/project organisers and marketing and administrative specialists. A prerequisite for higher productivity, efficiency and quality of work is the combination of technological digital innovations with the participation of specialists and social innovations in the workplace. Lastly, the article formulates conclusions and recommendations from the study.

Keywords: *workplace innovations, workplace changes, artificial intelligence, digital technologies, translation agencies*

INTRODUCTION

At the present stage, organisations are facing a number of challenges caused by the dynamics of environment, demographic change, shortened product life cycles, rapid development and the application of information and communication technologies in various spheres of life, economic activities and public systems.

The COVID-19 pandemic has put the economy, health and social systems, public policies and business organisations in crisis. COVID-19 caused changes in industries, markets, supply chains and consumer behaviour, and it became the engine of accelerated digitalisation in healthcare, education, banking and insurance, administration, urban and regional development and business – not only high-tech but also from traditional industries. Anti-epidemic measures and restrictions have necessitated a rapid transition to certain work activities and processes facilitated by digital technologies and technical means. Telework has become a practice primarily for job tasks with high levels of information intensity.

In this context, the impact of information technology and artificial intelligence-based technological solutions on professions, individual work tasks, processes and the professional knowledge needed to achieve higher productivity and protect the health and well-being of staff is an issue that acquires relevance. The potential of digital technologies for workplace innovations and the relevant changes in work, processes and staff competencies is the focus of growing research interest. Both technical and ergonomic issues of functionality, interface, “human-technological solution” interactions, usability and the socio-economic and managerial aspects of the digital transformation of labour (such as productivity, the possibility of replacing human labour and individual work activities with computerised systems, psychosocial risk factors, quality of work and “computerised work processes vs. competitiveness of the organisation in the long run”) are discussed.

The *subject of research* is the innovative potential of information and communication technologies and systems with artificial intelligence for the transformation of job activities and processes as well as the role of workplace innovations in agencies for specialised foreign language translation.

The main *objectives* of the report are focused on the following directions:

- analysis of theoretical and empirical research on the social and managerial aspects of the impact of digital technologies and systems with artificial intelligence on job activities and processes in organisations;
- discussion about the role of workplace innovations in the context of the opportunities opened up by digital technologies and systems with artificial intelligence;

- presentation of the results of an empirical study among 26 specialised translation agencies from Varna with the subject of the influence of information and communication technologies and systems with artificial intelligence on changes in the workplace and the role of workplace innovations;
- formulation of conclusions and recommendations from the research for encouraging workplace innovations in the context of the digitalisation of work in organisations.

INFLUENCE OF DIGITAL TECHNOLOGIES AND SYSTEMS WITH ARTIFICIAL INTELLIGENCE ON WORKPLACE CHANGES

Information technology, automation, robotics and artificial intelligence systems are changing the world of work – from labour markets to occupations and labour organisation – contributing to the emergence of new forms of work, such as platform and mobile work, and opening up opportunities for self-employment.

Statistics show that 90% of jobs at present require skills related to working with information technology. Over the last ten years, digitalisation has created 2 million new jobs in the European Union. The overall impact of technologies on labour markets is determined by their potential for job cuts and job creation. The outcome between the two effects is difficult to predict. Research shows that the impact of information technology on jobs will be significant and focused on, for example, replacing human labour with robotic and computerised solutions for certain tasks, the emergence or demise of new professions and jobs and changes in the necessary knowledge and skills of specialists.

According to forecasts, more than 151 million new jobs are expected to be created by 2030: 91% of them as a result of changed necessary skills and activities in the workplace; 9% due to the generation of new jobs. More than 1.75 million new jobs will be created for IT professionals (Servos, 2019).

The impact of modern information technologies on labour can be considered in two aspects:

- The influence of information and communication technologies on labour markets: new professions, division of labour, polarisation of the labour market, qualification and retraining of workers, migration to newly created jobs, digital labour markets and platforms.
- The impact of information and communication technologies on business organisation: the potential for renewal of products and processes, competitive advantages and changes in the work, knowledge and skills of specialists.

By analysing various research projects on the possibilities of information technologies to transform work in organisations, we can distinguish the following directions of innovative potential in modern technologies:

- *Innovative potential of modern information and communication technologies and systems with artificial intelligence in terms of job tasks and specialists' knowledge and skills*

Artificial intelligence systems are machine-based systems that can make predictions, recommendations or decisions that affect a virtual or real environment for a given set of human-defined goals (Lane & Saint-Martin, 2021). Artificial intelligence is a collection of technologies that combine data, algorithms and computing power (Artificial Intelligence for Smart Growth. Strategy for the development of artificial intelligence in Bulgaria until 2030, 2020). Artificial intelligence systems can be entirely software-based or include hardware elements. Information technologies and systems with elements of artificial intelligence have significant potential to replace certain job tasks and can perform them even better than a person, as well as more precisely, more accurately and in less time. Some of these tasks require intelligence.

Research highlights the following tasks that can be performed through information technology and robotic solutions:

- physical actions when working with machines in a predictable environment;
- repetitive tasks based on rules and models;
- non-routine tasks requiring cognitive skills, provided that the computerised system can derive a logical model of dependencies;
- data collection and processing activities;
- finding a match;
- classification tasks;
- process management tasks (for example, in the management of the supply chain);
- repetitive, high-risk tasks.

Malone et al. (2020) see possibilities for the application of systems with AI elements in the following types of tasks: *sensing*, i.e., analysis of motion signals, biometric signals and types of images; *solutions*, i.e., for solutions in which the input data and the desired results can be accurately coded and sufficient data is available for past cases; and *creation*, i.e., in the presence of a model that can be recognised and learned.

Tasks that could hardly be performed by information technology and artificial intelligence systems:

- are performed in an unpredictable environment;
- require social skills, social activities and relationships;
- include leadership of people;
- apply specific skills and expertise in new and non-standardised situations;
- require creativity and abstract thinking;
- involve physicality in a new or standardised situation.

Ernst, Merola & Samaan (2018) summarise the effect that information technology and artificial intelligence systems have on job tasks: (a) task replacement, (b) complementarity of tasks and (c) enriching job activity with additional tasks. The potential of information technology to change job tasks poses challenges to the knowledge and skills of professionals. At the forefront are digital skills, digital creativity, time management, independence in performing tasks, social skills, creativity and the ability to perform unstructured tasks.

New forms of platform work are placing additional demands on competencies. *Cedefop* research (2020) highlights specific skills that are needed in this respect: platform handling, online specialist skills, analytical skills and communication skills, as well as personal qualities like confidence and endurance.

1. *Innovative potential of modern information and communication technologies with regard to work organisation*

The potential of information technology to change job tasks and activities reflects on various aspects of work organisation. The application of computerised systems involves changes in the content and design of positions in business organisations, updating approaches to interaction between professionals, ensuring safe and healthy working conditions, assessing new risk factors and improving the work environment.

The possibilities for the remote implementation of job activities with the help of modern information technologies (telework) and the resulting need for the reorganisation of work in the following areas should be considered: working hours (length of working day and organisation of working hours), labour intensity, individual productivity and health, organisational productivity and quality of work.

As a specific challenge, management, business processes and work organisation and human resource management respectively (recruitment, selection, performance appraisal,

incentives) have to address the new forms of work through platforms and make decisions about their implementation.

2. *Innovation potential of modern information and communication technologies for innovations and entering new spheres of business activity*

Information technologies and systems with elements of artificial intelligence open up opportunities for new products, services, renewal of business processes and entering new areas of business in order to develop the organisation and sustainability of competitive advantage. In this sense, the management plan should consider changes in the responsibilities of job positions among professionals and managers, as well as the application of new work organisational and management practices.

Modern advances in information and communication technologies have the potential not only for new areas of activity, the renewal of business processes and labour processes, higher efficiency and effectiveness, but also for improving various parameters of quality of work.

A prerequisite for this is the combination of technological innovation and management measures with social innovation in the workplace.

MODERN INFORMATION AND COMMUNICATION TECHNOLOGIES AND WORKPLACE INNOVATIONS

At the present stage in the theory and practice of management, concepts such as entrepreneurial management, intrapreneurship, corporate social responsibility, stress management, safe and healthy working conditions, the competence approach in management and workplace innovations are becoming increasingly important. Although these concepts are different in nature and character, they have in common the focus on professionals from different fields and hierarchical levels in organisations and the search for opportunities to promote initiative, innovation and entrepreneurial talent among professionals, providing favourable conditions for work through socially responsible practices and innovative management approaches. In research, the term “*workplace innovation*” is not unambiguously defined.

Eurofound (2015) studies define workplace innovation as high-performance work practices or work organisation innovations which comprise planned changes that affect the way employees perform their duties or their professional experience and relate to different areas of human resource management. In his study, Pot (2011) identifies workplace innovation as the implementation of new or combined interventions in the organisation of labour, human resource management and technology which contribute to the continuous improvement of quality of work and organisations' success. Pot et al. (2012)

emphasise that workplace innovation complements technological innovation and relates to social aspects such as work organisation, human resource management and labour relations.

According to Oeij & Dhondt (2017), workplace innovations are a set of mechanisms based on the involvement of employees to intervene in the structure or culture of the organisation in order to continuously improve the conditions for success and quality of work.

The issue of workplace innovation draws scientific knowledge from various theories: that of socio-technical system design; models for psychosocial risk factors, such as the Job Demands-Control-Support Model (Karasek, 1979; Karasek & Thorell, 1990) and Job-Demand-Resource-Model (Demerouti et al., 2001); studies on various aspects and effects of work as a balance between specialist efforts, stimuli, negative emotions and stress (Siegrist, 2002), the effects of labour intensity (Paskvan & Kubicek, 2017) and managerial practices regarding work (Llorens et al., 2010), etc.; and modern approaches and concepts in management. It unites them in an independent field of research which receives its own path of development, theory and practice.

Developed on the basis of results from various studies and case studies, the workplace innovation model – the “*fifth element*” model – provides valuable knowledge about the nature of the concept. In accordance with this model, workplace innovations are the result of interdependence and synergy between the following components: (1) jobs, teams and technology; (2) employee-driven innovation and improvement; (3) organisational structures, management and procedures; (4) co-created leadership and employee voice; and (5) the fifth element – a synergistic effect between these different components (Totterdill, 2015). From a managerial point of view, different practices can be derived and applied which contribute to the formation of an organisational environment that promotes innovation at the workplace.

Workplace innovation drivers can be different: (a) changes in strategy, e.g., entering new areas of business; (b) renewal of key processes; (c) changes in structure, e.g., decentralisation, a team-based form of organisation in the direction of a flat structure or vertical integration; (d) crisis situations; (e) new practices in human resource management; and (f) social problems at work, e.g., work-life balance, age structure of the staff, integration of vulnerable groups, labour intensity and stress. Some specific driving forces for social innovation in the workplace are the application of modern information technology, robotic solutions and artificial intelligence systems, as well as the changes and innovation opportunities that they open up.

What is the role of workplace innovations through the prism of the opportunities provided by digital technologies?

From the **point of view of management**, the opportunities that digital technologies and artificial intelligence systems reveal should be assessed against several parameters: efficiency, effectiveness, productivity, technical and financial feasibility and potential for competitive advantage.

In social terms, digital technologies create, on the one hand, social challenges in the workplace such as: changes in the “work-life” balance in telework, labour intensity, working under pressure in a digital environment and the “man-robotic solution” interaction. On the other hand, information technology can contribute to improving quality of work.

Through the *prism of digital technologies*, workplace innovations represent new solutions to certain social challenges in the workplace caused by the application of information technology and artificial intelligence systems. Finding solutions to these specific social challenges will contribute to improving quality of work and reaching higher efficiency and productivity.

Theoretically, we believe that *workplace innovation can be seen as a renewal of the organisation of work, job tasks and the work environment as well as the components of the management system which integrates different stakeholders and aims to achieve higher efficiency, effectiveness, productivity and quality of work.*

Workplace innovations are social innovations: they are co- created and are aimed at achieving *social impact*.

Specialists have a central role in workplace innovations: their involvement in decision-making, their integration into the processes of organisational renewal and the promotion of innovative and entrepreneurial behaviour among specialists.

This presupposes a specific approach in management: incentives for specialists demonstrating innovative behaviour; allocating part of the working day for new projects; directing resources towards the implementation of new initiatives and projects; ensuring specialists’ autonomy/independence in performing work tasks and when choosing a project to engage in; and an organisational structure and culture that encourages professionals’ commitment to create innovation. In line with this management philosophy, an emphasis is placed not only on the innovative ideas and entrepreneurial talent of specialists and the provision of a system that allows for the implementation of employee proposals, but also taking responsibility for turning an idea into a profitable business on behalf of the company – all characteristics of intrapreneurial systems.

Workplace innovations imply *an entrepreneurial approach to management, complemented by a social aspect through searching for innovative new business development opportunities, finding possible solutions to social challenges in the workplace and implementing them in the organisation.*

INFLUENCE OF DIGITAL TECHNOLOGIES ON WORKPLACE CHANGES: AN EMPIRICAL STUDY

In order to track the impact of information and communication technologies and artificial intelligence systems on changes in the workplace, work tasks and processes, an empirical study was conducted among 26 specialised translation agencies operating in the Varna region. The survey was conducted in July 2021. The method used was an on-site survey at the respondent's office using a questionnaire.

Following *the profile and activity* of the agencies covered in the study, the following specifics can be highlighted.

- Nine of the surveyed organisations are a branch of Sofia translation agencies with an office in the city of Varna; the other 17 agencies for specialised translation have a registered address in Varna.
- 11 agencies operate on the national and international market; 15 agencies are local, mainly with clients from the Varna district.
- In accordance with the indicator "Number of specialists on a permanent employment contract", the profile of the surveyed agencies is: 12 agencies (46.2%) employing up to 5 specialists; 5 agencies (19.2%) with a staff of 6-10 specialists; 3 agencies (11.5%) with 11-20 specialists; and 6 agencies (23.1%) with more than 21 staff members.
- For 12 of the surveyed agencies, the range of services offered includes translation, interpretation and legalisation of documents; the other 14 organisations have a broader range of services offered.
- Ten agencies have entered market segments revealed to result from the innovative potential of modern information technologies, offering services and having implemented projects for software localisation and site localisation.
- Services for developing content on websites, blogs and social networks are offered by 6 agencies.
- Three of the surveyed organisations conduct activities in the field of education – language courses, schools and services for the promotion and organisation of education outside Bulgaria in parallel with offered specialised translation services.

The analysis of the results of the conducted research shows that various software applications and programmes have been introduced into the translation agencies' activities (Figure 1).

Computer-assisted translation software products are used by translators in 61.5% of the agencies covered by the survey. Larger specialised translation agencies provide translators working for the agency with a permanent employment contract or, on a fee basis, licensed software products that allow for translation memory and the use of vocabulary tools included in the programme. The study showed that translation memory is used not only by translators in large agencies but also as a popular tool for working translators in local agencies. This finding is in line with the results of a sociological survey conducted among translators from Bulgaria on their attitudes towards artificial intelligence and views on how it will change the translator’s profession (Kirov & Malamin, 2020).

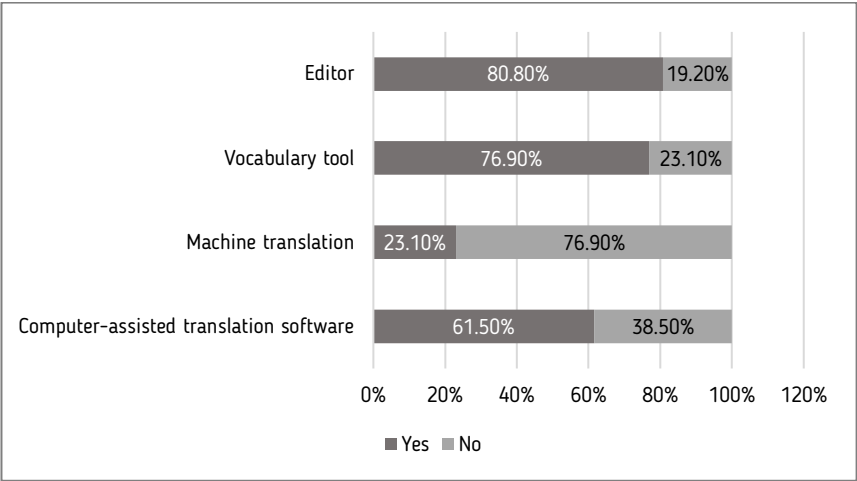


Figure1. Applied software tools in translation: results of empirical research

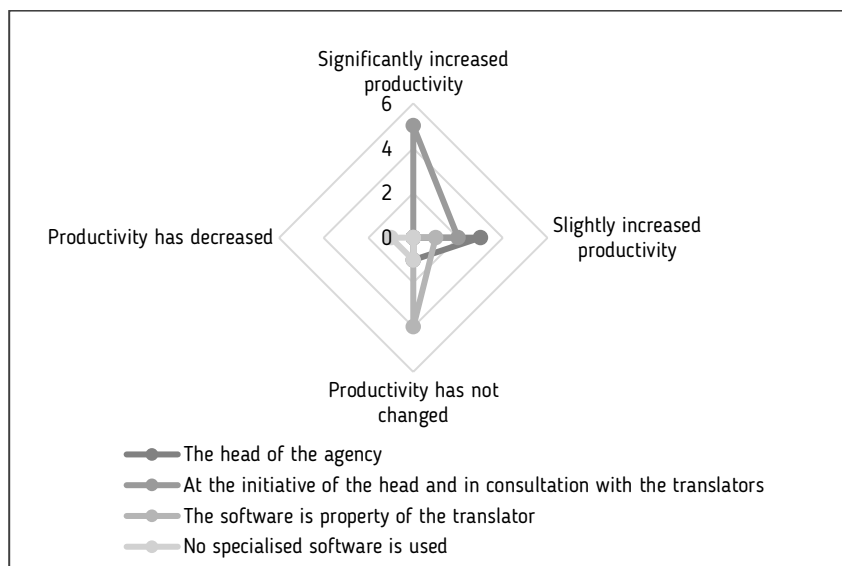
Both specialised software products and free, open-source programmes adapted to the specifics and needs of a given agency and type of translation find their application in the translation activities of the respondent agencies. Improving productivity, translation quality, translation speed, consistency in terms used and collaboration between different translators in large translation projects are key factors in decisions about whether to use software in translation.

For 26.9%, the decision to use specialized translation software was made by the head of the agency; 30.8% of the agencies have implemented software at the initiative of the head in consultation with the translators at the agency; and 26.9% indicated that the software for translation is owned by the individual translator. 15.4% of respondents do not use IT tools.

Statistically, as a result of processing the survey's results, a *relationship between labour productivity and the means for deciding on the software* applicable in the translation activity was highlighted (Figure 2).

Agencies that have purchased specialised software at the initiative of the head and after consulting with translators from the agency show significantly increased productivity.

In parallel, some translation agencies are traditionally oriented and rely on the experience and skills of the specialist translator. Two of the interviewed heads of translation agencies shared the opinion that information technologies (computer-assisted translation, machine translation) have a detrimental effect on high-level intellectual activity – i.e., translation into a foreign language, the profession of translator – and lead to the loss of certain skills and an inability to independently translate without a computer programme.



$\chi^2 = 0,003$; Contingency Coefficient= 0,761

Figure 2. Relation “labour productivity – a solution for the application of software in translation”

The most commonly used tools in translation are editors (as part of an office suite or a computer-assisted translation programme) and glossaries. Machine translation using

elements of artificial intelligence is offered by only 23.1% of the surveyed agencies (6 organisations). These are agencies that have entered the IT segment offering software localisation and site localisation services.

The results of the study on the *degree of change of different types of activities* as a result of information technology are interesting (Figure 3).

Information technology has changed different areas of activity of translation agencies: 38.5% of respondents indicated that the activities “order/project management” and “marketing and advertising” have changed to a very high degree. For 34.6% of the respondents, a significant change occurred in the implementation of translation and team work on a project for specialised translation.

The specificity of the specialists and the manner of their work within an agency is such that the agencies maintain a relatively small staff on a permanent employment contract and a large number of freelance translators. All respondents in the workplace emphasised that the professional experience of the translator and trust in the specialist are the most important factors in choosing a specialist and at work.

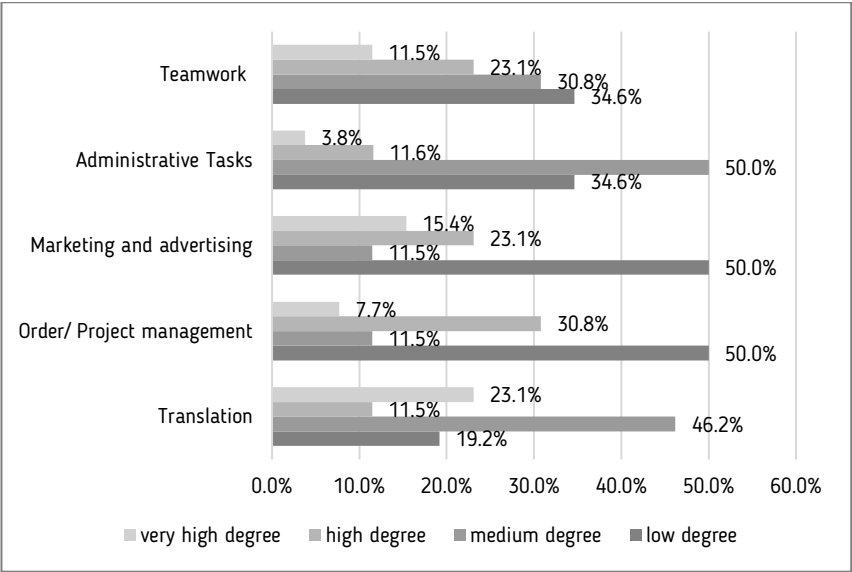


Figure 3. Degree of change as a result of information technologies for types of activities in specialised translation agencies

Trust can be distinguished as a value that characterises the organisational culture of the surveyed organisations: for 38.5% of respondents, trust is the most important factor at work, while 53.8% emphasised that trust is “rather an important factor”.

The agencies covered by the study *have so far not engaged freelancers through a platform* and would not do so. It was emphasised that they rely on their own staff: experienced translators, well-known translators or specialists recommended by people they trust.

A key element of workplace innovation includes the applied management approaches and practices for *the participation of specialists* in decision-making, renewal of products, services and working conditions. The study included questions about applied management practices with regard to specialists (Figure 4) and planned measures with regard to information technologies and specialists (Figure 5).

The most commonly used practice is related to the exchange of knowledge among specialists. Ensuring healthy and safe working conditions and involving specialists in this process is a legislative requirement in Bulgaria, regardless of the size or subject of an organisation’s activity.

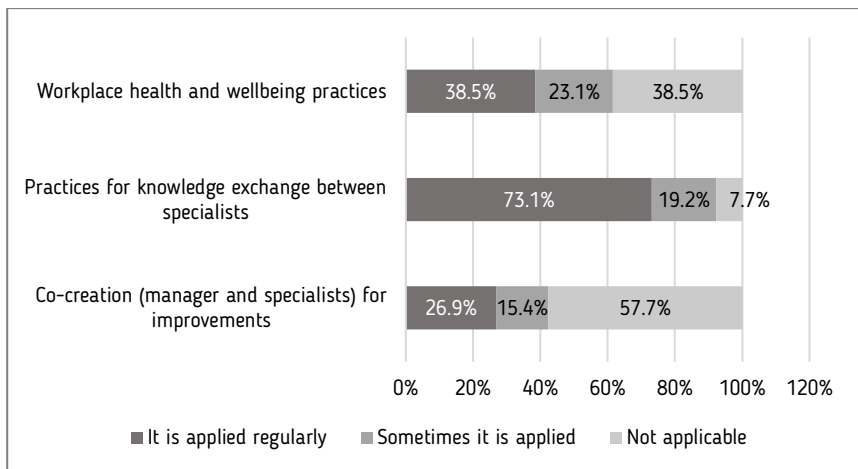


Figure 4. Management practices in the workplace in relation to professionals

Specific practices aimed at the health of specialists are regularly applied in 38.5% of the agencies, while the percentage of organisations planning to apply such practices is higher at 57.7%.

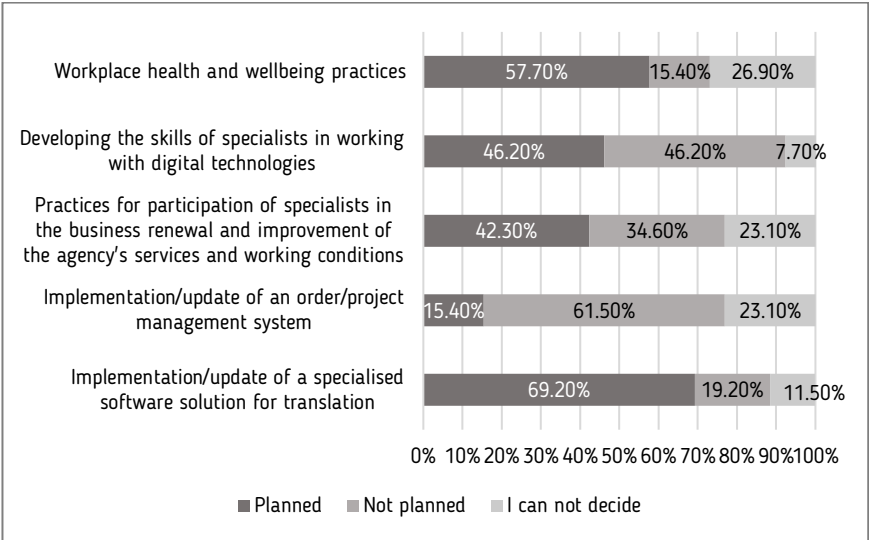


Figure 5. Planned measures and practices in the surveyed organisations

The percentage of agencies in which opportunities for the renewal, development and improvement of services, processes and especially work processes are jointly sought between managers and specialists is low: 26.9% of the respondents indicated that this is a regular practice, and it is not an implemented approach for 57.7% of the organisations. Less than 50% of the surveyed agencies (42.3%) plan management measures to involve specialists in improvement processes.

The situation regarding management measures which encourage the participation of specialist’s contrasts with plans for applying modern information technologies: 69.2% of the agencies plan an application/update of specialised software solutions for translation; 15.4% plan to implement or update an order/project management system; and 46.2% plan to develop the skills of specialists in working with digital technologies.

The majority of the surveyed heads of translation agencies evaluated their workplaces as secure, relatively well paid and with a relatively low degree of opportunity to implement the proposals of specialists (translators, marketing personnel, administrators and organisers of client orders).

CONCLUSIONS

The conducted theoretical and empirical research on the impact of digital technologies and systems with artificial intelligence on changing work processes and the role of workplace innovations in specialised translation agencies gives grounds for the following *conclusions*.

- Modern information and communication technologies and systems with artificial intelligence have innovative potential for changing the jobs, tasks, work organisation and competencies of specialists employed in specialised translation agencies: translators, organisers of order/project management and specialists in marketing, advertising and administration.
- Digital technologies are driving the entrepreneurial activity of specialised translation agencies to enter new areas of business, e.g., developing platforms with elements of artificial intelligence, software localisation, site localisation and content development for sites, blogs and social networks – contributing to the emergence of new types of job positions and changing the necessary knowledge and skills of professionals.
- A prerequisite for achieving higher productivity and quality of work in digitalisation is the combination of technological innovations with innovations in the workplace. By its nature, workplace innovation can be seen as a renewal of the organisation of work, job tasks and the work environment, as well as the components of the management system which integrates different stakeholders and aims to achieve higher efficiency, effectiveness, productivity and quality of work. They include planned changes in the competence profile of specialists, their job tasks and the organisation of work that are imposed as a result of the application of modern information technologies and systems with artificial intelligence. On the other hand, workplace innovations are related to the search for new solutions to the social challenges at work caused by digitalisation. Workplace innovations are social in nature and means of creation, and they are created jointly between different stakeholders and aim at social impact.

In *applied-practice planning*, in order to encourage workplace innovations in specialised translation agencies in the context of the application of modern information technologies and systems with artificial intelligence, there is a need for action in the following directions.

- In terms of management approaches and processes, organisational structure, organisational culture and human resources management, creating an organisational environment which, on the one hand, contributes to encouraging the commitment of professionals in creating innovations and launching

entrepreneurial initiatives and projects in order to achieve better efficiency and competitive advantage, and, on the other hand, is aimed at improving the quality of employees' working life.

- From the point of view of digitalisation, rethinking from the point of view of digitalisation of the profiles of the necessary knowledge and skills of employees in specialised translation agencies.
- A combination of planned changes in the workplace and unplanned emergent changes that are initiated by specialists and aimed at finding new, innovative solutions to the social challenges posed by digitalisation in the workplace.

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CHAPTER 8.

ATTITUDES OF GRAPHIC DESIGNERS AND COPYWRITERS IN BULGARIA TOWARDS ARTIFICIAL INTELLIGENCE

Bagryan Malamin

ABSTRACT

Artificial intelligence (AI) is one of the core technologies of the digital transformation. It is expected to lead to job losses, initially in occupations characterised by routine activities, but increasingly in creative professions. This chapter analyses the results of a recent empirical survey of graphic designers and copywriters in Bulgaria on their attitudes towards AI as well as their views on its future influence on their professions. The majority do not perceive AI and automation as a threat. In their view, digital technologies and artificial intelligence are a favourable opportunity for professionals that will change their work by taking away routine tasks and leaving creative activities to humans alone. Graphic designers and copywriters will engage in creative work, and their work will become more in demand because it is human. The analysis of the study shows that pessimistic scenarios of massive job destruction may not hold true. Expectations of a deterioration in the quality of work (Holtgrewe, 2014) as a result of digitalization are also not borne out. This study is the first of its kind in this country to explore creative professions and their attitudes towards AI.

Keywords: *digitalization, artificial intelligence, graphic designers, copywriters, creativity, work, labour, tasks*

INTRODUCTION

Digital technologies are increasingly entering the marketing sphere. Advertising, as a component of marketing, is among the main users of modern digital technologies – whether for image processing or content creation. Digitalization and artificial intelligence automate various activities. Increasingly, they are penetrating creative territories – for example, artificial intelligence is starting to replace designers by creating logotypes, labels, or other creative advertising products; it is also starting to write messages, emails, and posts for social networks, thus replacing copywriters.

Creative graphic activities related to advertising as part of marketing include: the graphic design of a variety of visual materials for various print and electronic media – web, TV, film, outdoor and print advertising. And the creation of creative concepts and texts for these various advertising formats are at the heart of the copywriting profession. Copywriters write copy for print ads, create scripts for TV spots or radio commercials, and "dress up" ideas for communication in text.

Artificial intelligence is rapidly entering each of these activities, though its creative abilities cannot match those of humans. Yet artificial intelligence, and more specifically machine self-learning, automates processes and eases work by working faster than when something entirely new is created.

This chapter presents the results of an analysis based on the author's empirical sociological research conducted among Bulgarian designers and copywriters in 2021. The study is part of a PhD dissertation on artificial intelligence and its projections on some creative professions.¹

WHAT ACTUALLY IS THE IMPACT OF AI ON CREATIVE PROFESSIONS?

Creativity is among the human abilities supposed to be the most difficult for artificial intelligence to take over. Creative professions use creative thinking and require an unconventional approach when tackling a task. They are usually pursued by people involved in the arts, culture, fashion, marketing, or communications. Creative professions include fashion designers, photographers, filmmakers, writers, journalists, and translators, among others.

The research hypothesis is that Bulgarian graphic designers and copywriters are not aware of what is to come in their profession. According to the prevailing understanding in the literature, their professions will be seriously affected by the advent of digitalization and artificial intelligence. The specific dimensions of these changes are numerous: new tools are constantly emerging which automate activities; new ways of finding work and tasks are more often entering the workforce; and freelance work is increasing at the expense of permanent employment (Kirov & Yordanova, 2020).

The study aims to analyse: 1) to what extent this process of digitisation is valid for Bulgarian designers and authors of advertising texts and ideas, and 2) to what extent they are worried about their future. Which activities in their profession could disappear, what activities may emerge, and what might they look like in the future? In order to find

¹ Artificial intelligence and creative professions: sociological projections of their present and future interaction. Dissertation of Bagrian Malamin, 2019 – 2021, IPS-BAS

answers, an original survey of individuals working either in advertising and marketing agencies or freelance was conducted.

Digitalization is not a new process, but the pace and scope of development in digital processes and their integration into companies and work have increased significantly, as highlighted by recent studies (Meil & Kirov, 2017). The development of the "digital transformation" is rapidly changing the world of work in developed societies across Europe and North America. Although there is growing recognition that new technologies are not deterministic (Warhurst et al., 2019), their adoption is having an impact on work and employment. Thus, in recent years, the debate about the future of work has been dominated by pessimistic scenarios of job destruction (Frey & Osborne, 2017).

According to a 2017 report by the McKinsey Global Institute,² occupations that are highly repetitive and predictable and which currently use human intelligence have the potential to be entirely replaced by automation. According to this 2017 report, up to half of today's work activities could be automated by 2055 (Manyika, et al., 2017).

The digital transformation is not bypassing creative industries. Also referred to as the so-called creative economy, these are industries based on individual creativity, skills, and talent that have the potential to create jobs and wealth through the creation and exploitation of intellectual property. Creative industries are both knowledge-intensive and labour-intensive, especially those with a high concentration of creative resources, as in theatre or film production, for example. The contribution of creative industries to employment is typically significant; they account for around 3.8% (Dent, 2020) of the workforce within European economies. The present study is the first in Bulgaria to examine the impact of digitalization on two occupations typically represented in this industry. According to Eurostat, 19,400 people in Bulgaria were employed in the creative industries in 2021, a trend that had increased by about three thousand people per year over the previous two years.³

Unlike translators, the subject of another recent study (Kirov & Malamin, 2022), no clear opinions or predictions have been identified in the literature as to whether the jobs of designers and copywriters may disappear as a result of digitisation. The research presented here is the only one currently available in Bulgaria concerning these two professions.

In the first section, after the introduction, I discuss developments in the work of graphic designers and copywriters; in section three, I describe where artificial intelligence is

² Harnessing automation for a future that works, <https://www.mckinsey.com/featured-insights/digital-disruption/harnessing-automation-for-a-future-that-works>

³ Creativity, art and entertainment, Eurostat, Cultural employment by NACE Rev. 2 activity. <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>

currently being applied in both professions; section four presents the methodology; section five is the analysis of the research results; section six is the conclusion.

EVOLUTION OF THE PROFESSIONS OF DESIGNERS AND COPYWRITERS

Evolution of graphic design and design

Design has existed since the beginning of human civilisation with the appearance of the first alphabets and in general when people began to draw or “scribble” for communication. The term graphic design was coined in 1922 by William Dwiggins,⁴ and the industry has been growing ever since.

In the early years of the profession, graphic designers worked only by hand – sketching, drawing, or painting; using brushes, scissors, and pencils. Today they have digital tools for the job. The gradual automation of some processes began in the 1950s, for example, typing text using pre-prepared sheets of type called Letraset.⁵ The mass distribution of computers is a technological advance comparable to the invention of the printing press by Gutenberg.

Made possible by the introduction of Apple Macintosh computers in the late 1980s and graphical user interfaces for the general public, along with the advent of the new printer software Postscript, a new field was created – Desktop publishing (DTP). The preparation, editing and arrangement of all the materials used to create a publication could be done by one person using DTP software (Lysakowski, 2017). The graphic designer's studio has shrunk to the size of the computer with which he works, and digitisation is ushering in a new era of mass communication and giving software access to new methods of creating art.

The automation that is coming in thanks to the introduction of digital technology helps designers in their work mostly by taking away the routine activities inherent to the profession – the monotonous tasks that accompany the creative process. So far, artificial intelligence has served as a technology that helps designers automate processes of organisation and search for resources (image search), assists in the application of various effects, and saves time. Today, besides simplifying some tasks, it helps them to easily correct their mistakes. It wouldn't be an exaggeration to say that design is the area where the penetration of artificial intelligence is most noticeable.

⁴ <http://www.designishistory.com/1850/wa-dwiggins>

⁵ <https://creativepro.com/scanning-around-gene-when-letraset-was-king/>

Currently, the creative industry is represented by graphic designers with varying levels of skill and experience – in addition to professionally created graphic materials, a whole new amateur level of home production has emerged. You don't even need an artistic background to practice the profession; you just need to know the software.

Designers work directly with clients or collaborate with marketers, copywriters, programmers, etc. to accomplish their tasks. Their work is in demand by businesses, media, and cultural institutions, while the internet and its platforms have opened up entirely new opportunities for them. Experienced designers with their own distinctive style are highly sought-after creatives.

What activities do graphic designers perform?

Graphic designers create visual concepts to convey information. They create many of the artifacts we see around us – posters, labels, packaging, signs, brochures, flyers, etc. In their products, graphic designers use shapes, colours, fonts, and illustrations to convey their ideas to the audience. Graphic designers may work in their own studio, in a marketing/advertising agency, freelance, or in the advertising department of a non-advertising company.

Some of the most important tasks handled by designers include choosing photos and fonts, developing layouts, and designing logos. Graphic designers may specialise in a particular area, such as graphics for the web or for print media only. Among the skills that graphic designers must possess are excellent knowledge of image design and editing software, creativity and innovation, excellent organisation and time management, attention to detail, keeping up with fashion and the latest trends, and responsibility to time, cost, and deadlines.

The activities of graphic designers are defined by and fit into the principles of creating a successful graphic design product. In order to represent the activities influenced by digitalization, graphic design must be reviewed according to the principles on which it is based (Dabner, Stewart & Vickress, 2017).

Principles on which graphic design is based

Principle 1. Research and creation of a graphic concept

A collection of diverse primary and secondary factual and illustrative information is a must because having a rich general culture is one of the prerequisites for a good designer. Also important are researching the audience to whom the message is directed, informing about its demographic and cultural characteristics, and generating graphic

concepts that would evoke the necessary emotional responses in the audience; creating emotion in the audience will make them more receptive to the message (Kabilka, 2020).

Principle 2. Composition

Composition is the visual structure of layout – the organisation of the different elements used. Its main role is to guide the viewer, create hierarchy, and highlight important information.

Principle 3. Typography

Typography is the science of typefaces. It is concerned with a clear and good arrangement of fonts so that the message is legible and in tune with the chosen graphic concept (Bringhurst, 2004).

Principle 4. Colour

Colour can evoke certain emotions or moods, describe reality, or encode information. It creates relationships between elements, linking or distinguishing them, hiding or highlighting one at the expense of another, creating hierarchy. Although graphic design during one of its defining periods was only black and white, colour plays a fundamental role in human psychology in terms of visual perception (Lupton & Phillips, 2015).

WHERE HAS ARTIFICIAL INTELLIGENCE CURRENTLY "SETTLED" IN THE ACTIVITIES OF GRAPHIC DESIGNERS?

Digitalization in the form of artificial intelligence, which is now entering the profession of graphic designers, interferes in all activities "serving" the principles of graphic design.

Artificial intelligence can work as an assistant – by organising, helping to achieve photorealistic effects, enhancing images, automating routine processes such as circling an object by its contours, intuitively searching for images,⁶ arranging text layout,⁷ and performing complex tasks (for example, creating website layouts,⁸ selecting colour schemes, etc.).

⁶ <https://thegrid.io/>

⁷ Ibid.

⁸ <https://www.wix.com/blog/2016/06/wix-artificial-design-intelligence>

Software can be divided into two types – one that makes the job of designers and copywriters easier and one that helps the end client “leapfrog” over these two professions. An example of software that helps in the work of graphic designers is Adobe’s latest Creative Cloud suite of programs. The artificial intelligence platform Adobe Sensei is now integrated across all products in the Creative Cloud suite and eases designers’ work by handling time-consuming tasks.⁹ Other programs with machine self-learning can support tone selection, image clarification, and image selection.

Graphic designers have lots of tools to support their work – Adobe Photoshop, Adobe Illustrator, Adobe InDesign, CorelDRAW, etc. – while copywriters can make do with only a pen and a sheet of paper. Whenever they need to, they can “pour” their text into MSWord or another program, and they often use text correction or translation features. Still, they generally lag behind their fellow designers in terms of technology use.

The second type of software is that which helps the end customer to create graphic products for their own business. There are already attempts to outsource work to artificial intelligence for creating logos¹⁰ and labels.¹¹ Artificial Intelligence is a “new employee” that mimics human work, creating an attractive and workable design from a marketing point of view. It works fast, understands requirements, and doesn’t argue or haggle over pay.

Evolution of ad writing

Advertising text has existed since Babylonian times, and the first printed advertisement came to light in 1477 with an advertisement for a prayer book.

The history of copywriting dates back to the time when early printed publications were distributed on the street. In fact, the word “copywriting” means writing words in order to sell products. A copywriter is a person who engages in this activity.

The word copywriter has been adopted in Bulgarian from English, and it is composed of two words: copy (manuscript) and write. The word is a relatively recent addition to the Bulgarian language, with the entry of the market economy and the emergence of a need to create advertising messages. The old name of the profession, used in the circles of advertising specialists in socialist Bulgaria, is “texter”, again borrowed from English. A copywriter is a specialist who convinces an audience about the qualities of various

⁹ <https://www.adobe.com/sensei.html>

¹⁰ An artificial intelligence tool for creating trademarks and logos: <https://www.tailorbrands.com/>.

¹¹ A Russian AI ‘graphic designer’ fooled the world... for an ENTIRE year!: <https://ironov.artlebedev.com/>, <https://www.rbth.com/science-and-tech/332370-russian-ai-graphic-designer-fooled>

products, services, or ideas by means of text. The activity that a copywriter performs is called copywriting.

What activities do copywriters perform?

Advertising copywriters work alongside creative directors and graphic designers in agencies' creative departments or in the in-house advertising departments of some companies. Many copywriters are also freelancers working in media and studios. They work on assignments from clients, and their job is to come up with and develop effective messages. Their duties include copywriting for advertising campaigns. Such texts can be for headlines, taglines, entire ads, flyers, websites, social media posts, mobile apps, scripts for radio spots, or scripts for TV commercials.

Copywriters are responsible for creating texts whose content must meet several criteria – interesting, informative, unique content, understandable to the audience they are writing for, optimally wordy, i.e., neither long nor short, with information optimally presented, and tailored to the medium they are writing for: radio, web, TV, magazine, etc. Much has been said about the requirements of texts in terms of their originality, but I don't think this is so important because their purpose is to convey a message – when this is presented in an original way, that originality will be remembered, not the product or object of the message. An example of this is the plots of advertisements being remembered rather than the brands advertised.

Copywriters work directly with graphic designers. They are tasked with the advertising concept, while the designer is tasked with 'dressing up' and conveying it with the necessary images.

What skills should they have?

Albeit graphic designers are quite dependent on digitisation and computers, this is less true for copywriters. They must be able to write good and clear texts in a variety of styles, with accurate spelling and grammar. They should have analytical skills, logic, creativity and imagination, attention to detail, an interest in popular culture, knowledge of trends and styles, written and spoken knowledge of a foreign language (English is the most common requirement), research skills, administrative skills, and knowledge of word processing programs.

The advertising opportunities provided by social networks and modern communication devices are increasing the demand for these advertising services. The demands on the people who carry them out are increasing accordingly. The more this demand increases, the more reliance is placed on automation to ease the work of creatives.

Where is artificial intelligence currently "housed" in the creative activities of the two professions?

In the "text" sphere, machine-learning software for ad-writing is starting to emerge, for example, the online platform CopyAI,¹² which offers the creation of marketing texts in seconds; another example is the software for creating e-commerce messages created back in 2018 by online retailer Alibaba.¹³ Artificial intelligence software uses deep learning and natural language processing technologies gathered from millions of pre-existing texts of the highest quality to generate texts for products. As with graphic design, this software is aimed at end customers, and copywriters can rely on AI programs, with the best AI copywriting software able to generate readable and coherent sentences that sound like a real person wrote them. Some AI copywriting tools are better at generating new ideas for social media topics and ads, while others are more focused on improving already-written content.

Graphic design, copywriting, writing scripts, and creating advertising ideas are essential elements of marketing. There is an informal debate among marketers as to whether advertising, as part of marketing and as the primary user of design and text, is a science or an art. Regardless of whether a consensus can be found, advertising is a creative activity. And the activities of both designers and copywriters are carried out on behalf of a client. In the age of digitisation, the need for designs and texts is increasing.

There has long been an interest in creative professions in the literature, for example, in an article on the impact of the digital transformation on journalism (a profession almost identical to that of copywriting): "One of the biggest future challenges facing media companies is related to the development of their skills base. The main concern for media companies today is how journalists can increase their knowledge and skills to meet the demands of digitisation and commercialisation of media" (Malmelin, 2017).

METHODOLOGY

The empirical information was gathered through quantitative and qualitative research. The quantitative one was conducted through an online survey distributed via the polling platform SurveyMonkey. It was supported by qualitative research – a series of six semi-structured interviews conducted either online using meeting software or in person.

The questionnaire was distributed through a Facebook group, Freelancers in Bulgaria – a group for seeking and offering professional services from specialists and experts in fields

¹² Copy.ai: Introducing the end of writer's block. With CopyAI's automated creativity tools, you can generate marketing copy in seconds: <https://www.copy.ai/>

¹³ <https://www.halfpastnine.io/insights/ai-copywriting>

such as law, finance, marketing, accounting, design, IT, PR, HR, professional translation, technical work, etc. The survey was also sent to freelance copywriters and designers as well as those with their own design studios or employees in advertising, marketing, or other firms. The survey could not be representative due to the impossibility of identifying the entire population of people performing these two professions in Bulgaria.

The respondents were selected according to their professional experience – three are designers with different practices, two are creative directors with copywriting practices in agencies, and one is a copywriter in an advertising agency. The interview guide consisted of a discussion of the questions from the survey.

The subjects of research were Bulgarian graphic designers and copywriters. These include both freelancers and people working on employment or civil contracts in advertising agencies or non-advertising companies. The study could not be representative, as there is no information on their demographics in Bulgaria.

The survey was conducted between July and November 2021. There were 109 respondents, while only 35 questionnaires were fully completed. The objective of the study was the attitude of Bulgarian designers and copywriters towards automation and the application of artificial intelligence technology in their work. The aim of the study was to describe and clarify to what extent the penetration of digitalization in both professions is perceived as either a threat or a favourable development opportunity for them and for the future of both professions.

Data from the study were processed using SPSS, and statistical analyses for non-representative sampling were used in the interpretation of the results, including descriptive statistics, the clustering method, and multivariate distributions.

RESULTS OF THE STUDY

Profile of the respondents

109 people were surveyed, but there were only 35 valid surveys. The highest proportion of valid survey takers were aged 30–40 (43%), followed by 40–50 (40%). 63% of respondents were female. 85% live in Sofia, 13% in a regional city, and only 3% in small towns. 63% have a Master's degree, 28% have a Bachelor's degree, and 9% have only secondary education. All respondents with a degree in design or other artistic disciplines work as designers; of the respondents who answered, designers were more often those with an arts degree (67%).

There were six respondents to the semi-structured interviews, three designers and three copywriters. All had varying work experience, ranging from 8 to 30 years. The copywriters

work in agencies and as freelancers (accepting commissions outside their workplace), and two of them are also heads of creative departments (creative directors) in advertising agencies. Two designers work in their own design offices, one works in a web design studio, and the other is a freelancer.

It is clear from the results that you don't need to have an arts background (design or fine arts) to work as a designer. 74% of those surveyed who work as designers have an art degree, while the rest have degrees in philology, mathematics, marketing, communications, or public relations. Among the respondents performing tasks as copywriters, none had an artistic educational background: they have degrees in philological education, the social sciences, marketing, communications, or public relations.

Regarding those respondents with whom in-depth interviews were conducted, those working as copywriters and creative directors had a mathematics background, a philology background and a communications and public relations background; of the three working as designers, one had an advertising background and two had an arts background.

59% of the respondents work freelance, 28% work in an advertising agency, 13% work freelance for supplemental income, and 15% work in companies with activities other than advertising (Figure 1). 54% do not use platforms¹⁴ or social networks for job searches. The platforms or networks the rest use include: Facebook groups¹⁵ for freelancers or handymen, artists, and craftsmen in Bulgaria; LinkedIn contacts; Upwork; Etsy; Webflow Designers (Global); and the Figma Slack group.¹⁶

¹⁴ Freelance platforms are aimed at companies and contractors; they are a place where clients can connect with contractors. Their business model is based on the share receive from the client and / or the freelancer. For a fee, these platforms provide seamless and convenient communication and negotiation for both parties.

¹⁵ Facebook groups are places where people with similar interests come together. Job boards and job search groups are a common place to look for work in Bulgaria.

¹⁶ Figma software users group: https://slack.com/apps/A01N2QYSA81-figma-and-figjam?tab=more_info

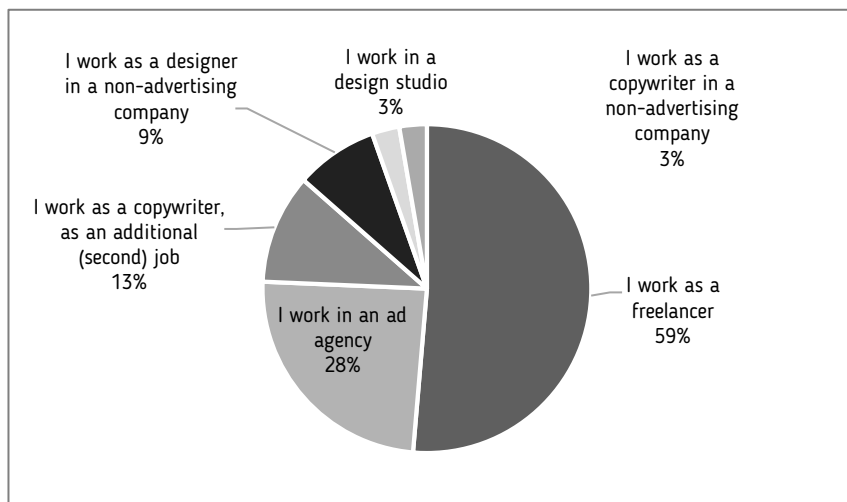


Figure 1. How do you practice your profession? More than one answer is possible. N=37

The respondents defined themselves as being well off: 50% receive medium or above-average incomes (1,000–2,599 BGN/month), 41% have high incomes (above 2,600 BGN), and 9% have low incomes (461–999 BGN). 70% of the respondents with high incomes are designers. From the data, it can be concluded that the services of designers are paid higher than the work of copywriters.

“Quite... average in the sense that it satisfies me completely, I don’t live in excess, I live frugally because that’s my philosophy of life. Compared to other people my welfare is wonderful.” (GD1, 20-22)

The respondents’ answers made it clear that those working in creative marketing professions are best paid in the capital and regional cities; one respondent defined his income as low, and he is a resident of a small town.

Longer work experience (over 11 years) implies higher earnings. 90% of respondents with high incomes had more than 10 years of experience. Seniority is not as determinant for earners of medium and medium-high incomes, while the distribution by seniority is relatively even, with a slight preponderance of those having between 16 and 20 years of experience. It is noteworthy that middle and high earners are also those with between one and five years of experience, regardless of their specific profession – copywriter or designer.

Table 1. Income distribution by length of work experience

	1-5 years	6-10 years	11-15 years	16-20 years	over 20 years
Above 2,600	0%	8%	23%	46%	23%
1,000-2,599	25%	19%	13%	31%	13%
461-999	33%	33%	0%	0%	33%

ATTITUDE OF DESIGNERS AND COPYWRITERS TOWARDS MODERN TECHNOLOGIES

When asked how they felt about modern technologies, meaning the digital technologies of the 21st century – for example: smart (mobile) devices and their applications, artificial intelligence, digital media, and social networks – 32 respondents out of 35 gave a positive answer. During the interviews, the answers were more developed. While none expressed a categorically negative attitude, all of them included a “but”, citing our 21st century society’s dependence on technology.

“And at the same time, I think that most people at this stage are also aware of, how shall we say, the negative side and the consequences of these addictions, which are making it easier for us, dumbing us down.” (CW1, 15-17)

“I have very mixed feelings about them because I’m trying to see different aspects. For example, why social networks exist at all as a paradox in our lives. As a consequence of what makes them so successful, for one thing. On the other hand, I also see the basis of what business they are resting on, the business of data. And that’s a whole other thing that people hardly see, even though they know. But nowadays you almost can’t live, it’s almost impossible without somebody collecting your personal data, information that you usually don’t want to share. So that’s where the mixed feelings come from. The other thing that I wouldn’t say I like very much about my life is that they’re engaging you more and more.” (GD1, 34-42)

“Otherwise, the bonus that all these things give is indisputable. When else will I have the opportunity for someone to write me something and for me to talk literally at arm’s length with everyone – you write him an e-mail and this is ... I don’t know, I don’t know another period in the history of mankind in which there is such potential all this.” (GD3, 1)

Almost the same number of respondents follow the development of technology in their field. Of the 32 respondents, only two gave a negative answer.

"I try, but rather not. They usually surprise me with innovations, for example, purely technically how computers, processors, develop, even these types of monitors, screens, I don't understand these things, I never understood them, and they surprise me every time. In a positive sense." (GD2, 22-25)

Based on the respondents' opinions from the interviews, it seems there is more to it than this two-dimensional answering, perhaps best indicated by a copywriter with 6 years of experience who explains:

"That is, I do not follow technology specifically, no, I have no purposeful interest in the development of technology in advertising, but because we live in a very connected world, very often technological reflections in other areas affect advertising..."

"I always think of technology and science in general as the great human meaning, what makes us better and makes us move forward. So I am extremely positive about any technology. Including the hydrogen bomb. It must have saved many lives by killing many." (CW2, 17-26)

It is not surprising that the graphic designers are particularly dependent on digital technologies to pursue their work. Until roughly 30 years ago, they used brushes, scissors, and pens; now they use computers that automate and simplify tasks. Each new version of image processing software brings new features. On the one hand, this means the automation of processes and saving time; on the other – faster access to information and resources (fonts, images) through cloud services.

TRAINING TO WORK WITH NEW TECHNOLOGIES

The research shows that the respondents working in creative professions take care of their own education (Figure 2). The training of designers is more important due to the image processing technologies they use. In the field of graphics, there are greater dynamics, and software updates are released every year. Only one answer from an interview mentions an employer who spends money on training.

"...there is an amount that is not small, decent, yes, which is given for education, for courses, etc. I am a subscriber to SkillShare, to Domestica. These are the two design portals, quite famous, and in Domestica I have probably over 300 courses that I bought, passed, looked at in some way. That is, I follow, constantly check, I see, but for me it is important not only because I develop myself but because I myself am, as they say, the organiser of trainings... [like] Typoface, etc., which

I organise, and for me this is a way to keep fit, this is a way to explore other methods.” (GD3, 241-248)

Unlike designers, this is not as important for copywriters because there are far fewer tools they need to use.

“...I do not have to work with any complex machines or complex software. I have enough paper and pen in general and I can do my job.” (CW2, 250-252)

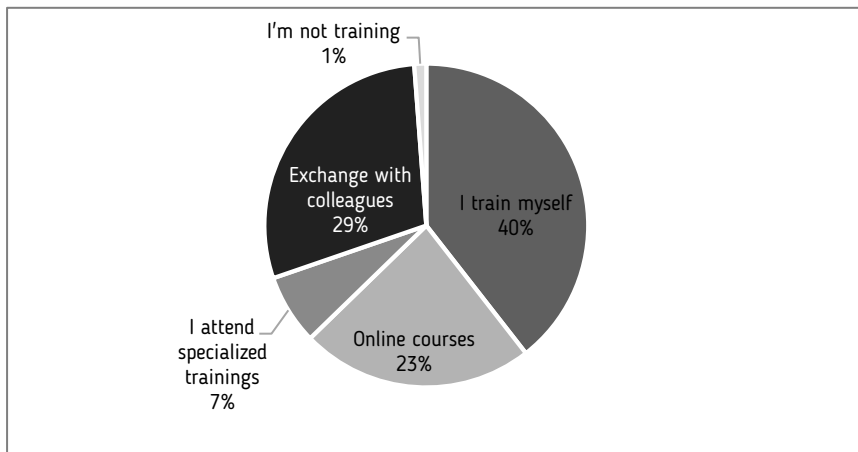


Figure 2. How do you train to work with new technologies? N=85

The most used online courses are those on the training platforms Domestica, Skillshare, Era, and CodeDepot. Self-study by watching tutorials (training videos) most often happens on YouTube or with the videos being downloaded through torrent¹⁷ sites such as Zamunda.

“...so now I went to work, they gave me a Mac, I had never touched a Mac, and I’m using this Mac like my grandmother, to fix myself I watch YouTube videos. By the way, anything related to technology, whether phones or I’m buying a robot vacuum cleaner at home, generally speaking some Indian has already bought it, tested it and can tell me the details if it’s for me.” (CW2, 252-257)

¹⁷ Torrents (like BitTorrent) are peer-to-peer (P2P) file sharing communication protocols that allow users to distribute data and files on the Internet in a decentralised manner.

The programs which designers use include the graphics package of Adobe (Adobe Illustrator, Photoshop, InDesign, etc.), Gigapixel AI, and an impressive array of online tools for image processing, colour scheme selection, and more. The most used technologies by designers are computers – 21%, mobile devices – 18%, graphics tablets – 13% (tablets on which it is easier to work with a stylus than a mouse); while computers, mobile devices, and online dictionaries are the most used among copywriters. The almost uniform usage of word processing tools is noteworthy. The fact that more graphic tools are employed by designers and that authors of text use mostly word processing tools is understandable (Figure 3). The most common ones are MSWord, Google Translate, Thesaurus, Notes, and Pages. Word processing programs are used by all professions, so it is not surprising that they are used by designers. Designers do not write in them as much as they receive the source information and texts in the format used by these programs.

The tools designers use allow them to work faster because the processing of photos and graphics is automated. Dictionaries (online or offline) help copywriters translate faster. In their work, copywriters look for inspiration and information from various resources, most often online, and they need to be translated sometimes. Very often the tasks assigned to copywriters include the adaptation of a text already existing in another language, which in turn must first be translated. Here the work of a copywriter is similar to that of a translator, namely – the transmission in Bulgarian of a message created by another.

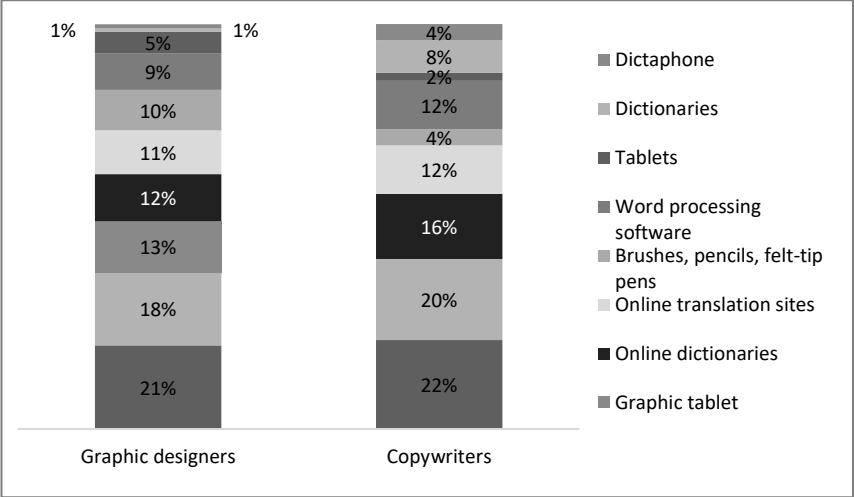


Figure 3. Which technologies (tools) do you use most often in your work? N=161

UNDERSTANDING AND ATTITUDES TOWARDS ARTIFICIAL INTELLIGENCE

The definitions given by respondents equate artificial intelligence to automated processes being performed by a computer. Respondents described the characteristics of narrow artificial intelligence – process automation, machine self-learning, or decision-making based on information received and analysed in the process of self-learning. Their answers paint a picture that somewhat confuses the concepts of automation and artificial intelligence.

“Artificial intelligence is everything that man has managed to transfer as needs and automation and all kinds of functions that he physically does not want or cannot perform and are transferred in the form of artificial intelligence.” (GD1, 50-52)

“In my opinion, artificial intelligence is a technology developed with the idea to “think” instead of people, to “think” and solve cases with greater speed and accuracy than humans.” (Answer to an open question)

“Artificial intelligence for me is choosing the best solution and starting a sequence of actions that you are looking for in a particular task. With properly constructed characteristics, artificial intelligence helps us make decisions based on our criteria and past behaviour. This makes it easier for us when looking for an address, food delivery, etc. and is gaining momentum in the chat functionality of customer support.” (Answer to an open question)

“An artificially created intellect that learns and develops itself, finds the best ways to do something, etc.” (Answer to an open question)

It is worth noting the opinion expressed by one of the interviewed designers – that artificial intelligence is the machine being able to choose, meaning independent decision-making. It is different because it interferes with the idea of choice in the definition of artificial intelligence.

“So, for me the first thing is the choice in general, the struggle of choices, so the moment the machine starts making choices that we don't understand and shouting ah, this is where it's from and at the same time being either adequate or inadequate, then we already have a mature artificial intelligence. And the stage where there are some processes going on that we can see where and why and how and they're transparent, that's more like automation, so for us, roughly speaking, a low level for human intelligence.” (GD3, 83-89)

“An attempt, through technology, to mimic the processes of the human brain so that machines can replace humans in making and exercising more complex

decisions. This even includes the “imitation” of free will.” (Answer to an open question)

Compared to a survey conducted in 2019 with translators in Bulgaria as subjects (Kirov & Malamin, 2022), the responses of designers and copywriters are much closer to the “target” when defining AI. However, there is also some confusion, which is not inexplicable – respondents do not clearly distinguish between narrow (specialised in specific operations) AI and general AI. Upon reading or hearing the term, they initially imagine a General artificial intelligence – a universal one that can think and act like humans do. The understanding is that artificial intelligence not only automates processes but also thinks, chooses, and makes decisions independently.

“Automation can be, for example, all those filters that exist in Photoshop and any others that create other plans. We are impressed by the result, but de facto, how to say, the scheme with which such results are created, it is transparent, there is not some ambiguity. Whereas artificial intelligence will be the moment when the machine will explain to you why it loves you [laughs]. It will be interesting.” (GD3, 90-95)

71% of respondents believe that artificial intelligence will have a positive effect on their profession. It would facilitate work by saving time and “taking over” routine operations (54%), supporting creative processes in people (51%). For 25% of respondents, however, there is no application in their creative profession. Freeing up time for people to engage in other activities and saving them routine work, as with translators, are the benefits of automating processes without the need for artificial intelligence. Quotes from an open question in the questionnaire:

“I would use everything that facilitates my work and gives me the time and opportunity to focus on what is important to me, namely the concepts, ideas, good communication with customers, the development of our brand.”

“Because the world must evolve and one must engage only in meaningful activities that cannot be performed by artificial intelligence.”

“Additional tools can be developed to support creative processes based on algorithms. In a business that is extremely dynamic, this would be mostly a time-saving benefit.”

One opinion differs, and the point of view is interesting because it distinguishes automation, which other respondents claim would bring about artificial intelligence. This copywriter believes it will contribute to faster work, but the benefits in terms of quality of advertising products will not increase.

It's certainly not faster, it's certainly not cheaper, I see no reason why it shouldn't be better, because a computer makes far fewer mistakes than a human, if one has programmed it well. But for me, at least, I don't see how artificial intelligence can enter our profession and improve quality. If it's an automated production, it's called automated, so it can be faster, because the computer can work more than a person, yes, it can be better, because the computer will not make mistakes that a person makes involuntarily, yes, it will be cheaper because of the previous two things, but I don't think advertising is a production line. (CW3, 76-84)

OPINIONS ON THE INFLUENCE OF ARTIFICIAL INTELLIGENCE ON THE FUTURE OF THE CREATIVE PROFESSION

The overwhelming opinion is that some of the current activities will disappear (83%). For 38% of these respondents, these are likely to be routine activities, while 14% think their creative profession may disappear altogether. For 2% of them, the writing of poor-quality texts will disappear along with the search for primary information; 38% could not decide about which activities may disappear.

Routine activities apply mostly to the graphic designer's profession, since they conduct many more operations than a copywriter, for whom a word processor and/or a pen and a piece of paper are sufficient. Design routines include cutting an object out of an image, removing the background, typesetting, banner pagination, prepress, object selections, changing colour schemes, and adapting an image for different formats. An activity that may disappear and was mentioned by one responding copywriter would be writing articles for SEO (search engine optimisation) – currently these articles containing certain keywords are created by humans:

"Creating SEO articles for reading and indexing in Google, we create articles to be read by Bots. Bots can also create text for them."

This is the opinion of the interviewed creative director:

"Editing of any kind of images. This would be something that is even currently possible to do. The assembly of any work. Layout, we have, we work with a lot of different formats. A key vision can be adapted, it can be done by artificial intelligence." (CW1, 165-168)

In this regard, the opinion of one of the interviewed designers deserves attention. On whether routine operations allow the artist to rest:

"One cannot always be in a creative, tense, how shall I put it, moment where one is constantly giving birth to some new solutions. I also often do routine

activities simply because it helps me to get away a little, to distract myself, to rest. In automation and artificial intelligence, it will probably take over this low level of routine tasks, which I don't know how much it won't affect the human in some way, because there will be more and more, you know, responsible, in quotes, tasks for the human and it won't be easy, it will be stressful, you know. So the benefit – definitely – time, money, process optimisation, you know, these things are obvious.” (GD3, 320-328)

Different opinions about disappearing activities were expressed by one of the copywriters; his extreme opinion is about the disappearance of the profession. He justifies its disappearance with the introduction of artificial intelligence that benefits businesses, not individual workers. Professions and activities will disappear when it is beneficial to a business: as long as that business benefits from the activities of these people, they will work and will not be replaced by a robot.

“Because we live in capitalism for sure, if a technology is invented that can optimise the money in an enterprise, then this technology will be used. I mean, I don't think anyone will feel sorry for a copywriter or designer just because they're very nice, but of course they won't get rid of them until the machine can do such a good job. So let everyone be afraid that they will be replaced by a machine. When? I do not know.” (CW2, 294-299)

In the answers of both the survey respondents and the interviewees, the prevailing opinion is that routine activities will disappear. As much as the routine activities of designers are clear enough, it is not obvious to copywriters exactly what they might be. However, clarity can be obtained from the answers to the question “On which type of text activities would artificial intelligence have the greatest impact?” (Table 2). A similar question was posed to the graphic designers – routine activities come first in the classification of activities that suggest automation; activities in which there is creativity are in last place (Table 3).

Table 2. Which type of text-based activities would AI have the most impact on? Please rank in order of importance. The activities were ranked in order of importance by respondents; here the ranking of the activities is conveyed by points. The more important an activity is, the more points are given.

Activity	Points
Correction of spelling	9
Generating emails	7.4
Technical texts	7.3
Creation of social media posts	5.8
Generating ads for web or social networks.	5.1
Copy creation for print and outdoor ads	5

Activity	Points
Creation of texts for websites	4.8
Stylistic editing of text	4.7
Generating ideas for advertising communication	3.6
Creating scripts for commercials or radio spots	2.3

Table 3. Which type of design work would AI have the biggest impact on? Please rank in order of importance.

Activity	Points
Creating icons and pictograms	7.95
Graphics and elements for websites	7.68
Graphic elements for videos	6.73
Typefaces	6.59
Printed advertisements	6.27
Infographics	6.23
Posters and billboards	5.41
Creating brand identity (logos)	5.36
Typography	5.32
Packaging	4.68
Illustrations	3.77

When asked whether new activities might emerge, 83% of the surveyed advertising creatives answered confidently that this would happen. Half of them, however, struggled to guess what these activities might be. Still, if there were a change, they believe it would be in the direction of new responsibilities emerging for the trainers and organisers of AI processes and (again) activities made up of routine operations.

“I am absolutely sure of this – just as there was no profession of consumer behaviour designer until 10 years ago, and now the need for it is growing worldwide, and so after another 10 years there will be other activities that at the moment I have no idea what they would be.” (Answer to an open question)

As implied by the open answers below, another activity that artificial intelligence could take away is working with data:

“Artificial art analysts and assistants, transferring huge data banks in a very short time, artificial interior design consultants, working on certain formulas and offering a huge mix of set options...”

“There will be a need to develop soft skills for designers, as good communication and customer consultation will set them apart from machines.”

For example, text corrections are closest to being partially replaced by artificial intelligence.”

“I cannot decide. They may be related to the development of AI or the organisation of its processes.”

The prevailing opinion of the survey respondents was shared by the interviewed professionals:

“For example, resizing a vision in 50 formats, this could be done by artificial intelligence, but the very creation of creative visions, pure design, I do not think is possible in an adequate, practical way.” (GD2, 201-203)

Creatives in advertising agencies – both graphic designers and copywriters – are confident in their professional future. However, some nuances should be noted, for example, that designers are confident about the advent of artificial intelligence resulting in tasks being performed faster, while copywriters have doubts – 20% are of the opposite opinion. Designers believe that their services will not become cheaper, unlike copywriters; this is the only issue on which there are opposing views (Figure 4 and Figure 5). The opinion of the third interviewed copywriter coincides with the answers expressed by his interviewed colleagues:

“One hundred percent [it] will affect incomes because when people see that something can be done, when businesses rather see that something can be done faster and cheaper, they will want to do it faster and cheaper.” (CW3, 422-424)

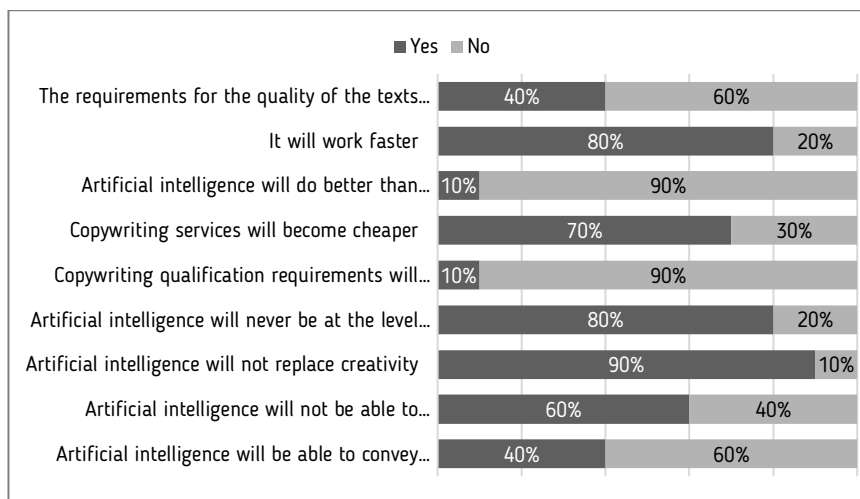


Figure 4. Where do you see the future impact of AI in the work of copywriters? N=10

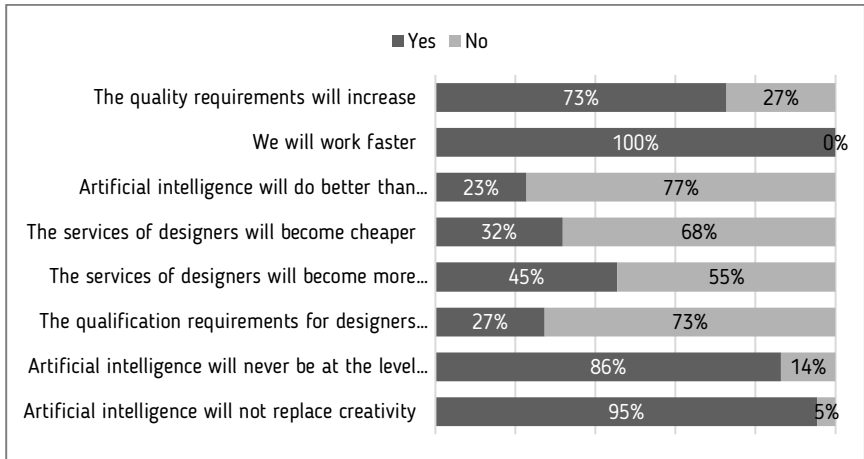


Figure 5. Where do you see the future impact of AI in graphic designers' work? N=22

"If he really comes in and starts doing this work, it should really make our work cheaper, because it's going to be a bit like Indian programmers doing crazy things for little money because there are a lot of them." (GD2, 270-273)

"In general, I believe that civilisation and the development of all these things makes people and enables them to have things that they could never have otherwise... If the physical continues to be the most important asset, understanding the land, resources, etc., then we will certainly become poor. That is, right, this automation, etc., it will make us more and more virtual, and others who have invented all this, or are in control of copyright or whatever, they will increase these assets simply because they understand what the asset is in general... As long as we think that to do the great design and launch another site is a very great thing. It's nothing, let's say. So, the question for me is social – to what extent will society succeed, perhaps the word is to share in solidarity the benefits of this development, because there are definitely benefits... In my opinion, labour will certainly become cheaper." (GD3, 412-448)

ARE THERE CONCERNS ABOUT THE FUTURE OF THE PROFESSION?

The survey respondents, whether designers or copywriters, do not feel worried about their future. 94% of them answered negatively as to whether they feel threatened

regarding their professional future. There is no concern in the answers of the interviewees.

"I don't think they ought to worry because always, even if they become, even if the computer and artificial intelligence can almost... or to perfection can imitate and look like a person in thought, in creativity... then the creative professions will become something like the bio [referring to an organic food label] in this creative market. That is, you will have an advertisement for artificial intelligence or a film directed by artificial intelligence, but now there is a bio film from a living person, as it used to be. The value of the human in this whole thing will change. I don't think it will completely displace him." (CW2, 305-312)

"Yes, if they are not just performers, but are creators and are people who create." (CW1, 171)

"I suspect that where automation can be imported, it will be imported. Once there are plans to automate content, to generate content where it can, then naturally those who now generate content will fall away, and those who control generation, not generation, but those who lead the process, will disappear... So I can't say who specifically, who would drop out." (GD1, 464-470)

"Yes. If an elephant can paint with a brush on canvas, why can't a computer?" (GD2, 209)

In one of the interviews, a designer gave his opinion about who should feel that their future is threatened. This coincides with the statement that people with low qualifications are always most at risk from the introduction of automation (Graetz & Michaels, 2018).

"Well, the most endangered are always the lowest qualified. This is normal. Highly qualified people are also usually at risk, but that is different. This with the highly qualified, when you are a very, very narrow specialist, not a narrow specialist, and when you are at a very high level and the whole model of work is restructured, usually these people burn out." (GD1, 415-419)

The respondents are unanimous about the speed with which artificial intelligence will enter their profession and become a potential threat to them. An equal share of designers and copywriters do not expect the threat of artificial intelligence to become a reality, but there are differences in the expectations of respondents who believe that the threat will happen. According to 41% of designers, the threat will occur within 10 years, against 20% of copywriters – according to 40% of them, artificial intelligence will threaten the profession in up to 20 years (Figure 6).

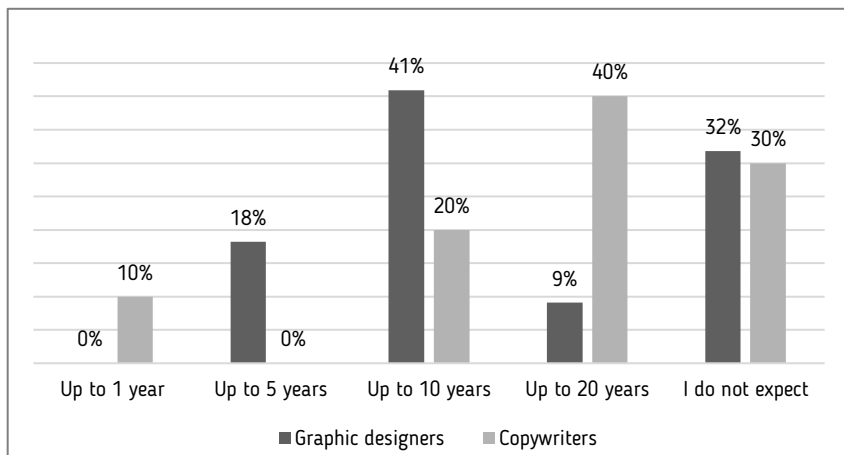


Figure 6. When do you expect this threat to become real? N=32

My explanation is that designers, as greater users of automation in their work, are more aware of the dynamics of change and the development of work tools, including new versions of the software they rely upon. For copywriters, the opposite is true – in their work, they do not see such dynamics in technological development; they only need a sheet of paper and a pen, or the most common, standard word processing program. Interestingly, more copywriters believe that their work will become cheaper, which provokes the question: do they value their work as highly as designers?

CONCLUSION

Artificial intelligence, as one of the most important technologies of digitalization, has the potential to change the way we live and work. It will change the tasks that characterise some professions with typical routine activities.

Both professions considered in the present study are characterised by creative tasks as well as tasks that can be defined as routine. The advent of artificial intelligence will take away some of these recurring tasks, changing the professions. Research about graphic designers and copywriters shows that in this case, the pessimistic scenarios (Frey & Osborne, 2017) of job destruction will not come true in the near future. The reason for this is that, rather than a job destroyer, artificial intelligence will become a facilitator, an organiser of new activities, or a performer of boring, time-consuming tasks. Artificial intelligence will help, not replace, people in these professions. Routine activities are being “taken over” now by artificial intelligence, and at the same time new jobs are being created as a result of the search for new activities (Salomons, Gregory & Zierahn, 2019).

The logical impact for both creative professions is related to the fact that new software solutions will take away routine tasks, and artists will be able to focus on the purely creative part of their work. The difference is that designers, as greater users of automation, are more aware of the dynamics of change and the development of digital tools. They are well acquainted with computers, their architecture, and specialised software. In this sense, a current graphic designer can be perceived as a partial IT specialist. This is probably why they are more aware of developments in digital technologies than copywriters. Designers are forced to use them to work, but copywriters are not.

Content creation via artificial intelligence is already being used by businesses (to describe e-shop products or create social media posts) and frees copywriters to devote themselves to purely creative thinking in search of an appropriate concept or creative strategy. However, it can be said that the future of both professions depends on the businesses which utilise them – if they become unnecessary professions, they will disappear at the expense of artificial intelligence. Copywriters fear the destruction of jobs and AI’s negative impact on the quality of advertising products.

The future of graphic design is headed exactly in the direction where its benefits are developing most – routine tasks being taken away, allowing for faster work. Probably everything that can be automated will be automated. Artificial intelligence automates and thus simplifies life. Though good advertising design will be automated, the human factor will not be ruled out but will rather become exotic or labelled as “bio”. Human-created products will be of higher value. Content design and creation programs will not be able to replace people; they will help them work faster, better and better, but they will not be able to create graphic or textual concepts that will convince customers and motivate them to action. The work of a human graphic designer or copywriter will stand out and become important for the success of the business that commissioned it.

According to the answers in the study, there is room for both artificial intelligence and human creativity. Machines will be “loaded” with speed, organisation and efficiency, and

creativity will remain for people. Machines will create, but only within the limits set by people, and more often take on boring and less 'professional' activities.

In the future, the recommendation I can give to the clients and workers of these two creative professions is to appreciate creativity, to pay more attention to the technologies in their field, and to show flexibility in the increasingly violent invasion of digital technologies. Customers will always choose the best combination of quick / cheap / efficient, and artists must find their place in it and convince their clients more clearly of their abilities.

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CHAPTER 9.

INFORMATION TECHNOLOGY SUSTAINABILITY REPORTING AND COMPANY PERFORMANCE

Rumiana Jeleva

ABSTRACT

The focus of this chapter is Information Technology (IT) sustainability and the reporting on sustainability dimensions within this sector. The latter is illustrated by the use of sustainability reporting platforms such as the Global Reporting Initiative and the German Sustainability Code. The analysis indicates the limited presence of IT companies in the database. Such research cannot explain the motives/drivers for disclosing non-mandatory information on the sustainability performance of companies and their managers/owners. Further in-depth research is certainly needed in this respect. IT companies do benefit from sustainability reporting, which provides an opportunity to demonstrate strategic leadership in times when digitalisation is becoming predominant.

Keywords: *sustainable development, IT sustainability, non-financial reporting*

I. OUTLINING THE PROBLEM

This chapter discusses IT sustainability and IT sustainability reporting;¹ the latter may have a significant and very broad impact on social development and societal perspectives. Various organisations and authors define IT sustainability in many ways. However, they all emphasize that IT sustainability can help minimize the negative impact of information technology on the social, economic and environmental aspects of sustainability. The second important perspective, which enlarges the definition of IT sustainability, is the understanding that IT helps solve (other/further and more complex) sustainability-related issues.

In order to lend greater clarity to our understanding of and approach to the topic, this study touches upon the relation between corporate sustainability and IT sustainability and defines IT sustainability accounting. Further, our research provides an overview of the IT industry reporting rates in Europe by using certain database platforms such as that of the

¹ The terms sustainability reporting, non-financial disclosure and sustainability accounting are used synonymously in this text.

Global Reporting Initiative and the German Sustainability Code. Special attention is devoted to the practices of small and medium enterprises (SMEs) in the IT sector and to their practical experiences with sustainability reporting. This evidence-based part of the analysis raises questions as to the definition of sustainability accounting and when and which companies should report on their sustainability-related performance.

In the last two decades, the demand for sustainability reporting and disclosure of non-financial information by companies has increased as a result of growing societal concerns about the sustainability of the environment and economic system in a time when rapid economic growth and instability are beginning to test the “planetary boundaries” (Rockstrom et al., 2009; Sachs et al., 2019). Although it is questionable whether companies’ reporting will ever be able to address the complex system of sustainability concerns, non-financial disclosure appears to contribute to the concept, and study, of sustainable organisations. How can the experience of the best companies become a model for others? How can sustainability reporting procedures, and the reports themselves, provide useful information for managerial decision-making and assessing a company’s contribution to its branch of industry, to the economy and to society? In these processes, IT companies have a special role to play; moreover, IT companies in particular carry the largest responsibility for information and data use, prevention of data misuse and, ultimately, for the fight against false and/or illegally disseminated data.

II. DEFINITIONS AND CONCEPTS

Sustainability and sustainable development

The terms sustainability and sustainable development are often used by various social actors (politicians, businessmen, journalists) but are rarely defined comprehensively. Despite the extensive literature and ongoing policy-related and scientific debates on the subject, it is still difficult to give an unambiguous and consistent interpretation of these terms. Moreover, the phenomena to which the two concepts refer are not static. Their meanings evolve along with the realities, with the intense transformations in technology and communication, the dramatic environmental challenges and increasing unpredictability of all sorts of developments. Speaking about sustainability and sustainable development, many authors qualify the terms unflatteringly as a “meaningless, empty formula”, criticising their “abstractness and vagueness” and the excessive use of sustainability “as a buzzword” (Kliesow, 2015).

The term “sustainable development” was first mentioned at the UN World Conference on the Environment, held in Stockholm in 1972, but came to be used more frequently after the Norwegian Prime Minister Gro Harlem Brundtland presented her report (“The Brundtland Report”) of 1987. The most commonly accepted definition, attributed to the

Brundtland Commission, construes sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987).

The 1992 Rio Conference on Environment and Development gave additional, important impetus to the scientific and political discussion on the concept of sustainable development. From then on, sustainability became a basic starting point for international, and subsequently national and local, (environmental) policies. Along with the environment, other essential issues are now in the focus of political debates. Such are the challenges posed by ongoing global urbanization, demographic issues, poverty, the (non)participation of citizens and the inefficient use of resources. Discussions on the limits to economic growth have also resumed since the 1970s. The foundation has been laid for the further development of the notion of sustainability performance, and, in the coming years, the concept will serve as a framework for development policy at all levels (Kliesow, 2015, p. 11 ff.). Following the Brundtland Report and the Rio Conference, the focus was placed on three dimensions of sustainable development: ecology, economics and social issues (Elkington, 1997). A new aspect of sustainability and sustainable development is indicated by the package of global goals for the period 2015–2030 adopted in September 2015, better known as the 2030 Agenda for Sustainable Development: Changing our World. According to the UN, the 2030 Agenda marks a new era in international development. It defines 17 Sustainable Development Goals (SDGs) and 169 tasks. They are a continuation of the eight Millennium Development Goals (MDGs) 2000–2015. Although the MDGs are considered to have been successfully accomplished, their outcomes remain limited and insufficient. Unlike the MDGs, the new Sustainable Development Goals are the result of the broadest consultations ever held in the history of the United Nations.² The most important achievement of the new programme is that it integrates the economic, social and environmental dimensions of sustainable development. In addition, it calls for action in all countries, poor, rich and middle-income alike, which makes it unique and global. The programme covers five crucial areas: people, the planet, prosperity, peace and partnership.³

Sustainable development and company performance

There has been a long-standing debate on whether businesses do or do not have some other (social) responsibility beyond maximization of their owners'/shareholders' wealth. This is often defined as a debate on corporate social responsibility (CSR). Here, it is neither necessary nor possible to trace these extensive discussions and theoretical considerations

² Discussions prior to the formulation of the Sustainable Development Goals continued over two years and included an unprecedentedly large number of participants.

³ The so-called “Five Ps” addresses key barriers to sustainable development, such as inequality, unsustainable consumption, outdated production models, inadequate infrastructure, lack of decent jobs, etc.

(Joshi & Li, 2016). Our focus is not on social responsibility, as it is obvious enough that entrepreneurial answerabilities and assignments go beyond the profit motive, especially in contemporary society. Schumpeter (1947; 1965) argues that “entrepreneurs” bear their responsibilities for developing innovation and fostering technological advancements. Bowen (1953) goes further and insists that businesses have not only the responsibility but also the obligation to pursue policies, decisions and lines of action that are beneficial to reaching the objectives and maintaining the values of society, which implies ethical (normative) responsibility. To the contrary, Friedman (1970) argues that corporations, being legal bodies, have no ethical feeling of responsibility. However, he also postulates that companies can be entrusted explicitly, by laws or regulations, with additional “artificial responsibilities” but that the only social responsibility they have is to maximize profit and investment.

After Davis (1960) asserted the existence of a link between responsible entrepreneurial behaviour (respectively, business activities that are responsible to society in general) and the company’s long-term profit,⁴ a number of economic and social concepts were proposed, showing the interdependence between a firm’s performance and the wealth of society. The implication of this reasoning is that companies can simultaneously add value and profit by following and, most importantly, implementing sustainable goals: “including better operational efficiency and cost reduction, reduced regulatory enforcement, increasing rival’s costs, improved environmental risk and compliance cost management via emission reductions, superior social risk management through stakeholder engagement and legitimacy, preferential access to scarce resources, product differentiation and access to environmentally conscious markets, lower cost of capital and labor due to improved reputation, shared value creation and lower input supply disruptions due to improved sustainability and resilience of sources, and sustained innovation and growth by addressing big societal issues” (Hart, 2005; Esty & Winston, 2009; Porter, 1991; Porter & Kramer, 2006, 2011; Orlitzky, 2008; Dhaliwal, Li, Tsang & Yang, 2011 – all cited in Joshi & Li, 2016, p. 2). At the same time, there have been extensive critiques regarding the impact of CSR activities on, and added value contribution to, companies and their essentially economic activities.⁵

⁴ Davis (1960) argues that “socially responsible business decisions can be justified by long, complicated processes of reasoning as having a good chance of bringing long-run gain to the firm, thus paying back for its socially responsible outlook”.

⁵ In the cited publication by Joshi & Li (2016, p. 2), a number of arguments demonstrate the reasonable doubts of many scientists regarding the interrelation of CSR activities with the financial performance of companies. Some aspects that raise concerns are: “(1) sustainability considerations represent additional constraints on production technology, forcing firms toward suboptimal choices, (2) CSR goals divert managerial attention and drain resources from productivity-enhancing activities and investments, (3) CSR activities represent unproductive ceremonial institutional practices, (4) managers engage in CSR activities to further their personal agenda and reputation at the cost of investors, and (5) CSR activities are corporate charity at the cost of shareholders”.

Inspired by the Brundtland Report, some authors define corporate sustainability as “meeting the needs of a corporation’s current direct and indirect stakeholders without compromising its ability to meet the needs of future stakeholders as well” (Dyllick & Hockerts, 2002, p. 130). Here, it is important to point out that other authors further discuss sustainability dimensions – the environment, society and the economy – while examining the effects these have on a company’s sustainable development but also on the sustainable development of the economy and society in general (Joshi & Li, 2016, p. 2). This conceptual viewpoint is useful because it enables an empirical study of the implications of various corporate decisions regarding their sustainability and provides a closer look at the accounting practice of companies working in different economic sectors.

As the COVID-19 pandemic hit the world in 2020, the IT industry experienced an unprecedented boom. With the increasing expansion, in the last few decades, of industries whose basic goods and services involve support for the electronic display, processing, storage and transmission of information, other sectors have also been looking to invest in this immensely promising area. IT is unquestionably present in every sphere of society. Today, it is hard to think of a company or economic sector in which IT plays no role.⁶

Information technology has such a variety of applications⁷ that it provides key components to the entire structure of contemporary economies, industries and services. In view of the growing role IT plays in all economic sectors and industries, it is essential to understand the main aspects of this industry and the key dimensions that make it such a powerful, even revolutionary, factor today.

III. IT SUSTAINABILITY REPORTING IN ACTION AND PRACTICE

Reporting on sustainability performance can either be mandatory (governed by laws and regulations) or voluntary (driven by “soft” institutional pressures or differentiation

⁶ Proof of the enormous influence of IT even amidst the COVID-19 pandemic is found in the 2020 Inclusive Internet Index Report (<https://theinclusiveinternet.eiu.com/explore/countries/performance>). Its overall conclusions refer to narrowing the Internet access gap between rich and poor countries. There are clear signs that the percentage of households with access to the Internet is growing in all countries. Also, a growing number of professions are practiced in or through IT. At the same time, the report notes the slow growth of Internet access in poorer countries. The pandemic has compelled people to use the Internet increasingly and for a wider range of activities than ever before. At the same time, the pandemic may have widened the divide between online and offline populations (the so-called digital divide).

⁷ Cloud Computing, Mobile Apps, Big Data Analytics, Automation, Artificial Intelligence, Smart Technology, Virtual Reality, Augmented Reality, Blockchain Data, Cyber Security, Growth of IoT Networks, Predictive Analytics Implementations, Cloud Migration, Rise of Data Officers, Quantum Computing Applications, Smart Technology, Open Source Solutions, Edge Computing, Rise Of Chatbots, etc. See more at <https://linchpinseo.com/trends-in-the-information-technology-industry/>.

strategies). Such regulations have a long history, especially in Europe. At the same time, few countries have passed laws that make sustainability mandatory.⁸ As of 2017, all large public companies in Europe are required to report certain environmental, social and economic and management-related information in accordance with the EU Directive (2014/95) adopted on 22 October, 2014.⁹ Along with this “top-down” approach in Europe a number of organisations are developing their own sustainability reporting standards for firms (mostly within their value chains) in order to make external sustainability reports accurate, consistent, reliable and comparable across time and within their own networks of firms. Companies are also committing themselves to, and monitoring, their sustainability through “triple bottom line” reporting, whereby enterprises record not only their financial gains or losses but also their social and environmental performance using the established indicator systems of GRI.

Reporting on IT sustainability concerns the environmental and social performance of companies working in this large industry and the impact they have towards a sustainable global economy and on society as a whole. Studies estimate that digital technologies are already contributing from 1.4% to 5.9% of global greenhouse gas emissions.¹⁰ These are high levels, though incomparably lower than those in industries like agriculture, transport, etc. Hence, the nature and contribution of IT sustainability need to be defined more broadly. The main thesis of this chapter is that IT sustainability reporting is not very popular among IT companies. An explanation for this could be that companies are not obliged to deliver such non-financial information about their performance because they are usually not very large firms. Another reason may be the large scope of the reporting and the difficulty to operate with the reporting indicators. Further on, IT companies try to avoid the non-financial disclosure of their activities even in cases when they have to display “good corporate governance”; or they simply underestimate the benefit and impact of IT sustainability reporting. A survey conducted by ACCA and Eurosif in 2013 confirmed these assumptions in examining the attitudes of shareholders/investors to non-financial reporting. The study asserts that 78% of interviewed investors disagreed or strongly disagreed that current levels of non-financial disclosure were adequate; 73% of investors disagreed or strongly disagreed that current levels of non-financial disclosure were linked to strategy and risk, and 93% of investors disagreed or strongly disagreed that current levels of non-financial disclosure were sufficient to assess materiality. They blamed the

⁸ The only such case about which information can be found on the Internet is Finland.

⁹ The European Commission’s directive states that all large companies (both listed and private) should be subject to the disclosure requirements on a consolidated basis; large companies are defined as those having over 500 employees and a balance sheet exceeding EUR 20 million, or revenues exceeding EUR 40 million.

¹⁰ Information can be found on <https://www.weforum.org/agenda/2021/06/coronavirus-pandemic-streaming-video-calls-data-environment-emissions/> (last accessed 30.01.2022).

management structures for this lack of greater accountability and transparency in the companies in which they were investing.¹¹

Many reporting instruments, such as the Global Reporting Initiative (GRI), are not specific to IT sustainability reporting.¹² The data for the 2020 GRI reporting on IT companies show that only 69 out of 1,815 non-financial reports were delivered by firms in the “Information and Technology” sector (Figure 1).

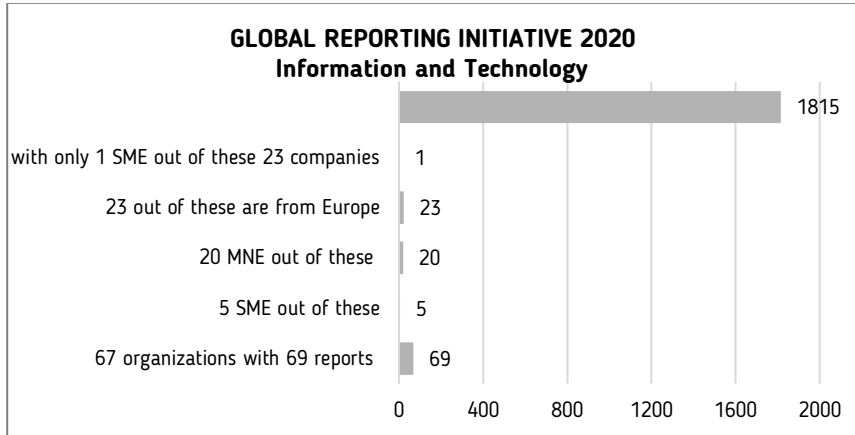


Figure 1: Reporting companies in Information and Technology and their characteristics (GRI 2020)

It is discouraging to find only 5 SMEs and 20 middle-sized companies among the 67 organisations with 69 non-financial reports. In addition, only 23 of the companies are European, of which only one is an SME. Once again, the following data are not as promising as one might expect (Figure 2).

¹¹ This chapter uses as an illustration the practice of some companies operating in Germany and their reports under the German Sustainability Code. These reports only indirectly explain the motives for non-mandatory disclosure of non-financial information on sustainability performance by companies and their managers/owners.

¹² In this chapter, all data for which the GRI is cited were obtained from the “List of GRI Standards reports and published materials with their self-declared claims”, last accessed at <https://www.globalreporting.org/reportregistration/verifiedreports> on November, 1, 2021. As stated on the webpage, the “list was last updated in December 2020”.

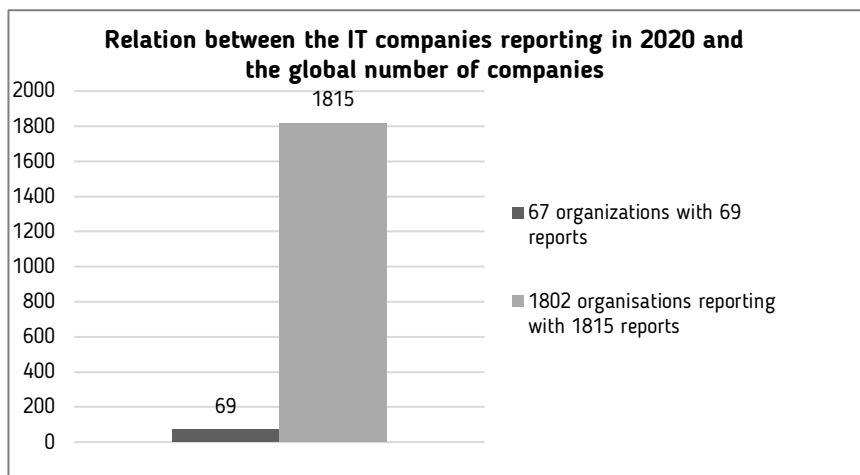


Figure 2: Relevance of reporting IT companies in 2020 and the global GRI reporting companies

The trend in 2020 can be indirectly confirmed by the data for 2019 (Figure 3). Out of 5,375 companies, 342 working in the Information and Technology sector report on sustainability. Interestingly, only 11 of these were SMEs. Although the data for 2020 are not complete and display the situation of non-financial disclosure within the framework of the GRI only partially,¹³ it is clear that the percentage of IT firms reporting on sustainability did not exceed 7% in 2019.

¹³ The GRI database has not been updated since December 2020. More at <https://schwery.com/gri-database-a-valuable-tool-soon-to-disappear/>

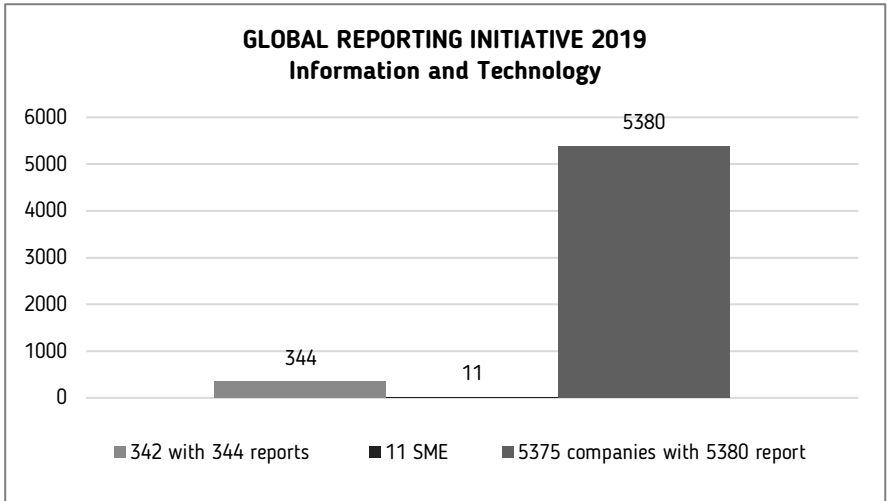


Figure 3: Reporting Information and Technology companies with characteristics (GRI 2019)

The same picture appears from an overview of IT sustainability reporting with examples from Germany in 2020 according to the indicators of the German Sustainability Code (GSC).

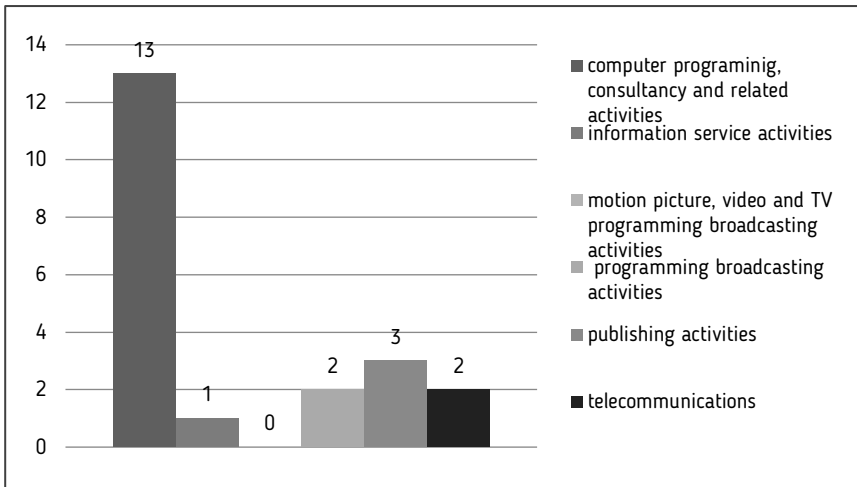


Figure 4: Reporting IT companies by sub-sectors (GSC 2020)

In the German sustainability reporting system, we find 6 different branches in the IT industry: computer programming; consultancy and related activities; information service activities; motion picture, video and TV programming broadcasting activities; programming broadcasting activities; publishing activities; and telecommunications. There were 21 non-financial disclosures out of a total of 759 disclosures by 2021 (Chart 4). 13 of them are SMEs with less than 250 employees, and 10 of the 13 had no obligation to report. Compared with other industrial branches, the sustainability reports by IT companies are few (Figure 5).

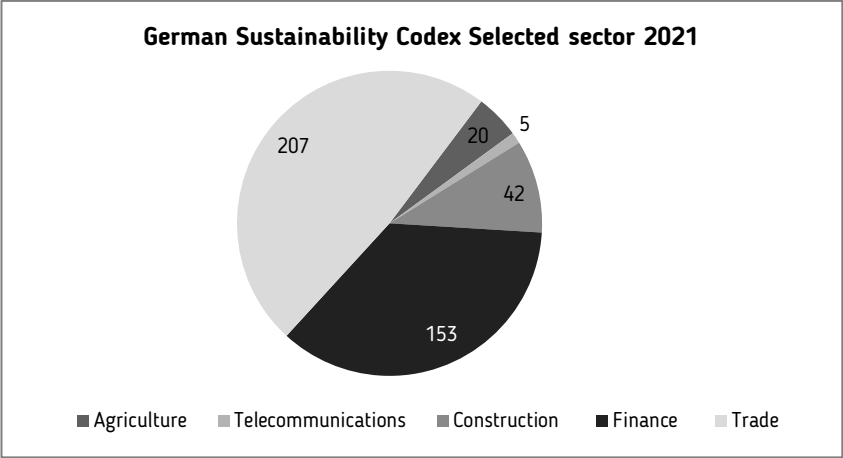


Figure 5: IT Sustainability reports in comparison with other industries (GSC 2021)

The Bulgarian IT industry is not presented in these reporting database formats, but the Albanian communication company “One Telecommunications” has accessible corporate responsibility reports for the years 2018 and 2019 according to the GRI core indicators.¹⁴ Although nearly 80% of households in Bulgaria had access to the Internet in their homes in 2021, which was 3.8 percentage points more than in 2019,¹⁵ and Bulgaria’s IT industry is reported to be advancing so rapidly that it is highly likely to rank among the three most

¹⁴ The presence of 9 reports by companies from Croatia, albeit not in the field of IT, is impressive.
¹⁵ Bulgaria ranks 26th in the Inclusive Internet Index for 2019 and 37th for 2021. The Inclusive Internet Index was commissioned by Facebook and conducted by The Economist Intelligence Unit for the fifth year in a row in 2021. The index provides a rigorous benchmark for national-level Internet inclusion in 120 countries across four categories: Availability, Affordability, Relevance and Readiness.

potent industries out of eighteen industries in Bulgaria for 2021,¹⁶ there is hardly any evidence as to its sustainability and reporting preparedness. The Bulgarian IT industry and especially its software sub-sector are among the few left unaffected by the COVID-19 pandemic. Indeed, the pandemic actually has actually given impetus to it, one of the few globally competitive Bulgarian industries.¹⁷ According to the ICT Industry Observer Bulgaria 2020 report, in that critical year, the IT sector displayed the most considerable absolute growth in revenue among all Bulgarian sectors, surpassing the gambling industry – its only competitor among growing sectors.¹⁸ Some of the main findings of this report confirm the enormous influence IT development has had in Bulgaria over the last four years. For instance, the software sub-sector and its related services sub-sector are the largest and fastest growing in the country. Over 1.5 million digital devices are sold on the Bulgarian market every year, including smartphones, laptops, tablets, desktops and servers. Telecommunications and Internet providers have entered a new stage of development: the pandemic has notably increased demand for their services. Their rapid development is closely linked to the digitalisation of businesses and the digital society. At the same time, the cited report highlights that IT business in Bulgaria is distributed too unevenly across the country's territory, being concentrated predominantly in Sofia; this additionally contributes to regional disbalances and may distort the structure of the national and local labour markets.

CONCLUSION

The last two decades have seen a call for sustainability reporting and disclosure of non-financial information by companies in all industries. The IT industry is no exception. Although it is questionable whether companies' accounting systems will ever be able to address the whole complexity of sustainability concerns, non-financial reporting appears to contribute to the concept of sustainable organisation. Only the latter can further achieve

¹⁶ See CBN Pannoff, Stoycheff & Co. ICT Industry Observer Bulgaria 2020 report and the Bulgarian Association of Software Companies (BASSCOM) webpage. Accessible at <https://basscom.org/>.

¹⁷ According to data from BASSCOM, in 2020 the sector marked 10% revenue growth, to be compared with the 5.5% drop in the country's GDP. Almost 38,000 people were employed in the software sector during this period, and their numbers were expected to reach 41,667 by the end of 2021. A BASSCOM study shows that more than 60 software brands have offices on the Bulgarian market, and entrepreneurs of more than 20 nationalities have been setting up new companies and opening offices in the country, despite the crisis.

¹⁸ See CBN Pannoff, Stoycheff & Co. ICT Industry Observer Bulgaria 2020 report. The report contains data and analysis for the last four years and a forecast for 2021. It presents the number of ICT companies in Bulgaria according to year, the number of people employed in the sector each year, revenues in the four subsectors of the industry and an overview of the industry in three specific regions – Sofia, Plovdiv and Varna. The study also includes a ranking of the top 25 companies in Bulgaria by revenue. The four subsectors into which the industry is conditionally divided are software and services, hardware and services, telecommunications and services and others.

effective environmental and/or social targets (e.g., reduction of CO2 emissions to acceptable levels; stable social investment in the workforce; the effective fight against corruption, etc.). Reporting on sustainability performance can be governed by laws and regulations (mandatory) or driven by “soft” institutional pressures or company’s/managerial differentiation strategy (voluntary). One of the most important questions in this context concerns the scope and content of the sustainability reporting indicators. This chapter has illustrated the use of sustainability reporting platforms such as the Global Reporting Initiative and the German Sustainability Code. The analysis indicates a limited presence of IT firms in these databases. Such research cannot explain the motives/drivers for disclosing non-mandatory information on the sustainability performance of companies and their managers/owners. In this context, further and deeper research is needed that would develop more sensitive research instruments; it is likely that managers/owners will publicly accept voluntary participation in reporting but would actually not fulfil this responsibility. In studying well-established concepts such as CSR or corporate sustainability, it would be wise to consider the discrepancy between a company’s normative (desired) and actual performance. Some organisations and companies are trying to develop their own IT frameworks and/or sets of indicators for non-financial auditing; these may be used even by SMEs as guidance and a practical tool for voluntary reporting on IT sustainability.¹⁹ The availability of special databases and/or relevant sets of indicators can probably increase the number of IT companies delivering non-financial sustainability reports.

Finally, the experience of the best IT companies reporting sustainability can serve as a model for others and provide useful information for managerial decision-making and assessing a company’s efficiency and contribution to its respective industrial sector, to the economy and to society in general. The impact IT technologies can have on the socio-professional structure, as well as their influence on the opportunities and risks arising for low- and high-skilled workers, for the employed and the self-employed, makes prominent the new social role of the IT industry and its leadership in the digital transformation.

The COVID-19 pandemic that began in 2020 is making people turn to the Internet more than ever and has greatly increased the use of digital devices. The ability of the IT industry to offer connection and engagement for people, while also securing high levels of productivity and development in other production spheres, has prevented much of the global economy from shrinking by half (2020 Inclusive Internet Index Report). Being responsible to the highest degree for securing the interweaving of connectivity and opportunity during the prolonged crisis caused by the COVID-19 pandemic, IT proves to be the industry of the digital future. It is emblematic for inclusion in development that is hoped to be global. Social responsibilities are being assigned to IT companies like never

¹⁹ For more information: <https://www.deitauditor.nl/business-en-it/it-sustainability-indicators-for-the-it-industry/> (last accessed on 30.12.2021).

before. Reporting on non-financial and sustainability-related aspects of IT activities is probably one of this industry's most powerful mechanisms for fulfilling the important role it has to play in our times.

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- CBN Pannoff, Stoycheff & Co. ICT Industry Observer Bulgaria 2020:
<http://blog.cbn-bulgaria.com/2020/12/ict-industry-observer-bulgaria-2020-by.html>.
- 2020 Inclusive Internet Index Report:
<https://theinclusiveinternet.eiu.com/explore/countries/performance>.
- UN 2030 Agenda for Sustainable Development: Changing our world.
<https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>

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CHAPTER 10.

WORKPLACE INNOVATION WITH DIGITAL TECHNICAL SUPPORT

Zsófia Riczu

ABSTRACT

Global development has been a significant process from prehistory to the present day. This long, complex process of development has changed the lives of humankind time and time again, in light of which many studies have dealt with developmental science and the concept of innovation in the fields of technology, informatics, economics, organisational science, and law. One thing is for sure: innovation is part of our daily lives, as technical innovation and renewal have been present from the very beginning. In my chapter, I will present the workplace aspect of innovation, in addition to exploiting the potential of digital work and also touching upon certain legal aspects. Technological development naturally brings about the development and transformation of social relationships. It transforms interpersonal relationships, having the most significant effects on employment relationships. Among these, I would like to highlight the subjects of digital innovation in workplaces, directing the focus to employers. I place the legal situation of the employer and the rights of command, direction, and control at the centre of my research; I explore this by combining theory and practice.

Keywords: *innovation, workplace innovation, digital technology, artificial intelligence*

INTRODUCTION

In recent years, the importance of technological innovation and its impact on our daily lives have grown exponentially. All this was induced not only by the development of technology but also by the pandemic situation which has significantly determined our lives since 2020. Developments in the technology industry are leading to innovation at both the corporate and workplace levels. Jobs need to adapt to relevant technological opportunities due to the sharp change of direction in order to remain competitive and stable. In my study, I examine how the revolutionary technological solutions that define our present are affecting work and employment conditions. I try to provide a comprehensive picture of the approach to the concept of innovation, its conceptual system, and the role that the opportunity provided by innovation plays in our daily work.

The first and most important theory that we need to point out for the study is that digitisation is no longer optional. We are talking about an irreversible process – all of us are conscious of it, but opinions are strongly divided on its necessity and application. In my opinion, the application of digital innovation in some workplaces is highly profession-dependent; there are places where digital labour is an indispensable element of everyday work, while elsewhere it has gained less ground. The current vulnerable situation, in my view, anticipates that digitalisation will slowly gain ground everywhere, which will also reduce work organisation and work management, in addition to leading to the disappearance of some professions and the emergence of other new ones. This, of course, depends on a number of environmental factors, including the acquisition of basic skills needed to use digital tools or the economic environment. With the entry of Generations Y and Z into work, I believe that there will be no problem with this. The representatives of these generations already have basic digital skills, while difficulties may arise for older, possibly pre-retirement generations. When examining the economic environment, the availability of projects supporting development and innovation, asset procurement tenders, and small- and medium-sized enterprises are essential. These enterprises are key players in economic life in Hungary;¹ however, in their case, developing equipment and introducing digital work is costly. This means that the digital switchover is taking much longer than in the case of a multinational company with significant profits. The National Technology Platform was established under the auspices of the Ministry of National Economy, the aim of which is to develop domestic digitised production, to determine digitisation needs, disseminate the relevant professional culture, and provide methods, monitoring, and professional quality assurance for transformation processes (the latter was marked not as a one-off but as a continuous activity).² Antal Nikodémus indicated at the V4 conference held in 2017 that it is unfortunately more difficult for micro and small enterprises to access such support.³

The project set up by the above-mentioned V4 Conference and the Ministry of National Economy are just two examples that have been organised to support workplace innovation. However, from the point of view of this study, we must first define the concept of workplace innovation itself, and I believe that only then can we analyse its possibilities.

¹ In Hungary, 90% of enterprises are micro or small enterprises. See: National Association of Hungarian Industrial Associations <https://www.iposz.hu/letoltheto-dokumentumok/2/> (2021.04.10.)

² Nikodémus, A. (2017.) Az ipar digitális átalakulásának (Ipar 4.0) stratégiai koncepciója és a komplex program tervezete – Lecture held on April 26, 2017 <https://eoq.hu/szakk/podium/ea170426.pdf> (2021.03.05.).

³ Digitalizálás és innováció a kkv-szektor szempontjából – V4 conference organized by the National Association of Hungarian Industrial Associations, Summary in Iparos Újság, 61(6.) 2017., <http://www.iparosujzag.hu/ipartestuletiet/1900-2018-02-10-10-04-31> (2021.04.12.)

I. DEFINING INNOVATION

In order to define the main topic at hand, workplace innovation, it is essential to compare the meaning of innovation, including different definitions from different periods. Innovation comes from the Latin verb *innovare*, *innovatum*, which means renewal.⁴

Joseph Alois Schumpeter laid the theoretical foundations of innovation, seeing that innovation can sustain the cyclical and dynamism of the economy.⁵ Adam Smith, the father of economics, though he did not name innovation as a concept, had already described it in his book, *The Wealth of Nations*. He explained the need for an increase in workload, from which it follows that the worker (worker) gains experience, a straight path to the development of routine tasks which can increase productivity. Smith highlighted the use of technological inventions at the time that were able to greatly help and complement human labour, shorten working hours, and free up more of the labour force.⁶ Closely related to this definition of innovation is the concept of research and development (often used as a synonym), defined by Attila Iványi: “an activity aimed at acquiring new scientific knowledge, exploring new applications of known scientific results and developing practical activities based on scientific results. The concept includes the tasks of basic research, targeted research and experimental development.”⁷ According to Baumol, innovation is foundational for eliminating or at least reducing market inequalities.⁸

In addition to the positions listed above, a number of insights have emerged regarding innovation; however, given the scope of this study, I will only describe the most basic definitions that are closest to workplace innovation. It is clear that the concepts mentioned above mainly concern the human-machine relationship of innovation; however, positions have subsequently emerged that emphasise the connection between humans. Peter Drucker, for example, confronts the technical aspect of innovation and emphasizes innovation as a social phenomenon.⁹ In addition to marketing innovation, product innovation, and process innovation, József Katona also formulates the concept of organisational innovation, which is most relevant to this study. According to his position: “[o]rganizational innovation means the implementation of new organizational methods in

4 Keresztes Gábor (2013). Az innováció fogalmának történeti áttekintése. *Gazdaság & Társadalom*. 5 (4.) pp. 81–95.

5 Schumpeter, Joseph Alois (1980). *A gazdasági fejlődés elmélete*. Közgazdasági és Jogi Könyvkiadó, Budapest.

6 Smith Adam (1959): *A nemzetek gazdagsága*, Akadémiai kiadó, Budapest p.12.

7 Iványi Attila Szilárd – Hoffer Ilona (1999.): *Innováció a gazdálkodásban*, AULA Kiadó, 12.

8 Baumol, William Jack (1968) : *Entrepreneurship in economic theory*. *American Economic Review*, 64-71.

⁹DRUCKER Peter (1985): *Innovation and Entrepreneurship, Practice and Principles*. Heinemann. London. Innováció és vállalkozás az elméletben és a gyakorlatban. Park, Bp. 1993.

the company's business practices, work organization or external relations.”¹⁰ The most concise and up-to-date wording can be found on the website of the Occupational Safety and Health Administration (OSHA): “[w]orkplace innovation aims to increase the productivity of organizations in a sustainable way, while at the same time improving the quality of working conditions.”¹¹ In addition to the definitions of basic research, applied research, and related agreements, the definition of innovation was also enshrined in Act LXXVI of 2014. Under this:

“3.§ 6. ^{} innovation: a new or improved product or process, or a combination of these, which differs significantly in its legal form or method of financing from the previous products or processes of the organization, and which has been made available to potential users in the case of a product or which has been used by the organization in the process, and which may be a) product innovation: a new or improved product or service that is significantly different from the company's products or services that it has already introduced to the market, b) business process innovation: a new or improved business process related to one or more of its business activities, which differs significantly from the company's previous business processes and which the company has used - in particular production, distribution and logistics, marketing and sales, information and communication technology, administration and management, product and process development”.*¹²

According to the wording of the fourth edition of the Oslo Manual 2018 Guidelines for Collecting, Reporting, and Using Data on Innovation, “[a]n innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).”¹³

In light of the above findings, innovation is a socio-economic-technological phenomenon which, in addition to supporting sustainable development, is able to increase productivity and maintain economic dynamism by involving new applications. Workplace innovation, in my view, is a narrower range of innovation that affects work performance and work organisation as a socio-economic phenomenon. Innovation in work organisation is essentially the renewal of working relationships. The expansion and reorganisation of

¹⁰KATONA József (2006): Az innováció értelmezése a 2005. évben kiadott Oslo Kézikönyv harmadik kiadása a Nemzeti Kutatási és Innovációs Hivatal megbízásából, Magyar Innovációs Szövetség.

¹¹ Opinion of the European Economic and Social Committee on Innovative workplaces: sources of productivity and quality employment opportunities, CELEX:52011IE0543/HU forrás: <https://osha.europa.eu/hu/tools-and-resources/eu-osha-thesaurus/term/70270i> (2021.03.04.).

¹² Act LXXVI of 2014 on Scientific Research, Development and Innovation, § 3.

¹³ Oslo Manual 2018 Guidelines for Collecting, Reporting, and Using Data on Innovation, 4th Edition, p. 20.

certain tasks and processes, through which safe work without danger to health, sustainable employment, employee job satisfaction, active employee participation, and social dialogue have come to the fore, also contributes to the improvement of organisational performance, i.e., to the growth of a company's economic power. Of course, workplace innovation does not exclude the technical aspect; on the contrary, in the vast majority of cases, workplace innovation is implemented using technical-technological-digital possibilities. The “smart workplace” is based on complex digitisation and analytical activities, complemented by proactive security strategies.

II. WORKPLACE INNOVATION IN PRACTICE

As discussed above, workplace innovation is a complex phenomenon preceded by serious managerial decisions. Advances in information technology have made it necessary to rethink work environments. In order for an organisation to maintain its competitiveness and operational efficiency, it must exploit the potential of technological development. Thanks to digitisation solutions, faster, more transparent decisions can be made while work becomes easier and more efficient, thus improving the performance of the organisation and increasing productivity, a straight path to better success. However, in my view, the biggest advantage of workplace innovations is that, in addition to refining and clarifying individual processes and shortening their time to completion, the utilisation and development of human competencies becomes more efficient. By applying the opportunities provided by technological achievements, quicker management decisions can be made, work becomes easier, and cooperation becomes more efficient.

The primary tools for workplace innovation are technical IT solutions. In addition to stand-alone applications and artificial intelligence, these digital solutions also include complex process automation. We can automate manual work, making the process faster and error-free. Given that the content and information needed to do digital work are mostly available anytime and anywhere, cooperation among a given group can be improved, in addition to reducing the possibility of error and supporting quality assurance with verifiable processes. Most businesses, regardless of their size, have targeted the digital future relative to their capabilities – with digital work, artificial intelligence, and even cloud-based solutions gaining ground.

Digital tools (technical IT solutions) used by organisations have numerous advantages: they allow teleworking or working from home;¹⁴ and they also allow remote workers to work together, further increasing their efficiency. An optimised, well-designed IT

¹⁴ See my previous study on teleworking and home-office work: RICZU Zsófia (2020). Távmunka vagy Home-office? Távmunka szabályozása a magyar és török munkajogban, *Studia Iurisprudentiae Doctorandorum Miskolciensium* 2020(2). P. 133.

infrastructure tailored to an organisation's operations will simplify work, support a changing workplace, and adapt to future workforce requirements. But what does the term digital workplace mean, and why will it be one of the most significant buzzwords of our time? I will detail this, and the main legal issue related to it, in the following paragraphs.

1. DIGITAL WORKPLACES

The digital workplace is a broad concept if we consider every workplace where communication takes place via email or an application to be digital. The digital workplace includes virtually all the digital technology solutions that employees use in a workplace in the course of their work, so the broader concept can also include organisations that use a corporate intranet.

According to a survey conducted in 2017, 38% of people in Hungary have a negative view of automation and digital work,¹⁵ despite the fact that the use of the digital workplace, in addition to increasing work efficiency, contributes to simplifying the tasks of employees. As social distancing, the most optimal tool to reduce infection due to the pandemic, has become a primary consideration, more and more people are beginning to accept the inevitability of the digital workplace. In most workplaces, employees work both at the employer's premises and remotely, and these two jobs must work in sync to achieve business goals. To put it in the words of Tamás Laufer, "[t]oday, almost all workplaces are digital",¹⁶ given that people use at least one digital device at work, be it email communication or anything else. According to Deloitte Tech Trends 2021, workplace leaders are anxiously approaching digital workplace prospects. In terms of resilience, distractions and weak supervision can hamper cooperation, and a lack of social support can lead to high levels of employee dissatisfaction and replacement. In terms of relationship-building and integration, strong existing relationships tend to persist even after the transition to remote work, but weaker relationships are often degraded. It can be a challenge to nurture new relationships virtually and to help new employees get recruited and integrate. Concerning development and learning, it can be difficult for workers to develop and maintain the skills and professional networks needed to advance. Loss of spontaneity – unexpected and appropriate employee interactions that facilitate exploration and invention – can have a negative impact on innovation in the long run. The concerns listed are not unfounded, in my view; the lack of social interactions can really affect an employee's attitude to work and his or her ability to work in a team. Undoubtedly,

¹⁵ European Commission. Special Eurobarometer 460, Attitudes towards the impact of digitisation and automation on daily life 2017.

¹⁶ LAUFER Tamás (2015), IVSz Elnök: "Already today, almost all jobs are digital, but in a few years there will be virtually no jobs that do not require digital competencies, digital literacy." (at Parliament of the Information Society).

a digital-only workplace also fundamentally determines the strength of human relationships, so it is understandable that the majority of companies use a digital workplace in combination with localised work.

Nevertheless, I believe that the digital workplace can be a tool for efficiency. It attracts a young, talented, ambitious, and agile workforce, as they can also work more flexibly and telework through digital tools, which are a key element in the lives of the youngest generations. According to the survey, due to the use of social media, employee satisfaction – which is a key element of effective work performance – has also increased. With regard to the younger generation, the emphasis on communication channels is no longer shifting to the use of e-mail, but to instant chat.¹⁷

The introduction and success of digital jobs are preceded by a myriad of thoughtful leadership decisions. Although many companies were forced to use digital devices and teleworking or home-office work during the events of 2020, complex organisational procedures for teleworking have already developed over the past year. In order for this type of work to take place, some significant conditions need to be met. The most crucial of the “pillars” of the digital workplace is maintaining communication, not only among workers but also between management and workers. It is advisable to provide the possibility of communication through several channels: in addition to a corporate e-mail account, to use a work chat or, if necessary, Skype. Using a corporate intranet, information publications, digital magazines, and the BYOD (Bring Your Own Device) approach are also widespread across borders.¹⁸ The latter is expected to reach nearly \$367 billion by 2022. For perspective, the industry was valued at \$30 billion in 2014, and the expected compound annual growth rate (CAGR) between now and 2022 is 15 percent.¹⁹ According to a Dell survey, 61% of Generation Y and 50% of workers over the age of 30 believe that technical devices used in their personal lives are more efficient and effective than those used at work; 60% use smartphones for work purposes, while 31% desire one.²⁰ BYOD-friendly

¹⁷ Deloitte Insights – Tech Trends 2021. Trend 7. Rebooting Digital workplace 117.

¹⁸ BYOD means “bring your own device”. It is an IT policy that allows and sometimes encourages employees to access corporate data and systems by using personal mobile devices such as smartphones, tablets, and laptops. <https://www.ibm.com/services/digital-workplace/byod> (2021.03.08).

¹⁹ JOHANSSON, Anna: Growth of BYOD proves it's no longer an optional strategy, <https://betanews.com/2017/05/12/growth-of-byod-proves-its-no-longer-an-optional-strategy/> (2021.03.08).

²⁰ Dell – IMR Position Paper Consumerization: What is in Store for IT, p. 4, https://i.dell.com/sites/content/business/solutions/whitepapers/it/Documents/intel-imr-consumerization-wp_it.pdf. (2021.03.08).

companies save \$350 a year per employee; using portable devices at work saves employees 81 minutes per week²¹ while increasing productivity by 34%.²²

In addition to the selection of applications to be used in the course of work, special attention must be paid to the development of an appropriate corporate infrastructure. In most cases, this covers a corporate network and server running 24/7 that employees can connect to anytime, from anywhere. However, working in this format can compromise corporate data security, so it is essential to ensure the protection of such systems against computer viruses, in accordance with the current EU GDPR regulations, and to pay special attention to measures against phishing activities. In addition to the use of anti-virus applications, certain restrictions on workers' access rights may also contribute to protection; regular surveys of employees' use of the system in both the physical and digital space are also warranted to ensure that they are aware of their rights and obligations with respect to the company's digital assets and data.

In connection with the research for this chapter, I prepared two questionnaires about digital work: one which aims at the desired satisfaction and the other which examines the attitude and willingness of employers towards working remotely. Questionnaires prepared through the Survio system were available until 12.03.2021.²³ I should note, however, that these questionnaires are not representative because of time constraints and completion rates: the employee questionnaire consists of 32 people (the majority of respondents work in the telecommunications, banking, finance, public administration, education, and chemical sectors, with a minority in production), while the employer questionnaire was completed by significantly fewer people, only 12.

In any case, it is clear that employees experience the vast majority of workplaces using a wide range of digital tools to enable digital work and teleworking. The majority of respondents are fully equipped with digital devices in their workplace, and a small number of them have only limited access to digital devices there. Employee responses support the hybrid work system mentioned earlier: the majority of respondents work at specific workplaces on specific days while maintaining a pandemic-induced distance, while on other days of the week they telework or work via home office. Regarding teamwork, the responses are significantly divided, but the majority reflect that collaboration has not been

²¹ 3 Big risks of BYOD, <https://dmstechnology.com/3-big-risks-of-byod/> (2021.03.07.).

²² Frost and Sullivan White Paper – *The Smartphone Productivity Effect, Quantifying the Productivity Gains of Smartphones in the Enterprise*, p. 3. https://image-us.samsung.com/SamsungUS/samsungbusiness/short-form/the-smartphone-productivity-effect/20170727/WP_Smartphone_Productivity_AUG16FS_2.pdf (2021.03.05.).

²³ Last access to the questionnaires: 2021.03.12.

<https://www.survio.com/survey/d/A8G6H1Y6F1P4I7I8D> and

<https://www.survio.com/survey/d/L6A6M4E7L7A1I5W9X>.

hindered by telecommuting. The responses also show that workers see the greatest benefit of teleworking as saving time traveling to work. It is important for a small number of respondents to be able to take care of their child while working. Though few feel their performance improves when they work outside the workplace, the majority of respondents feel comfortable working at home. Although the response rates are almost the same, it can be seen that the emphasis is on the use of internal corporate chats, even though telephone and email still play a significant role in workplace communication. During the evaluation of the questionnaire, it became clear that the majority of employees are satisfied with the circumstances of their current job, although a wide range of responses correspond to suggestions for change and confounding factors: lack of staff, reduction of bureaucracy, lack of face-to-face meetings, feedback, etc.

The analysis of the responses to the management questionnaire, albeit few were completed, also reflects interesting proportions. Managers still believe the “employees work when I see them” principle, but, at the same time, there is a growing trend towards a more flexible managerial attitude, given that employees perform the tasks entrusted to them to the maximum, even when working remotely. It also turned out that while the majority of employers saw the need for teleworking as essential during the pandemic, they did not support the digital work format: a lack of resources was cited as the reason for this. In workplaces where home-office work was preferred, employee performance increased significantly. Surprisingly little information is available on employee collaboration and teamwork, as the majority of respondents were neutral on this issue. Analysis of the questionnaire also revealed that managers still prefer telephone contact to corporate chats.

The questionnaire findings show that opinions about digital work and teleworking are still not uniform. However, we can say that the digital workplace is no longer just an unattainable foreseen phenomenon, as digital tools have been and are already used for office work, and they can increase accuracy, speed up processes, and ensure work that is more flexible.

1.1. Legal issues related to digital jobs

Digitisation is present in our everyday lives, including in industrial relations and in employment activities. Digital technology innovations intertwine labour activities, and there have been studies of labour law and digital technology at the national and international levels.²⁴ These studies have addressed a number of important issues, but the current question is whether the digital workplace will be the workplace of the future. Are domestic and international labour regulations prepared for this? Due to the pandemic, many elements of our lives, from our social relationships to work, have moved into the digital space. As Zsófia Bíró put it excellently: “[t]he nature of the legal relationship is questionable because electronic development is well ahead of its own legal regulation. As in all areas of law, there is a lack of regulation in labour law. Although the New Hungarian Labour Code and some previous European Union regulations seek to provide direction, a review of these can only show that that in addition to some frameworks, these sources of law do not contain rules engraved in stone; rather, they express and call for the introduction of a modern legal system that would adapt and evolve with the labour law of the digital world.”²⁵ Due to the technological explosion and the emergence of increased expectations from employers (companies), the issue of the adaptation of labour law has also come to the fore, both at the domestic and international levels. The unified labour law regulation can be replaced by related legislation and legal interpretations being used today.

With the entry of Generation Y into the workforce, creative labour comes to the fore – not necessarily covering only artistic activities but aiming to create an intellectual product. It is a knowledge-based process in which the person doing the work engages in intellectual rather than physical production. Given that, as a result of the development of digital technology, work as a unit is changing in time and space,²⁶ nowadays, it can be observed that labour itself is primarily related to the task and activity to be performed, while space and time are only secondary factors. Nevertheless, at the domestic level, employers still almost spasmodically adhere to established working hours to a far lesser degree than the determined place of work. With the advent of digital jobs, the issue of working hours is becoming more important. Recording workers’ time is becoming more prominent in digital workplaces. Employers have the authority to keep and check the register; in the case of

²⁴ KÁRTYÁS Gábor – RÉPÁ CZKI Rita – TAKÁCS Gábor (2020): A munkajog digitalizálása, Kutatási zárótanulmány 2016.; STRIHÓ Katalin: Munkajog a digitalizáció világában; LIPTÁK Katalin – MÉLYPATAKI Gábor (2020): Munkajogi és gazdasági kihívások a jövő munkaerőpiacán; J. BERG – M.FURRER – E. HARMON – U.RANI – M. S. SILBERMAN (2018): Digital labour platforms and the future of work Towards decent work in the online world.

²⁵ BÍRÓ Zsófia: A digitális világ munkajogi kérdései
http://faydigitaliskonyvtar.hu/uploads/biro_zsofia_digitalis_vilag_munkajogi_tdk.pdf (2021.03.02.).

²⁶ FRESE, Michael (2000): The Changing Nature of Work. In: Chmiel, N. (Ed.) Introduction to Work and Organizational Psychology. Blackwell Publishers Ltd., Oxford, pp. 425–439.

remote work, it is easier to check the beginning and end of workers' logged hours, as all the technical conditions for this are due to mostly digital work.

In the case of teleworking (which presupposes the use of digital devices and therefore digital work), there are also classic rights on the part of the employer: the right to command, direct, and control. FMM-PM Directive 7001/2005 (MK 170), regarding the aspects to consider when classifying the contracts on which work is based, establishes the hierarchical relationship between the primary qualification marking an employment relationship: "[t]here is typically a strict relationship of subordination between the employee and the employer, from which follows the unilateral management and instruction authority of the employer". The directive details the employer's right to inspect and direct a secondary rating. In an employment relationship, the employer may comprehensively check the execution of an instruction; however, the employer's right of control during such qualification is not an exclusive aspect.²⁷ Here, the power of control is complete; however, the rules of Act I of 2012 must be taken into account when exercising the right of control:

11/A. § (1) *The employee can be monitored for his / her employment-related behaviour. As part of this, the employer may also use a technical device, informing the employee in writing in advance.*

(2) The employee may use the information technology or computer equipment provided by the employer for the performance of the work (hereinafter: computer equipment) - unless otherwise agreed - only for fulfilling the employment relationship.

(3) During the inspection of the employer, employer can look at the employment-related data stored on the computer device used for the performance of the employment relationship.

(4) For the right to control under paragraph 3 the data necessary to verify compliance with the restriction set out in paragraph 2 shall be deemed employment-related data.

(5) Paragraph 3 shall apply if, by agreement between the parties, the employee uses his/her own computer equipment to perform the employment relationship.²⁸

In the field of teleworking and the employment relationship, the Hungarian Labour Code explains in more detail the regulations on employer control; however, it is an important

²⁷ 7001/2005. (MK 170.) FMM-PM Directive on the considerations to be taken into account when classifying the contracts on which the work is based.

²⁸ Section 11 / A of Act I of 2012.

condition that telework must be agreed upon in the contract. Thus, it is also necessary to inform the employee about any related employer control. In the case of a contractor-employment relationship, the employer also determines the method of control and, in the case of an inspection of the premises where the work is carried out, the minimum period between its notification and its commencement.²⁹ Although there are no specific regulations governing digital work in the home office and during teleworking (previously, separate home-office regulations were planned),³⁰ I do not consider it ethical to deviate from the employee rights enshrined in the above two forms of employment: *“the inspection shall not impose a disproportionate burden on the employee or on any other person using the property where the work is carried out”*.³¹ Based on the above, in practice, one of the main rights of the employer is the right of control, which does not mean absolute, unlimited power. Control has become simpler with the advent of digital work; at the same time, when carrying out a computer-based audit, it must be borne in mind that the process involves data management and, therefore, greater attention must be paid to compliance with data protection and privacy law. Still, the protection of the employer’s legitimate interest may provide a legal basis for the inspection.

The employee performs his or her work digitally, remotely, but the employer can keep their employee under control based on the interval between an email sent and a response to it or instruct the employee to be available at all times. The question is whether it is realistic for an employer to expect their employee to be permanently available by referring to availability in the online space, even outside working hours. In most cases, this appears as an implicit expectation on the employer’s side, and, as Tamás Prugberger points out, pressures from increasing global competition can put workers at a disadvantage.³² This tacit expectation of continuous availability simultaneously runs counter to the requirement of equity. As Jácint Ferencz Szilárd points out, there may be events of special appreciation in which this expected availability obligation may still be equitable.³³ In the latter case, the principle of proportionality cannot be disregarded. I believe that standby work in such cases can provide a temporary solution to this tacit expectation on the part of the employer; in this case, of course, the work actually done will be judged as overtime.

²⁹ Act I of 2012 196, § 200.

³⁰ According to the competent State Secretariat, the regulation was completed on the basis of the agreed principles, but the exact reasons for the delay in adoption are not known. The Secretary-General considers that the private sector should be coordinated in some way with the public sector, given the different nature of home-office work, but it may be in the background due to legislative dumping. In: Valamiért elakadt a home-office törvény <https://infostart.hu/gazdasag/2020/11/03/valamiert-elakadt-a-home-office-torveny> (2021.03.11.).

³¹ Section 196 (4) of Act I of 2012.

³² PRUGBERGER Tamás (2005.) A munkajog kialakulása és fejlődése a gazdaságpszichológiai folyamatok tükrében. *Competitio*, 4. (1) pp. 18–19.

³³ FERENCZ Jácint Szilárd (2019.) Az átalakuló munkajog változásának jellege – A 24/7 jogi kihívásai in: Glavanits Judit : *A gazdasági jogalkotás aktuális kihívásai*. Dialóg-Campus Kiadó, Budapest-Pécs, p. 43.

Another solution to avoid tacit availability, based on the example of French workers, is the “right to disconnect”,³⁴ that is, workers completely shun being available outside working hours, thus avoiding possible exploitation and burn-out syndrome.

In summary, the employer’s power of control can be exercised within strict limits, during which special attention must be paid to privacy rights and data protection. In the event of a dispute, the burden of proof lies with the employer that the audit activity was carried out exclusively in the context of the employment relationship and that the audit was necessary and proportionate. I think it is advisable to return to the principles of the Labour Code in order to avoid disputes over this, namely the principles of good faith and fairness, according to which the subjects of an employment relationship are obliged to act in accordance with the principle of good faith in connection with work, as well as the principle of the duty to cooperate.³⁵

Another important element of digital workplaces, in addition to the definition of working time, is the way in which electronic legal declarations are made, the transmission of electronic documents. Given that I have already touched on the topic in my previous study,³⁶ since Zsófia Bíró has also described it in detail during her research,³⁷ and due to the complexity and scope of the topic, I will not further explore it here. Berke & Kiss have also set out the circumstances of the disclosure of electronic documents and the presumption of service in full in their commentary on the law.³⁸ For the above reasons, and because of the elaborateness and diversity of the topic of digital jobs, not ignoring the legal issues, I shall touch on sustainability issues in relation to digital jobs in the next section.

2. SUSTAINABLE JOBS

Climate change is discussed on television almost every day, and the issue of global warming is still the subject of much debate among researchers.³⁹ Generation Y can make more environmentally conscious choices in addition to being able to work in the digital workplace, which can be applied not only in one’s private life but also while working. Eco-

³⁴AVOGARO, Matteo – Right to disconnect: french and italian proposals for a global issue <https://doi.org/10.26843/mestradodireito.v4i3.164> (2021.02.27.)

³⁵ Act I of 2012, Chapter I, Introductory Provisions, p. 4: General Conduct Requirements.

³⁶RICZU Zsófia (2020). A munka digitalizálásának és a robotika bevezetésének munkajogi és foglalkoztatáspolitikai következményei *Miskolci Jogtudó*, 2020.(1), pp. 116–125.

³⁷BÍRÓ Zsófia. A digitális világ munkajogi kérdései

http://faydigitaliskönyvtar.hu/uploads/biro_zsafia_digitalis_vilag_munkajogi_tdk.pdf (2021.03.02.).

³⁸BERKE Gyula – KISS György (2012). *Kommentár a munka törvénykönyvéhez*. CompLex Kiadó, Budapest

³⁹MIKA János (2018.)-Az éghajlatváltozás aktuális globális és hazai fejleményei – in: *Földrajzi Tanulmányok*, ISBN: 978-963-508-897-3 19.

friendly solutions can bring us one-step closer to a sustainable future – if not reverse it – but perhaps we can slow down the environmental damage of the past. This change, these steps, will be reflected at both the individual and community level. They start with “greener decisions”. The question arises: if we use selective waste collection in our home, why not apply it in the workplace?

Nowadays, we have the opportunity to use labour tools to reduce our ecological footprint. I believe that the introduction of digital jobs will make a big contribution to this. By using a digital workplace, telecommuting, and home-office, organisations do more than just save money by not having to rent or maintain office space; in addition, it reduces pollution by eliminating the use of cars and public transport for commuting. In addition to the above, digital documents have the biggest role to play: not only can we produce less rubbish, but we can also reduce deforestation.

Fortunately, almost every work email contains the following sentence at the end: “Think before printing!” With the spread of digital jobs, the amount of printing can be reduced; it is not necessary to print individual e-mails and documents, as these documents can be stored in electronic format. To further support this, WWF and the advertising agency Jung von Matt in Hamburg have launched an initiative to contribute to halting the growing rate of deforestation worldwide and eliminating unnecessary printing. A new file format has been developed to create a virtually non-printable PDF file. The free downloadable software adds a “Save as WWF” item on the computer menu bar. We can consider which files on our machine we do not want to print; and, by clicking on the “Save as WWF” button, our document will be saved in non-printable form. With this print-blocking file format, they want to encourage users to use paper more carefully.⁴⁰

The above examples also highlight that an environmentally conscious, sustainable workplace begins with the attitude of management and employees, to which the creation of a digital workplace can also make a significant contribution.

CONCLUSIONS

It can be seen that digital work and automation are already reshaping the labour market, as evidenced by a McKinsey Global Institute forecast, according to which automation transforms rather than replaces or eliminates human labour. For 6 out of 10 jobs, one third of the tasks are affected by automation.⁴¹ It also shows that digitisation

⁴⁰ WWF. *Új fájl formátum az erdők megmentéséért*, <https://wwf.hu/archiv/uj-fajl-formatum-az-erdok-megmenteseert> (2021.02.28.).

⁴¹ McKinsey and Company. *Átalakuló munkahelyek – Az automatizálás hatása Magyarországon* <https://www.mckinsey.com/-/media/McKinsey/Locations/Europe%20and%20Middle%20East/Hungary/>

is not a question but an inevitable, indispensable process. Even without the questionnaire results, it seems that history repeats itself: just as the innovations of previous industrial revolutions brought renewal to human life, so the labour market is expected to adapt to more innovations. What will be the benefits of these changes and adaptations? It largely depends on the reaction time of decision-makers. Hilda Tóth also asks further questions: how and to what extent does the law, especially labour law, affect innovation? Does labour law support creativity within a given company? To what extent does the law help to secure and resolve the rights related to inventions (property rights, exploitation rights)?⁴² In addition, a number of issues may arise during practical implementation, both in legal and in other areas, raising the possibility for additional research.

Nevertheless, what will tomorrow bring? Jobs are digitising, an indisputable area for study. I believe that tomorrow's workplace will no longer be defined by a modern office building, nor by a dress code; rather, the employees' values. This will be accompanied by the absence of paper and printing in the name of full digitisation, flexible work hours, and sustainability. High-performance servers will replace their archives, and human labour will be used much more to perform creative tasks. The question is: how do companies see the situation after the COVID crisis? In my view, an examination of this deserves a separate discussion.

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CHAPTER 11.

LABOUR LAW AND EMPLOYMENT POLICY CHALLENGES OF ROBOTIZATION

Gábor Mélypataki*

The labour market and labour law regulations are being affected by many elements at the same time. In the following chapter, I examine the use of robots in the workplace and in the labour market. However, the issue of robotization needs to be paralleled with the pandemic. One of the medium-term effects of the pandemic is the greater use of robotic labour. That is why I set out to examine two related issues. One is the examination of labour market issues, and the other is the joint work of cobots and human labour in the light of labour law regulations.

Keywords: *robot, labour law, cobot, pandemic, labour market.*

1. INTRODUCTION

New technologies are changing classic relationships. In this field, the technological changes and the protection measures due to COVID-19 point to the same direction. Technological changes primarily strive for the replacement of human manpower, and the measures due to the virus primarily encourage people to stay at home. It is possible that a conditional reflex will develop in people until the disappearance of the virus, if it ever does disappear, and this will be related to the increase of personal distance (in space and time as well).

One of these technologies is robotization and automation. Most industrial sectors are significantly building on robot work. Nowadays, the functions of robots are only auxiliary ones. Robots function as tools that perform certain processes alone in such a way that makes employees' tasks easier. The role of robots will be more and more important in the economic system. In my opinion, robotized working activities will be extended to a greater part of the labour market. Using robots is primarily typical for industrial sectors in order to help or replace physical work. Robots are changing not only the relationship between the classic employee and employer, but labour relations as a whole and the labour market, as well. One main effect of robotization and automation will be collective reductions. This process can be expected even if those analyses about robotization being used for the expansion of employment turn out to be true (Jakab & Tóth, 2020).

Some research shows that robotization and automation will affect a significant proportion of jobs (Nábelek & Vági, 2019). Of course, the level of development in each country will

also influence the extent of this impact. A significant proportion of jobs will be negatively affected in the short term (Mélypataki & Lipták, 2020). More positive labour market changes can be expected along the medium- and long-term projections. The use of robots is becoming more widespread. More and more workers are being trained, mainly in physical jobs. The trends also point to the need to develop new competences to help reposition the human workforce.

It is also important to highlight the growing importance of the so-called “dark factory” as a next step in automation. But what is a “dark factory”? First, we need to look at the concept. The term refers to a fully automated industrial production site where production is carried out without direct human intervention. The entire production process, from the delivery of raw materials to the factory to the delivery of the finished product, is carried out by fully automated machines. An example of this solution is the Chinese e-commerce giant JD.com. In 2018, JD.com’s “dark warehouse” in Shanghai began operating, where 20 industrial robots pick, pack and prepare goods for delivery. There is no human supervision at all. The plant covers 3,700 square metres, the equivalent of more than half a football pitch. To run such a huge warehouse normally would require no less than five hundred people. Instead, only five technicians can handle the entire task (CBINSIGHTS, 2019).

The next several years will be a period of short-term economic recovery from the pandemic, and the automation and stabilization of working processes could serve as tools in this manner. There will be a new induction process leading to widespread robotization (from manufacturing to agriculture, from retail to the service sector); this will require further rules in order to minimize the social risks related to the transformation of workspaces (Putilo, et al., 2020). It also should be added that the economic transformation will be mainly more favourable for employers in the short and perhaps medium term, but it will be unfavourable for employees.¹

I would like to analyse the main effects of how robotization influences labour relations. I will analyse not only the changes in the labour market but also the relationship between employers and employees. Using robots is a standard practice today. We could not even imagine how many purposes robots are used for by certain companies. Some use them as a supplementary workforce besides human manpower. And other employers use them especially for controlling purposes (Dzieza, 2020). The combination of technologies has developed a lot in recent periods. The COVID-19 pandemic will probably strengthen this process. The lack of employees and the restriction of human relationships based on

¹ Of course, the image is not only black and white. Statements from the main text should be nuanced only on the level of footnotes at this time, as robotization and automation represent a solution only for those employers who might save up enough capital to start or finish these processes. Most small and medium-sized businesses will fall behind in the short term. Additionally, jobs’ replacement or transformation will decide whether AI or the application of robotization would be more efficient.

voluntary and legal measures due to the coronavirus pandemic are boosting the demand for service robots in China. According to some studies, this current situation could potentially boost this sector, which has not been very strong a market perspective (Jakab & Tóth, 2020).

Because of the recession caused by COVID-19, automation will probably continue to have an effect, as some of the jobs lost due to the virus will never return and companies can transform their operation to be supported by machines rather than humans. The economic repercussions of the pandemic cannot be estimated at this time, but great losses can be predicted even without concrete numbers. The virus has attacked the two most important yet, in some ways, weakest elements of our present economy. One is the globalized economy, based on various components or raw materials are imported from overseas because of their cost-effectiveness compared with domestic sources that are often a bit more expensive. The other such important but also weak element is human manpower. As the virus and its exact behaviour are still unknown, we know only that it can lead to death relatively easily in case of certain co-morbidities and risk factors. Accordingly, governments have ordained restrictive measures partly in order to protect employees. This is also important from an economic standpoint, since in factories where the level of automation is greater it is easier to solve the problem of lost manpower. Another reason for using robots has also been strengthened over the course of the pandemic, namely the development of vaccines in the health sector. And, because of the above-mentioned reasons, the replacement of physicians' and nurses' tasks could also be a goal in the future; moreover, it will be so.

In this current situation, personal space is being transferred to the digital space. The demand for digitalization is exponentially increasing, and the increase of robots' significance will be one of its branches. In my opinion, some prognoses about automation (Manyika, et al., 2017) will become invalid, as a lot of companies would like to robotize some or all of their working processes. As it has been mentioned, human manpower is one of the weakest elements of the developing globalized market (Deloitte, 2020). Its replacement by machines has been in process for decades now, and this will only be accelerated by the current situation.

Two significant directions within the automation of certain jobs could be distinguished. In one case, using cooperative robots will strengthen the systems created by the harmonization of mechanic and human manpower within the short term. In the other case, the aim will be real automation to create such systems that closed working processes are possible without humans. The first process will primarily influence labour law issues; the second one will primarily influence processes on the labour market. On this basis, I would like to analyse the legal and social frames of the automation of work through the lens of one of the greatest and most influencing events of our contemporary lives.

2. PROBLEMS WITH USING COLLABORATIVE ROBOTS (COBOTS)

More effects than those of robotics on labour law and the labour market can be observed. Two perspectives should be analysed here: one is robotics related to the “effect replacement” of human manpower, while the other is related to collaboration with robots or other cooperative working processes. Examining both is important (Zackova, 2017). They will be covered in the frames of this study, as far as it is possible. Using robots as fellow workers brings up several questions on legal, economic and work safety grounds, as well. The following are the most important aspects of these questions:

- - The most important legal and regulatory aspects of work and the safety of work; also the appearance of new psycho-social risks.
- - The relationship between employees and changes in their working hours.
- - Employees have the right to a private life, especially regarding “robotic” control, as its problems should also be managed.
- - Intellectual property rights / patent laws in cases where an employee “trains” a robot.
- - The special perspective of trade secrets (Sánchez-Uán Azana & Grau Ruiz, 2020).

All the above-mentioned aspects should be interpreted in a wider context. To really deal with them, the basic features of using robots should be examined at first. As Nóra Jakab also highlights, robots have significance from the perspective of labour law when they physically move in the same space as humans in a workplace. These robots are called collaborative robots (for short: cobots). Collaborative robots have been developed to be able to perform defined tasks with humans in the same working space at the same time (Jakab & Tóth, 2020). Present-day industrial robots are primarily the property of companies fighting against the requirements of capital-intensive manufacturing at great volumes. For example, car manufacturing, electronics and the retail sale of electronics all account for 80% of industrial robots (Hägele, et al., 2016). However, their application is likely to move to less capital-intensive sectors, as well. The possession of this labour power will have more and more relevance in the future. As Freeman emphasizes: *“Robotization, like past technological changes, can be a very good thing, relieving the workload of humans while helping overcome the many challenges the world faces”* (Freeman, 2016). Nevertheless, it can have effects on humans in shared societies. In this scenario, the owners of the robots are on one side and the employees competing with these robots are on the other. This in itself is neither good nor bad at the moment. However, it carries a lot of risks for the human workforce in the short term. However, the legislator is not

prepared to answer such questions. In the short term, excessive robotization can have a decisively negative impact on workers.

Another point of consideration is the relationship and collaboration between cobots and human workers, which should be examined in the light of Freeman's statements. Collaborative robots and employees are not just cooperative mates; they are also competitors, from a certain point of view. These two characteristics are the colour and backhand of this relation system. The collaboration aspect is quite important from a labour law perspective, while competition is mainly important from the point of view of employment policy.

From the perspective of labour law, using cobots presents an extended version of the obligation of collaboration. Collaborations between humans and robots make a number of combinations possible, in which the typical strengths of robots are matched with human strengths and features. From an industrial standpoint, robots' great tenacity, workload capacity and precision are all important strengths, and they tolerate repetitive processes well. However, there are some strengths of human manpower that cannot be compared to any machines, for example, adaptability: the ability to adapt to new production tasks, the presence of skills for creative problem solving and the ability to react in unpredictable situations (Hägele, et al., 2016). It should be added that, apart from the fact that cobots are fast, precise and powerful, however, they simply do their jobs blindly. The basic condition of their operation is precise timing because these robots, even if they can see, only do it in two dimensions. This can cause systemic instability and result in humans being required to perform some monotonous, routine tasks. These employees perform tasks between two robotized phases or the assembly at the end of a process. So, according to these opinions, robotization cannot replace the preformation of monotonous routine tasks on such a level (Ford, 2015). The virus situation points to exactly this: although robots perform their own subtasks, humans are necessary as a mediating medium. It is still a fact, even now, that human manpower as a mediating medium is more efficient than in a less automatized factory unit. In my opinion, further relapse will be less pronounced in those companies where employees and cobots can work together cooperatively. Nóra Jakab especially highlights that applying work safety rules among human and robot colleagues is a key issue. From one side, the main question is whether using robots can be considered a dangerous business (Jakab & Tóth, 2020). I agree with Réka Pusztahelyi in this regard, as the application potential of dangerous manufactural responsibility serving the technological improvement is significant (Pusztahelyi, 2019). Artificial Intelligence (AI) denotes particularly increased risk; by way of analogy, in my opinion, using cobots also brings about the strict liability of risk-based liability rules – outlined in a document titled 'Artificial Intelligence 4 Europe'. This risk-based liability is a very important part of the liability system in civil codes at national and international levels. We can also speak about special rules for robots, connected to cars, factories, and other dangerous activities, as well.

Why is it important to highlight measures referring to AI when talking about robots? This is significant because, as Nóra Jakab also points out, according to the resolution of the European Parliament, collaborative robots will have artificial intelligence in the future ideas: they will make autonomous decisions, learn and adapt. These robots should be treated as “humans” in collaborative factories and workplaces in order to manage the arising responsibility issues (Jakab & Tóth, 2020).

So, it is important to underline that legal regulatory frameworks on their own are not enough. The collaboration of cobots and human manpower implies numerous dangerous situations. One cause of the basic problem is that a robotized system can only follow a given program. Such a program defines clear commands and goals. A robot is not able to question or evaluate the quality of these commands because of its nature and characteristics. So, the system seems to be a perfectly compliant one. It does not account for deliberation, nor the nature of human conditions. A system of human workers is an imperfect one from the perspective of robots, since it can overwrite and revalue the received instructions if necessary, and the workers will perform them less precisely compared to machines. A perfect system will always find mistakes in the imperfect system it is compared with. This needs to be examined from two sides. One has to do with robotized technology being used to control employees’ work, and the other is the creation of a structure for work safety rules as mentioned above. The former simply takes advantage of employees, in case the technology is regarded and raised above human employees by the employer. Based on the above, a robot is a despot boss when a perfect system meets an imperfect one. Josh Dzieza explains some examples of when these relations are realized: humans cannot sustain the intensive work required by robots without damage to their health; employees become stressed due to the differences between systems, and many of them suffer from burn-out in the short term (Dzieza, 2020). This significantly relates to the latter side of the problem, the issue of industrial safety. Creating conditions for safe work without endangering health is the employer’s obligation. But how can it be realized in a system where the employer delegates control mainly to robots? One of the best-known recent examples is the case of Amazon’s HR robot, which has brought up several questions that should be answered on both legal and ethical grounds. Nevertheless, it will be the central question of great debates whether machines should be given such competencies and skills by which they could decide over human fates. This question has quite a strong moral-philosophical embeddedness. Are men able, or is it necessary, to emancipate technologies made by them and acknowledge them as equal (Mélypataki, 2020)?

Whatever the answer may be in the end, it should be highlighted that an intelligent factory does not necessarily mean a “dark” factory. Humans are expected to remain key figures in the processes taking place. Still, intelligent factories may cause changes in the operations and IT/OT organizations that will result in the redistribution of roles in order to support new processes and abilities (CRO Forum, 2015). As I have mentioned earlier,

some roles will become unnecessary as they are replaced by robotics (physical and logical), the automation of the process and AI (Burke, et al., 2017).

Based on the abovementioned facts, in my opinion, the system of legal regulatory framework is not sufficient for the creation of rules among cobots and human workers. The role of applying different standards has at least such importance, and its need was highlighted in Point 22 of a recommendation made by the European Parliament (European Parliament, 2015). According to the recommendation, the issues of creating standards and interoperability have key importance considering the development of future competition in the field of technologies related to AI and robotics. The European Parliament warns the Commission to continue its work on the international harmonization of technical standards in cooperation with the International Organization for Standardization (ISO) in order to promote innovation, avoid internal market fragmentation and create minimal safety standards for the working environment. The Recommendation emphasizes the importance of legitimate engineering decryption and open standards in order to maximize the value of innovation and ensure communication between robots (European Parliament, 2015). The role of standardization by testing robots in real life situations is basically important in order to estimate possible risks and avoid them (European Parliament, 2015). ISO 12100 should be highlighted among the important standards, as it deals with the general protection and risk evaluation rules for A-type standards connected to machines; additionally, ISO 13849 contains safety rules for B-type standards that regulate control design and systems with safety functions; ISO 13855 concerns protection distances; and ISO 10218 is about the system integration of the safety of industrial robots and robots in C-type standards (Hägele, et al., 2016).

ISO 10218-1: 2011 contains specific requirements about human-robot collaboration. Four groups are defined as having collaboration operations during which humans cooperate with a robot working in automatic operational mode (Hägele, et al., 2016). The first mode is “stop on access with automatic task resumption”, according to which the robot stops if a human worker can access to the collaboration field which is still controlled by the robot. The second one is “hand-guiding”, which mainly means manual control. According to its content, this kind of operation involves a direct physical interaction between the human and the robot, on the basis of which the human has total control over the robot’s movement. The third one, “separation and speed reduction”, builds on the duality of distance and speed. Such a system actively responds to the relative speed difference between worker and robot as well as their physical distance. With a human present, the robot should maintain a safe combination of speed and distance to be able to stop all movements and contact which could endanger him. The fourth, “monitoring and power and force limiting”, means that the robot’s mechanical hazard should decrease sufficiently during the working process to make direct, physical interaction between human and robot possible without further security control. This can be reached by the appropriate limitation of collision. Through the robotic system’s design, in case of such contact between man

and robot, the biomechanical tolerance values cannot exceed a certain degree of force (Hägele, et al., 2016).

However, standards have not been created only in connection with using robots, but work in general. In my opinion, special attention should be given to general work safety measures and standards during cooperative collaboration. Ensuring conditions for a safe work environment without detrimental health effects is the employer's obligation. On one hand, this is necessary when applying the above-mentioned standards and the collaboration of cobots and human manpower; on the other hand, general work safety measures should be authorized continuously. The new health and work safety standard called ISO 45001, based on standard BS OHSAS 18001 of the British Standards Institution, provides help in this regard. The British standard is already being used by several European employers. During its development, the new standard has changed significantly, especially in terms of management and employee participation. But it should be mentioned here that while certain technical standards have some legal power, these kinds of standards will not provide an appropriate guarantee for this (ETUC, 2018). The standard uses the term 'employee' in a quite a broad sense of its meaning. Everybody is an employee who performs a task or working activity under the control of the organization; therefore, part-time employees, the self-employed people and contracted employees may be included. All employees, including directors, are included in this definition (ETUC, 2018). Article 6 of the standard deals with design, as well. This obliges the organization to determine the risks both in occupational health and work safety and in the management system. It also requires having a proactive system to recognize dangers. It says clearly that workload, working hours, workplace harassment should be taken into account during the organization of work (ETUC, 2018). In connection with this, Article 8 of the standard arranges the conditions for operation, based on which an employer should operate the system to prevent dangers and decrease risks. These should be performed based on the following hierarchy, according to the method defined by the standard: removal of danger, replacement, technical protection and reorganization of work, administrative control (including training) and, finally, appropriate individual protective gear (ETUC, 2018).

It can be seen from the above that using cobots and any other kind of robot during working processes requires the application of appropriate safety rules, but there is also a question raised that I would like to use in a slightly different context. Is it still the law's task to create security in the workplace, or is that over now, meaning it should rather deal with the protection of income and employability (Jakab & Tóth, 2020)? The harmonization of human and robotic power will have a long-term effect, as well. This relates to the labour market. The application of work safety rules and standards examines the effects of robots on work in a narrow context. In a broader context, its impact on the labour market should be analysed, which is also being given particular relevance by the current pandemic.

3. RELATIONS BETWEEN ROBOTS, COBOTS AND THE LABOUR MARKET

Using collaborative robots has and will significantly affect the labour market. Using robots will change working positions dramatically. This process could be compared to when guilds were replaced by manufacturers during the industrial revolution. The spread of the application of robotic power is completely changing the requirements for employees. There will be necessary competencies that are not currently possessed by most of them. An excellent demonstration of this was that a greater part of the employees were obliged to work from home in order to decelerate the spread of the virus, and home-schooling had to begin as soon as schools and universities were closed. The change-over was successful, but it did not happen completely or smoothly. This is particularly true in disadvantaged areas where children do not have access to online education. They will acquire the right competences, the ones needed to work together with robots, much later or not at all. A lack of competences often means a lack of adaptability (Hermann, 2020). These differences can significantly open social stratification, which demonstrates the differences between certain social layers. The situation of children without access to online learning is also made harder by the likelihood that their parents will become unemployed, and this will not help reduce the disparities. Most of these students and their parents live in disadvantaged areas where the lack of tools and infrastructure also obstructs learning and, thus, the achievement of the appropriate competencies. In the absence of such competencies, employees will not be qualified enough to take part in the above-mentioned machine-human labour collaboration, so their exclusion will be increased. Which are these new competencies that will be necessary in the new working positions (Köllő, 2021)? Such questions should be examined, even if one recommendation of the European Parliament obviously tries to mark some signposts in this regard. Research has highlighted that, according to the Recommendation, the main purpose for using robotics is the increase of human capacities and not their replacement. The European Parliament finds it important to underline that human control should be maintained throughout the whole process of developing robotics and Artificial Intelligence (Hajdú, 2017).

The widespread use of robots does not automatically lead to the substitution of manpower, but jobs requiring lower education in labour-intensive sectors will probably be more exposed to the danger of automation. A recommendation of the European Parliament highlights the trend according to which robotization may bring back production processes to the Union, as research has found that employment increases significantly faster among jobs using computers on a higher level (European Parliament, 2015). However, the recommendation does not mention the masses breaking away. Even though we can bring production back to the continent, there will still be layers breaking away that cannot join in this production (or can but just in a limited way) because of their lack of the appropriate competencies. This process will only strengthen the distribution between certain geographical regions, to the further detriment of disadvantaged regions. The source of

this is a burning problem: the current virus situation shows what can be expected in disadvantaged regions in case of the significant automation of work. If it is true that more jobs will be available due to automation in the longer term, it will first lead to mass job losses in the short term, and an interim period similar to the current one will be developed. The difference compared to this current pandemic will be that employees can return to the labour market once the economy is restarted. Yet we are not talking about new general competencies as application requirements at this point. If automation increases, these interim periods will be more individually determined. Their degree will be determined by the time necessary for employees to gain a given competency that is necessary to fulfil the new labour market requirements.

All these effects should be evaluated in the mirror of the ecological economy. The starting point, besides the above, is Point M of the mentioned recommendation, which asserts that the development of robotics and AI will definitely influence the working environment and may generate new concerns regarding responsibility (European Parliament, 2015). One prediction about the ecological economy says that more work will be available in a sustainable world because energy will start to be excessively esteemed and working with robots will not be such an attractive thing anymore. Compared to this, the current dominant approach is that people will simply be able to work less and deal with something else via the development of robotics. David Graeber highlights in his theory, debated on multiple levels,² that most production jobs have been automatized and service-based and administrative jobs have replaced them as these sectors have expanded (Purves, 2018). He often considers these to be meaningless and unnecessary jobs – “bullshit jobs”, as he calls them in his book – in which people do not do anything and they are performed completely needlessly.³ Even if he is not completely right, it is important to underline that digitalization is transforming work and the currently known solutions will not work (Graeber, 2018).

SUMMARY

Based on the above, it can be said that increased automation and robotization are bringing about significant and complex changes. I wanted to highlight the labour law and labour market changes regarding the current pandemic situation in this study. One reason for

² Purves, M. (2018) *You're Not Just Imagining It. Your Job Is Absolute BS*. [online] <https://www.bloomberg.com/news/articles/2018-05-15/bullshit-jobs-by-david-graeber-review>, (05/ 04/ 2020).

³ Graeber, D. (2018) *On the Phenomenon of Bullshit Jobs: A Work Rant*. *Strike Magazine*, [online] <http://www.strike.coop/bullshit-jobs/>, [04/ 04/ 2020]; Graeber, D. (2018a): *Bullshit Jobs*, New York: Simon & Schuster, pp. 234–237.

this is that the spread of the virus will really accelerate the automation of working processes. In the first stage, the application of collaborative robots will spread; in parallel with this, several companies will strive to develop completely automatized working processes. These processes will transform labour law relations and labour market relations, as well. The mass application of robots will be a process driven by cost-effectiveness, besides the supplementation/replacement of vulnerable human manpower. In my opinion, if the maintenance cost of a robot falls under 5 dollars a day, it will only be a matter of time before companies begin to live with the opportunity. In labour law relations, the application of cheap robots will not only directly influence working conditions, but also issues such as wage bargaining and the exercise of collective employee rights.

In everyday use, the aim is the appropriate use of collaborative working processes in the frames defined by labour law and work safety rules and standards. In connection with this, it should be highlighted that the human-machine relationship is an extended collaborative obligation in which rights and obligations should be interpreted in the triple connection among employee, employer and cobot. The application of new technology cannot lead to the kicking of current minimal labour law standards, as has already been seen, such as in the case of Amazon. The development of a completely new business culture and working culture is necessary, one that will positively influence the labour market and the learning of new competencies. This is an important feature to underline because there are not enough employees with appropriate competencies in certain industrial fields in Hungary and other Eastern-European countries. Most often, we are not even talking about the work to be performed in human-machine relations, but only about line work in a traditional sense. If I reflect on this situation in the context of future developments in the level of automation, it becomes an even more burning concern.

Appropriate trainings are the solution for managing this situation, primarily those aimed towards competence improvement. Of course, the application of training is not only the state's responsibility; it belongs to the market participants, as well, and employees should also do their part in this regard. The current behaviour of companies and the state that is deliberately holding employees' training back will change. We do not educate people because we are afraid that they will move abroad if they learn an internationally usable job, and it will come back to hurt us in the future. The state and companies alike should turn to employees' training so that, after a break like the current pandemic, employees can come back with such competencies that will allow them to follow the accelerating automation and robotization processes which will be, in my opinion, the medium-term result of the economic crisis caused by the virus.

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CHAPTER 12.

REMOTE WORK IN BULGARIA BEFORE AND DURING COVID-19: GENDER INEQUALITIES

Gabriela Yordanova, Vassil Kirov¹

ABSTRACT

The aim of this chapter is to examine the gender effects of telework in work-life balance before and during the COVID-19 pandemic period. The literature shows that the introduction of telework can enrich the possibilities for combining parental and professional roles. But it has also been observed that telework is a factor in work-family conflict. Our analysis of data from two quantitative studies, conducted in Bulgaria in 2016 and 2020, shows that imposed telework contributes to exacerbating existing gender inequalities.

Keywords: Covid-19; gender inequality, virtual work; work-life balance; Bulgaria

**These authors have contributed equally to this work and share first authorship.*

INTRODUCTION

The aim of this chapter is to examine the gender effects of remote work on the work-life balance during this difficult pandemic period. While the literature does show that the introduction of telework can enrich the possibilities for combining parental and professional roles, telework also affects work-family conflict (Yordanova & Kirov, 2020). However, is this conclusion valid to the same degree for men as it is for women? Is telework a factor in existing (and growing) gender inequalities? Who finds it easier to work from home, and why?

Bulgaria is a country where telework² has long been a largely mainly marginal practice; moreover, this was previously the case in Central and Eastern Europe in general. According to Eurostat data for 2019, Bulgaria ranked last in the European Union (EU) for the number of people working from home – 0.5%, followed by Romania (0.8%), Hungary (1.2%), Cyprus

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² For the purposes of this analysis, we use remote work and telework synonymously.

(1.3%), Croatia, and Greece (both 1.9%), while the EU average was 5.4%. In other words, the vast majority of employees in the country had no experience of teleworking until very recently. In the context of the containment and anti-epidemic measures resulting from the COVID-19 pandemic,³ telework was introduced on a massive scale, in the absence of the necessary training and skills among employees. Recent research in Bulgaria has already identified some disadvantages for employees working from home before the COVID-19 period, for example, role conflicts and family members' misunderstanding (Ibid.).

Paradoxically, this massive shift to telework, while helping some people to keep their jobs, has been the cause of deepened gender inequalities. We understand inequality here as the social and organisational disparity which disadvantages one sex over the other. Our comparative analysis between two periods, before and after the start of COVID-19, is based on data from two independent empirical quantitative studies carried out using an online questionnaire.

This chapter includes a literature review section, followed by a methodological section. The results of the analysis are presented for two periods: before and after the outbreak of COVID-19. The conclusion discusses the results and suggests avenues for further research.

LITERATURE REVIEW

The concepts used here come from the sociology of gender and from a sociological approach towards the balance between one's professional and private life.

Since the beginning of the post-communist transition in 1989, the countries of Central and Eastern Europe have been in a special situation with regard to gender inequality. The legacies of the system in place between 1944 and 1989 produced a society where women enjoyed quite equal positions in professional life. Moreover, this gender equality has also been observed in relation to technologies: the study by Reinen & Plomp (1997) informs us that Bulgaria was among the countries with relative gender equality regarding computer technologies. However, as Stoilova (2002) points out, post-communism has influenced women from different socio-professional groups in various ways on the labour market – very negative for the lower qualified, but generally positive for the more qualified. In fact, this dualism has been highlighted by other studies in other contexts, for example, Kossek & Lautsch (2017). This is especially true, as two other authors argue, because the experiences and outcomes of work-life flexibility are occupation-dependent (Chung & Lippe, 2020), even though employees in all economic strata are facing more and more diverse challenges.

³ Parliament voted unanimously to introduce a state of emergency from 13 March 2020.

In fact, there are different support regimes for achieving work-life balance within European countries (Drobnic & Guillén, 2011), some of the most favourable being those of the formerly socialist countries, although this support decreased considerably in the transition years (Abendroth & den Dulk, 2011). The issue of work-life balance entered the public sphere in Bulgaria only after 2000, mainly under the pressure of the EU accession process (Kovacheva & Spasova, 2015), but it was poorly addressed by public as well as corporate policies and measures (Yordanova & Kirov, 2018).

Telework has long been recognised as a factor that can contribute to a better balance between family and private life. But as Hilbrecht et al. (2008) observe, the time ‘saved’ by not having to go to the office is usually reallocated to caregiving, household chores or paid employment, rather than to time for oneself (spare time).

In the context of COVID-19, digitalisation is shifting the boundaries between paid and unpaid work, with considerable implications for women and men (Bettina & Weber, 2020). And while it is true that inequalities between those who can telework and those who cannot are significant (Samek Lodovici et al., 2021: 38), there are also observable gender inequalities in telework. According to Tremblay (2002), “There is no legislation to cover the specific case of telework or to ensure that the working conditions of teleworkers are the same as those of other employees. This could lead to a progressive polarisation of workers, and this polarisation could be along gender lines, as already seems to be the case for full-time and part-time teleworkers... this polarisation may be particularly detrimental to women by creating less attractive work content and conditions”, particularly in the light of sociological research showing that long working hours have a detrimental effect on workers’ work-life balance (Harrington, 2001; White et al., 2003; Fagan et al., 2012; Eurofound, 2013). Overtime and long working hours exacerbate work-family conflicts (Golden, 2015).

However, the impacts are not only negative, as discussed in the literature. For example, employee control over working hours and autonomy at work can help mitigate work-life conflict (Fagan et al., 2012; Golden, 2015). And as Lyttelton et al. (2020) have argued, there is a need to address the new forms of inequality associated with telework and ICT-based mobile work (TICTM) at the societal level by strengthening the opportunities that these new forms of work offer to workers previously marginalised on the labour market.

DATA AND METHODS

The analysis is comparative and covers two periods. More concretely, it is based on data from two independent empirical quantitative studies carried out by computer-assisted web interviewing (CAWI), respectively: in 2016, among 397 people (297 employees working remotely and 100 self-employed, working remotely), and in 2020, among 1,192 people aged 18 and over, of whom 279 people work remotely and 94 others carry out their duties at the office and at a distance.

An explicit condition for all participants in both studies was to have at least one child under the age of 18. Data from the CAWI surveys were processed with SPSS – version 26.0 (IBM, 2019). To interpret the results of the surveys, statistical analyses were carried out on the non-representative samples. An illustrative analysis of time use by gender was conducted. More specifically, it focuses on working hours, hours outside the normal workday, the availability of help with childcare, and the influence of the form of employment (e.g., salaried or self-employed) as factors in one's work-family balance. The statistical analyses demonstrate the ambiguity of telework, which may contribute to exacerbating gender inequalities.

Only questions asked in the same way in both studies were used. At the same time, it is also important to note two limitations in the analysis. Firstly, work-life balance, as well as work-family conflict, is only considered for those who telework (always or partly) and, at the same time, have responsibilities towards their children. This means that this text does not deal with employees who have responsibilities for other family members who need care. Secondly, the results of the 2016 survey only concern the ICT sector in Bulgaria. Such a condition was not given in 2020, and the respondents were employed in various economic sectors.

CONTEXT

Before presenting the results of our analysis, the context of the shift to telework must be set out. The use of telework has certain limitations, which are not the same in different economies. Dingel & Neuman (2020) have recently estimated the share of jobs that could be done at home with existing technologies. They show that the teleworkability of employment in Central and Eastern European countries (CEE) is below the European average – 36%. In Romania, it is estimated that only 22% of jobs can be done at home, while the segment of teleworkable jobs is between 29 and 33% in the other countries studied; it is 29% in Bulgaria.

A certain level of digital skills is needed to do these teleworkable jobs. In general, Bulgarian women score lower in this area than the average for women in the EU. But at the same time, Bulgaria ranked first in 2018 by the number of women working in the ICT sector

among EU Member States – 28% (27,100 women), with the average value for the Union being 18% (Table 1).

Table 1. Digital skills

	EU 28		Bulgaria	
	Women	Men	Women	Men
Daily internet users (16-74, %, 2019)	78	80	59	60
Above basic digital skills (16-74, %, 2019)	31	36	12	10
ICT graduates (% , 2018)	20	80	35	65
ICT specialists (15+, %, 2019)	18	82	28	72

Source: EIGE 2020

According to Eurofound (2020), 36.3% of the EU population started working from home due to the COVID-19 situation during the first quarantine containment period (April-May 2020). In Bulgaria, as in the EU, this applied more often to women than to men. Both at the EU and national levels (Bulgaria), women reported feeling too tired after work to do some of their household tasks more often than men did. They also found that their family responsibilities prevented them from spending enough time on their work. In addition, because of their family responsibilities, they found it difficult to concentrate when working (Table 2). In this context, it can be said that the crisis caused by COVID-19 aggravated gender inequalities, disrupting the work-life balance of working women.

Using data on 7,843 employed workers from the Eurofound survey (2020), we examined the determinants of teleworking. The dependent variable indicated whether a person started to telework due to the COVID-19 epidemic. In the sample, 40% of workers reported working from home during the pandemic.

Table 2. Work-life balance April-May 2020 (First Lockdown)

	EU 27			Bulgaria		
	All	Female	Male	All	Female	Male
Have you started working from home as a result of the COVID-19 situation? ('yes')	36.3%	38.5%	34.3%	27.1%	28.7%	25.8%
How often in the last 2 weeks have you felt too tired after work to do some of your household chores? ('Always' and 'Most of the time')	22.4%	25.1%	19.8%	27.9%	29.9%	26.4%
How often in the last 2 weeks have you found that your family responsibilities prevented you from giving the time you should to your job? ('Always' and 'Most of the time')	5.6%	6.8%	4.7%	5.2%	5.7%	4.7%
How often in the last 2 weeks have you found it difficult to concentrate on your job because of your family responsibilities? ('Always' and 'Most of the time')	9.0%	10.1%	8.1%	6.3%	6.8%	5.3%

Source: Eurofound 2020: COVID-19 working-teleworking dataset⁴

⁴ Background and data collection - Fieldwork: 9 April-1 May 2020; Sample size: 86,457 (63,354 complete responses for EU27); Target population: People aged 18 and over. Dataset is available at: <https://www.eurofound.europa.eu/data/covid-19/working-teleworking>

According to the European Institute for Gender Equality (EIGE 2021), Bulgaria ranks 18th in the EU for the Gender Equality Index,⁵ with 59.9 points out of 100. Bulgaria's score is 8.1 points lower than the EU average. Since 2017, the country's score has increased slightly, by 1.9 points. Its ranking has dropped two places since 2010. In 2021, Bulgaria's scores were highest in the domains of health (77.2 points) and work (69.6 points), although the country ranked poorly in both domains (26th for health and 20th for labour). Its scores improved most in the domain of power (it ranked 9th in 2021). In this domain, Bulgaria has gained 4.2 points since 2017 and 14.4 points since 2010 (Table 3).

Table 3. Gender Equality Index (1–100)⁶

	EU		Bulgaria	
	2017	2021	2017	2021
Gender Equality Index	66.2	68.0	58.0	59.9
Work	71.5	71.6	68.6	69.6
Money	79.6	82.4	61.9	64.5
Knowledge	63.4	62.7	53.3	55.2
Time	65.7	64.9	42.7	42.7
Power	48.5	55.0	56.0	60.2
Health	87.4	87.8	76.4	77.2

Source: EIGE 2017; EIGE 2021

According to the EIGE (2021), Bulgaria's score in the domain of time is 42.7, the lowest in the EU. Inequalities in time sharing, related to both care and social activities, have continuously increased since 2005. Women are more likely to spend time caring for their families. Around 39% of women and 26% of men spend at least one hour a day on care activities. Among couples with children, 93% of women spend time caring for their families on a daily basis, compared to 72% of men. Women are five times more likely to spend their time cooking and cleaning: 73% of women, compared to 13% of men, cook and clean for at least an hour a day. This gap has widened since 2003 and is much larger among couples with children. In Bulgaria, fewer women (12%) than men (19%) participate in sports, cultural, or leisure activities outside the home. The proportions of women (3%) and

⁵ The Index uses a scale of 1 to 100, where 1 is total inequality and 100 is total equality. The scores are based on the gaps between women and men and levels of achievement in six core domains – work, money, knowledge, time, power, and health – and their subdomains.

⁶ The data for the 2017 Index is mostly from 2015, and the data for the 2021 Index is mostly from 2019 (The UK is not included.).

men (2%) participating in voluntary or charitable activities are the lowest in the EU (Table 4).

It can be assumed that, due to the fact that most women take care of children and are mainly responsible for cooking and cleaning the house (for almost twice as long as men in Bulgaria), they do not have enough time for sports, cultural, or other activities.

Table 4. Time Indicator (%)

	EU				Bulgaria			
	2016		2019		2016		2019	
	Women	Men	Women	Men	Women	Men	Women	Men
Care activities								
Caring for children, grandchildren, older people, or people with disabilities (18+, %)	38	25	37	25	39	26	39	26
Cooking and/or housework every day (18+, %)	79	34	78	32	73	13	73	13
Social activities								
Sport, cultural, or leisure activities (15+, %)	28	32	27	31	12	20	12	19
Voluntary or charitable activities (15+, %)	12	11	12	11	3	2	3	2

Source: EIGE 2017; EIGE 2021

According to Sostero et al. (2020), the presence of school-age children in the household did not have much of an impact on the incidence of working at home during the crisis. In fact, the proportion of people without dependent children among those working at home was even slightly higher. This would tend to confirm that the main determinant of working from home is the nature of the work and the extent to which teleworking is possible, rather than the individual or family circumstances of employees (Ibid.).

There were no time use observations for 2020 in the Eurofound database, but the results for 2021 show that, even one year after the pandemic, women continue to invest more time in unpaid work than men in similar jobs (Table 5).

Table 5. Time Indicator February/March 2021 (hours per week)

	EU 27			Bulgaria		
	All	Women	Men	All	Women	Men
<i>Last month, on average, how many hours per week were you involved in any of the following activities outside of paid work?</i>						
Caring for and/or educating your children, grandchildren	8.7	11.1	6.1	7.2	10.3	3.9
Caring for elderly / disabled relatives	3.6	4.2	2.9	6.0	6.4	5.7
Cooking and housework	12.2	14.7	9.4	11.8	14.4	9.0
Sporting, cultural, or leisure activity	5.2	4.9	5.5	5.2	4.8	5.6
Voluntary or charitable activity	1.0	0.9	1.0	1.3	1.3	1.3

Source: Eurofound 2020: COVID-19 quality of life dataset⁷

Although the reasons for starting to work from home may differ from having a school-age child in care, our results show that mothers whose children attend school are much busier in their daily lives, especially during COVID-19, as the crisis has complemented their unpaid work with the new social role of teacher, imposed by distance learning measures.

RESULTS

Our analysis is based on the results for Bulgaria among teleworkers – in whole or in part – who have children (aged up to 18).

⁷ Background and data collection – Fieldwork: 15 February–30 March 2021; Sample size: 62,518 (46,800 complete responses for EU27); Target population: People aged 18 and over. Dataset is available at: <https://www.eurofound.europa.eu/data/covid-19/quality-of-life>

Before – Telework in Bulgaria before COVID-19 (CAWI 2016)

More than two-thirds (74.8%) of those surveyed in 2016 combined working at an office with working from home, and the rest were self-employed people working from home.

The majority of respondents, both employed and self-employed (86.3%), stated that their choice to telework was personal. The percentage was 6 points higher among the self-employed (92.7%). The main reason why respondents chose to telework: “So that I can spend enough time with my family (housework, childcare)”, an answer that was given almost three times more frequently by women than men.

Table 6. Main reason for choosing to work remotely

Bulgaria			
<i>What is the main reason for your choice to work remotely?</i>	All	Women	Men
To be able to devote enough time to my family; housekeeping; childcare	35.9%	44.6%	18.5%
To save time and travel costs to and from the office	14.1%	14.3%	18.5%
Because of independence, the freedom to choose what to work on	10.9%	10.7%	14.8%
Bonus to standard working conditions in the company	7.6%	5.4%	11.1%
To live where I prefer	7.6%	1.8%	14.8%
The convenience of better time management; flexible working hours	6.5%	5.4%	7.4%
Due to the possibility of higher incomes	5.4%	3.6%	7.4%
To work at the most efficient time for me	4.3%	5.4%	3.7%
Because of the comfort of the home environment	3.3%	3.6%	0.0%
Because of higher labour productivity	3.3%	3.6%	3.7%
Lack of stress without personal contact	1.1%	1.8%	0.0%

Source: CAWI 2016

An important finding about time use in the CAWI 2016 is that women working remotely managed to complete their work tasks in less than a standard 8-hour working day (Table 7); this has already been observed by Hilbrecht et al. (2008). At the same time, this would allow them to spend much more time caring for their families. This may be an additional reason for the high satisfaction reported among the study group regarding the balance between work and family.

Table 7. Time Use 2016 (minutes per day)

Bulgaria			
	All	Women	Men
Time for personal care (sleeping, eating, and other physiological needs)	619	620	580
Employment (paid work)	429	418	490
Domestic work (shopping, food preparation, washing dishes, cleaning)	79	94	41
Childcare (bathing, changing, feeding, games and activities)	144	172	75
Care for elderly and sick household members	34	19	73
Education (classroom and non-classroom activities)	32	34	29
Leisure time (reading fiction, newspapers, magazines; visiting attractions; hobbies; sports; attending cultural events, etc.)	56	26	126
Travel time (for household care; for social contacts, etc.)	47	57	26
<i>Total</i>	<i>1,440</i>	<i>1,440</i>	<i>1,440</i>

Source: CAWI 2016

Almost all the women surveyed (98%) think that teleworking improves their work-life balance (Table 8). But to be able to work from home, they need certain personal qualities, which were specified in the spontaneous answers: being able to manage time (organisational skills); self-discipline, responsibility, concentration, and motivation.

Table 8. Impact of teleworking on achieving work-family balance, 2016

Bulgaria		
To what extent do you agree that remote work (from home/home office) improves the balance between work and family?	Rather it does	Rather it doesn't
All	90.6%	9.4%
Male	77.3%	22.7%
Female	98.0%	2.0%

Source: CAWI 2016

After – Telework in Bulgaria during COVID-19 (CAWI 2020)

- Professional situation and family commitments

75% of the survey participants worked solely remotely, and a quarter (25%) combined working at the company office with working from home. For almost half of the participants (45%), this also applied to their spouse/partner (respectively, 30% worked only at home and 15% worked at home and in the office).

This result applied more to women than to men. Moreover, women took on most of the family responsibilities at home (Table 9). For some of the respondents (21%) and their spouses/partners (14%), work during the first lockdown increased. As a result, 40% were working overtime. The additional workload associated with the job, as well as involvement in childcare, led to an even greater reduction in free time. According to 62% of the participants in the online survey, the availability of free time ‘deteriorated strongly’ or ‘worsened’ due to the first lockdown. This result also applies more to women than to men. Moreover, women personally took on most of the family responsibilities at home (Table 9).

Table 9. Time Use 2020, First Lockdown Bulgaria

Bulgaria			
<i>Personally, which part of the family duties are you responsible for?</i>	All	Female	Male
Personal care (incl. physiological needs) for child/ren	92.5%	94.3%	78.0%
Cooking for your own household	89.8%	94.0%	56.1%
Domestic cleaning	87.7%	92.2%	51.2%
Help with distant schooling of child/ren	81.0%	83.4%	61.0%
Shopping for own household	78.8%	76.8%	95.1%
Shopping, cooking, cleaning for parents/relatives	35.7%	35.5%	36.6%

Source: CAWI 2020

- Causes of conflict situations in families during times of crisis

Precisely because of active and direct parent involvement in their child/ren’s distance education, two-fifths of participants (40%) in the study reported that they did not normally fulfil their work commitments while assisting their child/ren in learning.

At the same time, the study showed a lack of family support for teleworkers. Specifically, a quarter (27%) said that their family would ignore their work, i.e., other family members

not remaining silent during official work-related telephone conversations or while the working parent performed their duties remotely. For women, this share was 5.7 percentage points higher than for men. This result highlights the main disadvantage of teleworking already identified in Bulgaria, namely, the conservative work culture of the society⁸ (Kirov & Yordanova, 2018) – which was exacerbated under the containment due to the COVID-19 pandemic.

- Work-life balance and the pandemic

The COVID 19 pandemic represents a major challenge to the work-life balance. However, more than half of the study participants believe that it was the possibility of working remotely (fully or partially) during the state of emergency that helped improve work-life balance (Table 10). And although women's workload in performing family tasks was greater, their satisfaction was paradoxically higher than that of men.

Table 10. Impact of teleworking on achieving work-family balance, 2020

Bulgaria		
<i>To what extent do you agree that remote work (from home/home office) improves the balance between work and family?</i>	Tend to agree	Tend to disagree
All	57.5%	42.5%
Male	54.0%	46.0%
Female	57.9%	42.1%

Source: CAWI 2020

In general, the factors that favourably affect work-family balance are: the presence of an older child (at least 12, when children can be more independent); the presence of one or two working parents (in whole or in part); and the help of another in raising the children (including spouse/partner, grandparents, older children, babysitter).

⁸ This means that employers were not ready to trust their employees. On the other hand, society, parents, family, and children do not accept telework as 'real' and serious work.

DISCUSSION AND CONCLUSION

The main reason for starting telework was different for the two periods observed (CAWI 2016 and CAWI 2020). Before COVID-19, the main reason was to have more time for the family. During the first lockdown, all employees whose work allowed for teleworking were instructed to operate from home – but this was imposed by employers.

Our results not only confirm the gender inequalities indicated by EIGE (2021) and which are valid for Bulgaria, but they underline a deepening divide under COVID-19, mainly due to the doubled care burden for mothers: personal care for their children's distance learning being added to the usual care in addition to involvement in other unpaid work.

However, women working at home achieve a better work-life balance because they fulfil their work obligations at times that suit them and in less than 8 hours. The work-life balance is favourably affected if the child is older (over 12 years old), if there is one or two working parents (in whole or in part), and if a woman has help in raising her children (from a spouse/partner; grandparents; older children; a babysitter).

Our results are consistent with another recent research finding that gender gaps in household tasks are greater for teleworkers and, among teleworkers, more so on telework days, as observed by Lyttelton et al (2020). Mothers of young children seem to value telework and are generally more willing than women or men without children to accept a lower wage in return for working from home (Mas & Pallais, 2017). However, in the Bulgarian case, personal choice is decisive for the level of satisfaction with the work-family balance.

Our study represents an important contribution to the knowledge about the problem in CEE countries, where telework had been marginal until recently. These are complex situations where public policies and employers' practices have to take into account employees' preferences.

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CHAPTER 13.

THE DIGITAL TRANSFORMATION AND NEW FORMS OF CIVIC ACTIVITY IN THE FIELD OF LABOUR (THE EXAMPLE OF ONLINE LABOUR CONSULTATIONS)

Petya Klimentova

ABSTRACT

This chapter highlights the results from research carried out on contemporary alternative forms of civic engagement in the area of labour that emerge, manifest themselves and develop without intermediaries such as unions, companies, employers, non-governmental organisations, etc. Free consultations in a Bulgarian Internet forum on labour matters were the subject of this research. The analysis shows that individual labour cases tend to give rise to certain acts of civic behaviour (free consultations), as they generate informal voluntary social relationships connected with taking a supportive position towards others. The thesis defended herein is that such relationships transform virtual spaces into efficient places for everyday civic engagement and civic culture.

Keywords: *everyday civic engagement, online consultations, labour*

INTRODUCTION¹

Over a quarter of a century after the beginning of democratic changes and a decade following Bulgaria's accession to the European Union (EU), Bulgarian society still seems to have a deficit of effective labour policies. The classical collective subjects of political action (i.e., parties, unions, state institutions or legitimate participants in the tripartite dialogue) have proved their incapability to resolve social issues. No spontaneous manifestations of civic action could hope to find sustainable solutions to the inefficiency demonstrated by institutionalised policies. While some scarce yet robust non-governmental organisations (NGOs) are involved in activism, the majority of Bulgarian citizens tend to gravitate between empathy and indifference regarding communal affairs. When it comes to labour, the situation feels even more paradoxical. The transformed or newly established unions which managed to get a foothold on the political scene throughout the period starting in 1989 are increasingly losing membership and influence. On the other hand, the post-

¹ A previous version of this text has been published in Papers of BAS (Klimentova 2021).

industrial epoch in which the transforming Bulgarian economy finds itself continues to compound labour-related problems rather than alleviate them.

How can such problems be solved when they are not vocalised as the concern of unions or when unions as such are absent? Does the solution in its essence come down to the employee-employer relationship alone? Are legal procedures the only way to resolve conflicts between employee and employer? How are problems concerning self-employed people solved? Does the search for solutions in the field of labour take the form of so-called everyday citizenship, i.e., civic self-initiative, which has been emerging and developing outside the institutionalised channels of collective action observed over the last decade in various areas, such as environmental protection, education, health, the urban environment and public works (Koleva, 2013; Koleva et al., 2013; Koleva, 2014; Koleva et al., 2014)?

These are the main questions this chapter will try to answer. Its exposition consists of three parts. The first part provides a presentation of the labour situation in Bulgaria in the context of the problems common among Eastern European countries in the period after their accession to the EU and during the global crisis from 2008. The second part presents how with the concept of “orders of worth” and “modes / regimes of engagement” authored by Luc Boltanski and Laurent Thévenot the labour consultations in a free online forum are seen as acts of civil behaviour in the third part. The thesis defended here is that such consultations on labour issues in a free online forum place participants (inquirers and respondents) in a relationship wherein different values are engaged according to their importance (“orders of worth”), alongside different competencies according to how these values are used to justify and substantiate actions and decisions (“regimes of engagement”). Such informal and voluntary social relationships, relative to taking and staying in a position which helps others, are transforming virtual spaces into effective places for everyday civic engagement and civic culture.

THE LABOUR SITUATION IN BULGARIA UPON ITS ACCESSION TO THE EU IN 2007

While trying to describe the situation of labour in Bulgarian society after 2007, at least two circumstances need to be taken into account. First is the fact that Bulgaria, together with Romania, was part of the EU’s fifth enlargement, i.e., the second wave of countries

accepted from Eastern Europe.² The second is that Bulgaria's accession coincided with the onset of the 2008 crisis.

Institutional transformations in Bulgaria aim at joining the European social model (which implies active dialogue and effective social protection), but economic reforms take place on the basis of a neoliberal doctrine that does not provide for measures to offset the social cost of reforms.³

Logically, social dissatisfaction should presume the necessity of enhanced union representativeness; however, empirical data outline a different picture of reality. According to a study undertaken by the European Foundation for the Improvement of Living and Working Conditions (Eurofound),⁴ union membership density in Bulgaria plunged from nearly 37.3% in 1998 to 17.9% in 2007 (Daskalova, 2010). Experts from the European Trade Union Institute report that the official census of trade unions undertaken in 2016 showed a union density figure of 15.4%, not including trade unionists outside the two main union confederations; at the same time, it assumes that all trade unionists are employees (ETUI, 2016).

In 2020, an expert from the Confederation of Independent Trade Unions of Bulgaria (CITUB)⁵ explained more prominent resignations from union membership as a consequence of the privatisation and crises which even predated 2008.⁶ In fact, this drop had come about much earlier. While some federations (public sector entities, including higher education institutions, energy and transport) have shown a slight increase in trade union membership in recent years, this may not compensate for the reduction observed in other sectors.⁷ Another point of focus should be taken into consideration: some of the registered

² As Mr. Krastyo Petkov mentioned, the ten countries that were declared “functional democracies” and “emerging market economies” in 2004 were accepted into the EU; therefore, the European community in the East became an institutional and legal fact (Petkov, 2015, p. 47).

³ “European social model” here would mean the aggregate of principles and objectives, around which the European Member States are united, along with the diversity of approaches and implementation thereof in the individual countries. While the characteristics of this social model may vary from country to country within the EU, the principles and objectives of the European social cohesion model, like solidarity and competitiveness, are universally valid. This is the basis for drafting directives on development in various areas, including those of labour and industrial relationships.

⁴ The two main confederations declared a total number of 350,879 trade unionists in the census, while total employment in Bulgaria in the same year was 2,277,345 (ETUI, 2016).

⁵ This refers to an opinion given in an informal conversation.

⁶ Exemplary of this resignation would be CITUB memberships in the metal working and chemical industries, timber processing and furniture production, paper mills, light industry (especially, in leather and footwear), some sectors within services (mostly in private services, i.e., commerce, restaurants, etc.) (for reference, see previous note).

⁷ There has been some expansion in trade union membership observed in the banking sector, where there is already an associated federation comprising the unions in UniCredit Bulbank and United Bulgarian Bank (UBB). The Union of Bulgarian Actors has also become an associated CITUB

exchanges between individual federations within the CITUB will allow us to find out which sectors have suffered the most and where there has been growth, however slight it may be. For the two nationally represented unions – the CITUB and Labour Confederation “Podkrepa” – the main reason for the outflow from trade unions as a global trend is the development of the digital economy (Daskalova, 2010). Trade unionists’ narratives which included terms such as “digitalisation” and “online” in the context of union-member relations demonstrate that the problem has been registered, yet its response remains a challenge:

Currently, a lot of influence is made by digital forms of work and all kinds of changes related to these new ways of providing work through online platforms, through call centers, workers on call, etc. All these atypical / informal forms of employment lead to some challenges for the unions, how to reach these workers, how to unite them and what we can offer them [...] to stimulate them in some way, to activate them and for them to ask us and [for us] us to offer them appropriate trade union protection (interview with an expert, CITUB).⁸

THE PROBLEM OF EVERYDAY CITIZENSHIP THROUGH THE LENS OF THE “ORDERS OF WORTH” AND “REGIMES OF ENGAGEMENT” CONCEPTS BY LUC BOLTANSKI AND LAURENT THÉVENOT

In a number of different areas of research, including the political sciences, sociology, clinical psychology, social activities, etc., the new forms of civic engagement observed since the beginning of the 21st century have been defined as ordinary or everyday citizenship (Berger, 2008; Duchesne, 2009; GRAC, 2009; Koleva, 2014). These have their genesis and manifestation beyond the institutionalised structures of political, professional or associative activities. An individual connects with others of his/her own free will and invests voluntary time, energy and knowledge to act together with them, whether or not this individual is affected by a certain problem.

Insofar as defending their principles, interests and rights, citizens are faced with the need to publicly articulate and justify their positions and actions. Thus, we find a possible analytical framework of the forms and manifestations of everyday citizenship in the theoretical model by Luc Boltanski and Laurent Thévenot on two interrelated concepts, the

member; there is another new union in the IT sector, still with low membership, which for the time being is a member of the Federation of Trade and Services.

⁸ This is comes from answers to questions about atypical forms of work, as per the respondents’ wording. The original orthography and syntax have been preserved in all respondents’ answers in this chapter. Atypical forms of work also appear in some answers as connected to informal, flexible forms of work.

“orders of worth” and “regimes of engagement” (Thévenot, 2007; Thévenot, 2006). The notion of “orders of worth” would mean the standards to which individuals refer to present their actions and decisions as justified and legitimate. This means those ultimate general principles (Rousseau), commonly accepted by the public, which are defined by Boltanski and Thévenot as “principles of equality” (equivalence).

Boltanski and Thévenot distinguish six “orders of worth” (market, industrial, domestic, civic, inspiration and fame) in their positions of logics to justify actions, behaviours and decisions in modern society. They analyse the behaviours that are not prepared for expression in the public space or those for which the type of sharing is not required by their public presentation. This refers to communication in a public environment, and the two sociologists distinguish three groups of communicative actions.

The first group is relative to an action in the public space: by definition, the audience looks at others, although the meaning of this view may vary across theories. This type of communication would suggest reflected behaviours, meaning that individuals consider the influence of their own behaviour on others in the public space.

The second group of actions is relative to what builds solidarity with regard to a common good. The audience influences the evaluation and preparation of an action for such a critical assessment. The grammar of the common good directs the legitimacy of the “orders of worth” which serve the assessment. In this grammar, there is an everyday sense of fair and unfair in relation to inequalities related to abilities and power.

The third group of patterns of action is close to “non-reflexive and incorporated habits”. Here, with the term coordination, Boltanski and Thévenot designate the conventional forms which define actions prepared for public criticism, on the one hand, and, on the other hand, “localized and personalized adaptations, including conventions and inconveniences of less limited importance” (Thévenot, 2007, p. 138). The connection with the surrounding environment is a determining one, both in understanding a specific behaviour and in the choice of appropriate behaviour. It may be adequate only if there is a correct rational perception of the situation’s respective elements and if the behaviour of others is accurately interpreted. What is important is the coordination with and within the environment, where primordial significance is laid on the means of perceiving one’s surroundings, rather than placing the emphasis entirely on the actor. In addition, it is precisely one’s means of perception that are so instrumental to behaviour.

Three “regimes of engagement” are outlined based on this conceptualisation of dynamic adaptation in communication within a public environment (Table 1).

Table 1. *Regimes of engagement*

Regime of the familiar (Régime du proche)	Regime of the plan (Régime de l'action en plan)	Regime of justification (Régime de la justification)
<ul style="list-style-type: none"> • Personal forms of participation/ engagement in the world • Convenience, cosiness • Familiar, usual, pleasant environment • Simplicity • Ordinary world • Close environment • Immediate relations and communication, direct contacts • Affection, close relationships and connections • A person completely integrated into his/her environment • Close things are an extension of the human body • Adaptation to the near space, living in the near space • Adaptation of personal space for living and daily use • Care, empathy, attention 	<ul style="list-style-type: none"> • Functional action • Instrumental action • Target action, intention • Individual, project holder • Autonomous individual • Independent individual • Responsible individual • Rational subject • Strong-willed and determined person • Will • Individual plan, individual goal, strategy • Strategic rational choice • Calculation, planning • Mutually beneficial contract • Functional scope of reality • The environment as a functional resource • Functional, instrumental use of things/objects 	<ul style="list-style-type: none"> • Public actions • Public justification / Public actors • Conventional, legitimate assessments • Conventional behaviour and interaction • Mediation • Generally significant higher valuation principles • Common good • General interest

Source: Koveneva, 2018, p. 18.

These are the regime of justification, the regime of the familiar and the planned action regime. In the case of the first regime, people and things engaged in a justified action are assessed according to the “orders of worth” which allow for some assessments based on certain common goods. In the case of the planned action mode/regime of the plan, a personality is viewed as an autonomous individual who is independent from their environment as the “author” of an action plan, against which anything that is important would be assessed. In the case of the third regime, the regime of the familiar, “personality and all that surrounds it are engaged versus some specific ties and their adjustment is seen as a convenience that remains paramount to the maintenance of personality” (Thévenot, 2007, p. 139).

The main axis against which these three regimes are distinguished is the relationship of the individual with the environment towards which his/her activity is directed. It is on their basis that the mutual engagements connecting the behaviours of different individuals can subsequently be identified and clarified.⁹

MAIN CHARACTERISTICS OF THE LABOUR ISSUES FORUM ON THE WEBSITE LEX.BG

The portal lex.bg self-identifies as the most visited website dedicated to legal topics in Bulgaria.¹⁰ The portal has a comprehensive reference system for legal information in electronic form, but we consider only the labour forum, which provides legal practitioners, law students and Internet users in need of legal assistance and advice with useful information and the opportunity to exchange experiences and knowledge in the field of labour law.¹¹

The main hypothesis in the study of the forum is related to the idea that in an environment populated by ineffective institutional actors for the protection of labour and employment rights (unions) and with a neoliberal restructuring of the economy in place, individual strategies for seeking protection of labour and employment rights on the part of workers and the unemployed through online platforms are transformed into the subjects of civic action. Moreover, these strategies, due to the way they are organised, make other actors (consultants, professionals) into active citizens and turn the virtual forum into an interactive space for the formation of civic knowledge and skills in order to provide labour protection. Therefore, through the virtual space, participants in these online consultations

⁹ The variable (varying) geometry of engagement, in which citizens are constantly moving from closeness to publicity, would require not only flexibility of behaviour but also specific knowledge and competencies. For the agents (initiators and participants) of everyday citizenship practices, the geometry of engagement is complicated. First, because they would generally operate outside the structures of institutionalised activities, which would automatically mean that they would not benefit (directly) from the support and/or mediation of their official representatives, i.e., traditional or conventional actors. Second, being doers engaged in an activity that is not subject to traditional models of organised civic action, they continue to operate in a social space, functioning in a conventional way, to one extent or another.

¹⁰ Balgarskiyat praven portal. (2021). [Българският правен портал]. <http://lex.bg/forum/viewforum.php?f=14&start=750> Accessed: 10.09.2021.

¹¹ According to the blog capterra.com, some of the best Google-indexed sources for legal advice pretend to be free but after having walked visitors through several pages, just when they are ready to receive the answer to a question, the site requests credit card data. Capterra.com supports the understanding that "Good, free advice is even harder. Good thing these [free of charge legal advice] sites exist. If they can't solve your problem, they'll at least get you closer. And you won't have to go through doorway pages or give up your credit card information to get there". Source: Reisenwitz, C. (2019). Free Legal Advice: 5 Best Sites That Are Actually Free. <https://blog.capterra.com/free-legal-advice-easy-to-use-sites-that-are-actually-free/> Accessed: 15.01.2022.

create new forms of civic behaviour, despite remaining in their traditional employment roles (with the inquirers seeking consultations on issues about their daily work and the consultants being labour law experts).

Some quantitative and qualitative methods were used to empirically verify this hypothesis. We studied labour cases and related discussions that were registered in the forum of lex.bg during the period 2007–2016. The processed 256 cases out of a total of 4,500 were selected from the archives of the online labour forum (lex.bg/forum), applying a random principle in the order they were published during the reference period. Labour consultations were processed by means of a questionnaire and systematised in MS Office Excel.¹² The semi-standardised, questionnaire-based interviews were made through the feedback form on lex.bg, via email, by phone or live in 2017. The related survey of inquirers and consultants allowed for the following to be analysed: 1) the problems, motives and reasons of those seeking employment assistance; 2) the coincidences and differences in the positions of consultants; 3) “regimes of engagement”/disengagement regarding a problem; 4) opportunities (lack of opportunities) in terms of the formation and acquisition of skills for individuals’ protection and assertion of rights by acting autonomously outside and independently of institutional forms of association.

PARTICIPANTS IN THE LABOUR-AND-EMPLOYMENT LAW CONSULTATION FORUM

For the purposes of this research, the participants in the above labour forum were divided into two groups of counsel seekers, with inquirers posing questions about labour-related problems and answerers/consultants interpreting the problem in question, seeking solutions and suggesting some actionable options. Due to the fact that communication in this forum is anonymous, it was not possible to draw any division lines between experts and people sharing their own experience only.

Questions in the labour forum are asked most often by employees, in 176 cases (68.7%); followed by questions from other, unidentified persons (participants) in 40 cases (15.6%); lawyers/jurists in 13 cases (5%); employers in 9 cases (3.5%); and others (Figure 1). The share of cases in which the questions were asked by a person defending an employer’s

¹² The questionnaire contained the following questions: what is the problem being posed; who poses the problem; who answers the question asked; whom does the question concern; what is the type of rationale for the purpose and action of the inquirer (financial, legal, moral or other grounds should be indicated); what is the type of rationale of the consultant (strictly legal, moral grounds, use of arguments of a variety of value ranking). In addition, ten interviews were conducted with consultants in the forum, selected according to the frequency of their consultations (e.g., a consultant who posted more than 100 opinions in the forum), who agreed to participate in an interview.

position was relatively small, with only 20 cases (7.8%) where the question was asked by the employer, accountant or employee in payroll administration, versus 183 cases (71.4%) where the question was asked by the concerned person (an employee, friend or relative of an employee).

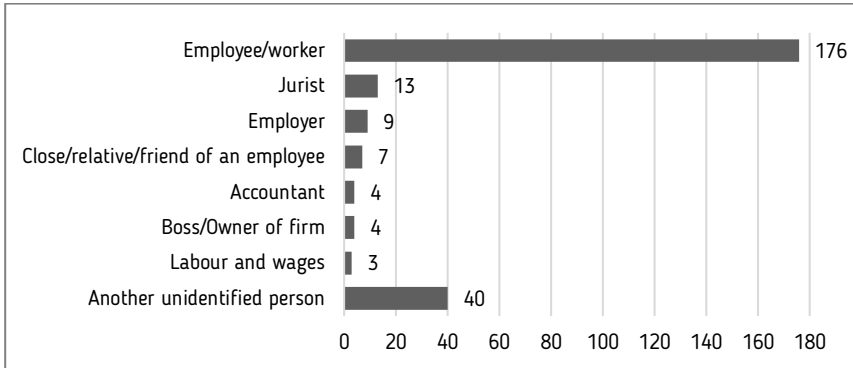


Figure 1. Who poses the problem?

This data gives evidence that the forum is used for individual searches and solutions for personal problems, rather than for company consultations or for collective actions.

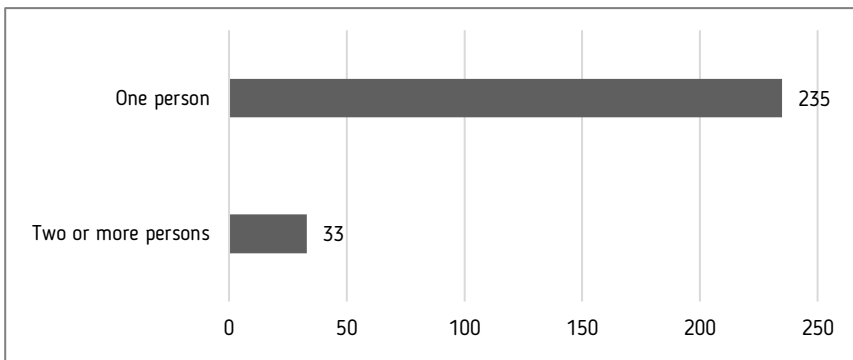


Figure 2. Who answers the question asked?

Data processing concerning the answerers yields the following picture. A prevalent 143 cases had an answer provided by lawyers; 111 answers were given by one lawyer. Next

comes the group of answers given by an individual participant (whether or not they were legally qualified remains unknown), with 93 cases, out of which 21 came from more than one answerer. There were 13 cases where answers were given by an accountant, and in 7 cases the answerers were others. In other words, the vast majority of answers, 235 (91.7%), were given by one person, versus answers with two or more persons participating in a dialogue string: 33 (12.8%) (Figure 2).

PROFILE OF QUESTIONS ASKED

The question most often concerned one person, with 207 cases (81%) in which the formulated question was presented as referring to the inquirer only, i.e., concerning an individual/personal problem in a specific work situation; 44 cases (17%) featured an inquirer claiming that the problem was relevant for two or more employees, while the question was formulated as a matter of principle only in 5 cases (Figure 3).

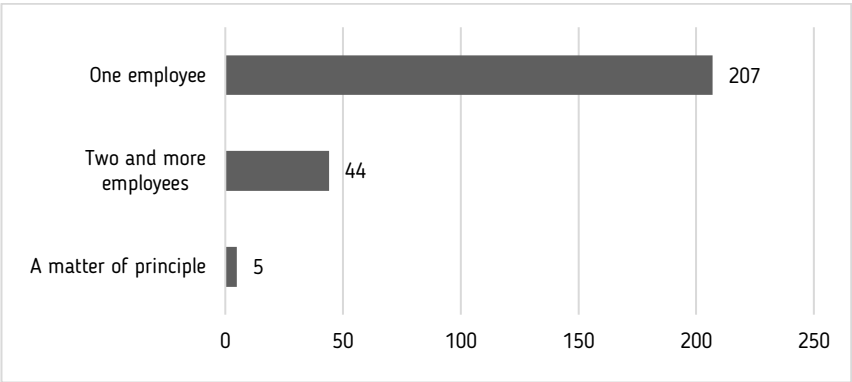


Figure 3. Whom does the question concern?

The questions asked by the forum participants refer to a number of different aspects of labour and employment rights. The description of each specific case reveals conditions of uncertainty, harmful working environments, disrespect to human dignity or the violation of the principles of remuneration agreed for full-time work or overtime. Driven by a sense

of trampled justice, inquirers wanted to know how to assert their rights or how to obtain redress for such violations.¹³

MEANS OF REASONING BEHIND THE ISSUE RAISED AND THE INTERPRETATION THEREOF

In 122 of the cases (48%), the issue raised was argued by putting forward the necessity of the inquirer's reimbursement due to financial and/or physical damage incurred as a result of the employer's actions; in 86 of the cases (34%), their justification would contain some moral categories such as justice and dignity; and in 48 of the cases (19%), this reasoning was strictly juridical, i.e., based on some legislative principles and texts (Figure 4).

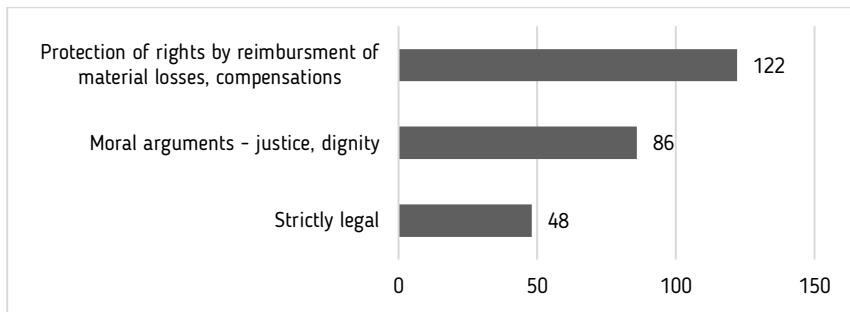


Figure 4. Reasoning of the inquirer

¹³ The queries from inquirers reveal hesitations or doubts related to the knowledge of their rights and obligations arising from them. This indirectly puts forward the question of trade unions, of how they interact in the defense of labour and employment rights, along with the question of what training and information might be available regarding the labour and employment rights across a whole variety of employee categories in different situations.

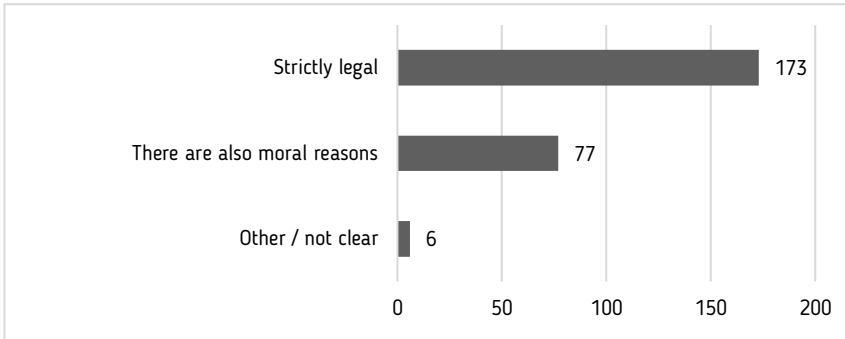


Figure 5. Reasoning of the consultant

Viewed through the lens of Boltanski and Thévenot's regimes of engagement, these labour consultations reveal that the reasoning of inquirers and counsellors can be identified with the regime of justification and criticism. People and things that are referred to in the substantiation of a given case refer to those accepted as common goods and conquests. The forum as a platform turns out to be the space (environment in Boltanski and Thévenot's terminology) in which inquiring citizens can coordinate their actions first with themselves – by making their problem public – and then with others, by trying to describe it so as to make it understandable to them and obtain some support, advice or decision. The answer to a question is already the beginning of an interaction, which may be joined by anyone having a position or an opinion or any knowledge on the question.¹⁴

Quite often in the reasoning given, legislation is also considered through the lens of the moral principles of justice and equity on employer-employee relationships. In their interpretation, the unequal position of the employer (capital) and hired staff (labour) give way to general, higher principles of justice in human relations. The legal embodiment of the norm is diffracted through the understanding of equality and justice for everyone, regardless of his or her position of power. As the consultants are not in their capacity as officials, and in this sense are not obliged to interpret the law in favour of certain institutional interests, they give advice based on the law and the moral imperative of justice.¹⁵

¹⁴ The feeling of injustice or disrespect to human dignity and non-recognition make up the bulk of main elements that could be observed in the questions of inquirers. In response to such frustrations, counselors who voluntarily took on this role would seek and provide tools to resolve the conflict situation in which the inquirer found him/herself, as described by him/her.

¹⁵ Therefore, the cases in which the consultants argued among themselves about the professional (legal) and moral (legitimate) quality of advice given were no exception.

THE FORUM AS VIEWED BY THE COUNSELLORS

In addition to analysing the questions raised, the study of the lex.bg also included interviews with consultants, i.e., those who have voluntarily agreed to provide free advice. This means that the dialogue space covers different categories of participants and, through their interaction, shows the dynamics of argumentation and related problems and deficits in civic culture.

Counsellors were selected on a random basis among those who had provided more than 100 consultations at lex.bg. The interview invitations were sent to 30 counsellors by means of personal messages via the site.¹⁶ A typical invitation provided some information on the research, on the author and their institutional affiliation and contained a call for an interview (live, on the phone or in writing) with 18 open questions associated with the motives for participation in the forum, the method of counselling and the results from their experience as counsellors hitherto. Ten interviews were conducted: four via the contact form on lex.bg, three via continuous communication by e-mail, one by phone and one live. The latter was the most comprehensive of all, with the most examples of specific cases, albeit not always from the forum itself.¹⁷ One free-form opinion was also expressed. While the interview questionnaire does not contain an explicit question concerning the sex of the counsellors, the answers of those interviewed showed the answerers were three women and seven men.

All the counsellors who agreed to be interviewed were people with experience in the forum who had provided their opinions for 10 or more years (four of the counsellors), between 5 and 10 years (two) and more than three years (two), the others were with less experience. The consultants' experience in the forum was closely interrelated with their periods of service as lawyers/professionals¹⁸. They belonged to different age groups: two were under 40, three were in the 40-50 age group and four were in the 50+ age group, one was younger. At the time of the interview, they lived in Sofia (three), Plovdiv (one), Varna (two), Gabrovo (one) and in a settlement of under 30,000 people (two).¹⁹, for one we do not have information.

¹⁶ This form of communication was selected as the only viable one, as the individuals on the forum are active using their anonymous avatars (profile images) and nicknames.

¹⁷ Out of the sample of 30 consultants, only 10 responded to the invitation in 2017.

¹⁸ The interviews with the consultants showed that the highest number of them had 10-15 years of professional service (six), two had been professionals for over twenty years, one had 16 years' experience and there was no information on one of them. Those interviewed were mostly employed as pleaders (six), one of them was employed as a private bailiff, one of them was an attorney, one was an internal auditor and one was employed in a metal processing enterprise.

¹⁹ Those interviewed did not self-define as counselors. Four of them emphasized they did not provide consultations in the legal sense of the term; they claimed they would rather provide an opinion or a recommendation or share their experience. They claimed that a reason for that was the

Most often, the people interviewed would provide consultations on individual cases. “A main topic is how salaries are to be paid, or pregnancy leaves, or maternity leaves or re-employment, quite often lower paid, when the probationary period has already expired, and the employer is supposed to increase the salary” (K007). While employees in the labour forum of *lex.bg* would mainly be looking for a way to solve their own labour problems, these individual strategies often lead to an online discussion between participants in different situations – people having already dealt with similar cases; others for whom getting out of such situations would be a matter of professional honour; inquirers facing legal ambiguities or conflicts in the workplace and needing advice. From the point of view of the consultants, the ongoing discussion seemed somewhat contradictory. While it could be quite “amateurish”, some cases tended to be very serious and required a professional touch.

This completely free forum, in which everyone can seek help and advice on labour law issues, turns out to be a double-edged sword.²⁰ Forum participants’ personal experience, when they are not experts on labour and employment issues, provides no guarantee for the inquirers’ orientation in a specific case or making out an accurate judgement thereof. “Very often questions are asked about probation, basic salary, leave, etc., and this requires at least consideration of the terms of the specific contract (when they differ from the main provisions of the Labour Code)” (K003), i.e., the judgement of an expert.²¹

According to the respondents, the main problem with the consultations was the low level of communication skills among the inquirers. They would find it difficult to formulate the question they were looking for, “they would fail to ‘sift the wheat from the chaff’ and the questions would be cluttered with unnecessary and useless information, which for some reason, especially emotional, the inquirers would consider particularly important, but [they would be] irrelevant to the solution of the problem” (K007). At the same time, many key

fact that most questions in the forum were for either pleaders or lawyers in general, and “those would not require a standard type of a consultation as is provided to a customer” (K008). One of the respondents shared that they would usually give opinions; however, if they were asked in a personal message to represent the inquirer in court, they would refuse and forward such an inquirer to a lawyer, as they could only represent the companies which they legally advised. Another respondent specified that the law “prohibits pleaders providing free consultations. We would sometimes give a piece of advice but hardly ever in details. It would be rather a general framework thereof” (K009).

²⁰ Freedom of expression and access to different opinions and comments in the absence of control over the information and the adequacy/validity of the advice given may be misleading to inquirers. If such an inquirer lacks the capability to sift through, contextualise or judge whatever information he/she might be given, there is a real risk for him/her to choose the wrong actions to solve his/her problem.

²¹ Discussions would quite often get intertwined with disputes over who among the counsellors had what qualifications, whether it is appropriate for experts to participate in such discussions in a forum, whether an accountant or a legal adviser can give advice on cases where a lawyer’s opinion is required and so on, with all of this being mixed with insults, threats and fruitless disputes.

details would be left out of the description of the problem, the real situation becoming clear only when some clarification questions were asked.

Whether a discussion has passed into a professional dialogue between lawyers (who quite often ask for their colleagues' opinions on a case) without the participation of the inquirers would be difficult to find out. From a purely professional point of view, the "benefits" for counsellors would be in sharing and gaining experience, including "orientation among the asinities that are invented in labour law" or the acquisition of knowledge to solve various cases.²² From the perspective of the research question regarding the existence and forms of civic activity manifested in the area of labour, the work of the consultants in the forum *lex.bg* is interesting in at least two aspects. Consultants offer their professional competence for the benefit of others free of charge, guided by both professional and civic duty:

I continue because I cannot accept that a person who has turned and asked for an opinion can be misled. The moment I see that he is not receiving adequate help, I immediately intervene (K001).

[...] I believe that the existence of such a forum, although it cannot in most cases lead to the resolution of the case, provides a good basis for inquirers to find their way and find the shortest way to achieve a satisfactory result (K010).

The assistance provided by counsellors is as much a self-initiated action directed at others to resolve injustice related to their work as it is a professional and civil act through which counsellors are restructuring their own professional field, "exporting" legal experience and culture in a public environment, however limited it may be. Through their interaction with and advice given to people who "enter" the public space without knowledge or experience in reasoning and argumentation, consultants indirectly influence two labour environments – that of the questioners as well as their own professional environment. Participation in the forum among both inquirers and counsellors was marked by "transitions from one engagement regime to another" (Thévenot, 2006, p. 220).

THE LABOUR-AND-EMPLOYMENT LAW CONSULTATION FORUM ON THE PORTAL LEX.BG AS AN EVERYDAY CIVIC ENGAGEMENT SPACE

On the labour-and-employment law consultation forum at the portal *lex.bg*, everyone is entitled to ask a question and may express their personal position while defending a labour, civic or social right. The interaction with others happens through the interaction

²² "If the question is not quite simple, it involves thinking or searching in professional practice, especially in cases where a question is asked and there is intervention by other colleagues or inquirers in the question" (K010).

with the environment (the forum's requirements, possibilities or rules); moreover, it starts with this interaction, which allows participants to show their "active attitude to the world" (Thévenot, 2007, 139). In their argumentation, both the questioner and the counsellor engage a regulated (entitlement) and perceived common good (e.g., right to decent work, decent pay, healthy working conditions), regardless of whether the case concerns only the questioner or a larger group of people. The significance of this "engaged good" can belong to various orders (market, industrial, civil, etc.); what is important is the way in which the good is articulated and used in presenting and interpreting the problem.

The abilities and competencies connected with a given problem, its definition and communication in the space of the forum are unevenly distributed between questioners and consultants. However, the justification regime in which they are engaged voluntarily leads to an interaction in which each party complements the other with his/her own empirical experience and specific knowledge.²³

The study of the labour-and-employment law consultation forum on lex.bg confirms the hypothesis of individual strategies among working and unemployed people for dealing with violations of rights, moral norms and principles of justice when institutional actors are ineffective at protecting labour and employment rights (trade unions). However, the cyber domain – due to its structural features (wide access, interactivity, ever-increasing opportunities to take, defend and argue a public position and mobilise for a cause) – constitutes all participants as the subjects of new forms of civic behaviour, although they remain in their traditional employment roles (inquirers seek advice on issues about their daily work; consultants are experts in labour law). The questioner and the counsellor participate in a "dialogue" of their own initiative, engage regulated (entitlement) and commonly perceived (moral) goods in their argumentation, exchange unevenly distributed abilities and competencies on a given issue and thus mutually create opportunities for the formation of civic knowledge and skills in order to provide labour protection. However, such interactions between private active citizens will not entail any collective cause-defending actions. In the context of the neoliberal restructuring of the economy, these new forms of mutual assistance between citizens, regardless of their labour positions, raise the issue of civic activity as a means not just to change an individual work situation but also to improve the situation for large groups of people. It is this type of communication that transforms the labour-and-employment law consultation forum into a space of interaction between citizens who have the equal right to express and hold positions.

²³ While the various cases of inquirers expand the experience and competencies of legal advisers, these consultations also help citizens to get competent information about a specific case or about the possibilities for action and effective ways to protect and assert one's rights.

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CHAPTER 14.

DIGITAL PLATFORMS AND DIGITAL LABOUR THE UBER LABORATORY PRISM

Mathilde Abel, Patrick Dieuaide

ABSTRACT

Based on interviews with both employees working for the company Uber and drivers using the Uber app, this chapter revisits the notion of work platforms by focusing on the virtualisation concept (borrowed from P. Lévy, 1998). Defined in a simplified way as a process combining programming and notification, virtualisation is mobilised in two ways. First, to propose an approach to work platforms as 'work ecosystems' and to reassess the notion of digital labour; as the latter is too often reduced to a click, we present it as a continuous activity anchored in the digital and professional spaces in which drivers transmit and receive information. Second, from this perspective, we argue that the virtualisation process refers to a productive world based on the idea of work prefiguration or representation (being virtual work). Furthermore, we build a typology of externalities (or socio-spatial effects) based on the interplay between the digital labour activity of drivers and the Uber platform. The chapter concludes by discussing the scope of this framework for understanding the clashes in terms of temporality and the inevitable social conflicts in which the Uber platform is both the scene and the object.

Keywords: *digital platform; digital labour; virtualisation; work ecosystem; digital space; professional space*

INTRODUCTION

In many studies and field surveys on digital labour platforms, it has been common practice to distinguish between web-based platforms and location-based platforms. The first ones outsource work via direct call-up to a geographically dispersed population (e.g., web-based platforms, such as ATM or Upwork), while the second are based on a dedicated application (location-based applications, such as Uber) that allocates work to individuals in a specific geographical area (Berg, Furrer, Harmon, Rani & Silberman, 2018). This distinction between "crowd work platform" and "work-on-demand platform" highlights two possible

options for linking labour supply and demand in the field of the gig economy: one direct (or online) and the other indirect (through an application).

However, a comprehensive literature review reveals a second difference in the way web-based platforms and location-based platforms operate. The former responds to a “just in time” dynamic (De Stefano, 2016), the latter to a “just in place” dynamic (Wells, Attoh & Cullen, 2020). Thus, according to labour jurist De Stefano (op. cit.), the expression “just in time”, when applied to platforms, refers to an employment offer that combines easy access to a wide variety of (micro)tasks with a flexible model of work organisation. These can connect an available workforce at any time, free of fixed time constraints and paid on a per-service basis. For Wells et al. (op. cit.), the perspective is somewhat different. The notion of “just in place” is preferred to that of “just in time” to emphasise the power of platforms – such as Uber – to position drivers in the best possible way within urban spaces to meet customers’ demand for mobility at any time. In both cases, platforms form an ecosystem that places the worker in a new space and a singular temporality, suggesting a major transformation of the nature and practices of work.

This paper chapter examine the foundations and implications of this new topology of work. In the vast literature on platforms, many authors seem to accept (explicitly or implicitly) the principle that platforms apply the well-known Taylorian principle of “the right man in the right place”. In other words, this approach considers that there is no need to question the differences in nature between a traditional company’s ‘command and control’ system and that of platforms. Based on algorithms, this system would be more subtle and complex, but the purpose of controlling workers’ actions would be the same. The purpose of this chapter is to show, on the contrary, that work platforms – whether web-based or location-based – are accompanied by a double rupture. First, a topological one is observed through the existence of a digital programming space (Supiot, 2015) where work is defined virtually by a certain number of parameters; a second, topographical rupture can be seen in a new geography of workplaces characterised by the immersion of more and more professional spaces in public space (whether urban, commercial, private, etc.).

To support our remarks, in the first part we will discuss the notion of platforms, understood as work ecosystems. On this basis, the notion of digital labour (Casilli & Cardon, 2015) is reassessed, taking into account the duality of workspaces between the digital and the professional, driven by a virtualisation process (or “platformisation” phenomenon). Using our case study based on Uber firm activity, the second part analyses the consequences of this profound change in the relationship to both the place and time of work. We focus on the way in which digital labour is organised and managed by Uber in this new context. Particular attention is paid to the effects of scale and to the management and digitisation activities attached to the process of virtualising drivers’ working practices. Lastly, we examine the socio-spatial conditions in which driver performance is implemented and valued by the platform. Our investigation shows the importance at this stage of the place and role played by externalities and feedback effects

in the business model's sustainability. The chapter briefly concludes with the issues and perspectives raised by the spatial duality of our digital labour hypothesis, especially in debates about digitisation's impact on the regulation of social work relations.

AGENDA

1. Theoretical framework: the digital labour space-time duality
2. Case studies: the Uber virtualisation process
3. Discussion: from the digital to the professional space (and back again), digital governance and socio-spatial effects

1. GENERAL FRAMEWORK OF ANALYSIS: THE DIGITAL LABOUR SPACE-TIME DUALITY

Economists and sociologists have written extensively on platform work. While their views may differ on the scale and singularity of the phenomenon, they largely agree that such platforms are businesses like any other. For the former, they are an original form of organisation that considerably lowers transaction costs and whose intermediation function enables supply and demand to be brought together more efficiently than the market (or contracts) or hierarchy of firms (Autenne & De Gellinck, 2019). For the latter, platforms are synonymous with the outsourcing of low-protection jobs and are powerful vectors of precarious, deskilled and underpaid work (Eurofound, 2018). But platform work is not just about techno-organisational choices responding to logistical arbitrage.

1.1. Digital platforms as a “work ecosystem”

As suggested by A. Dudézert (2018, p. 48–49), C. Bénavent (2016), and F. Eymard-Duvernay (2004), platforms are open and modular systems, alternatives to the classic ‘command and control’ system. They function as “collective cognitive devices” (Eymard-Duvernay, *Ibid.*, p. 63), offering users unrivalled “interpretative flexibility” (Pinch & Bijker, 1984, in Dudézert, *op. cit.*, p. 18). On one hand, according to this approach, platforms help to put workers’ subjectivity and intelligence back at the heart of work practices. On the other hand, as Bénavent suggests, platforms aim not to directly control the performance or behaviour of workers but rather to organise and manage the information they send or receive (Bénavent, *op. cit.*, p.30) in order to coordinate and ensure greater efficiency of their actions.

From this perspective, platform work constitutes what we propose to call a “work ecosystem”. The particularity of this device is that it replaces direct communication between individuals and transforms social work relationships into relationships of co-presence (A and B) mediated by the platform (C) (see Figure1).

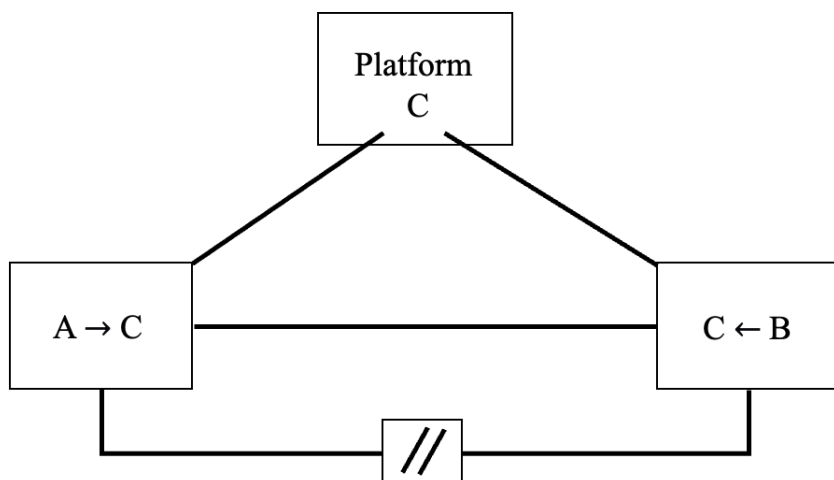


Figure 1. Triangulation: an operation of enclosure of the digital space

In other words, there is no longer anything immediate about work in the age of platforms insofar as its reality or its very possibility, as a service or productive act, is not self-evident but presupposes that the platform (C) first produces and guarantees a certain coherence of representation of work between A and B. This alignment requirement necessitates an intermediation activity that can be schematically broken down into two stages:

1. The first stage is programming. It is made possible by a small number of parameters extracted from the information collected from users on the different sides of the platform. This stage can be defined as an operation of “subjectivities” capturing and digitally shaping the goals assigned to the work. In that way, the platform opens new possibilities by objectifying the reality of work through cross-referencing, correlations and other calculations performed using algorithms.
2. The second stage is notification. That is to say, the distribution of these parameters and their display on a screen in a form that is readable and

understandable by the various users involved in the work performance. Literally, the platform makes visible and understandable what work is to be done. This operation is crucial because the knowledge of such information provides A and B with the ability to commit in a coherent manner and operationalise the moment of service delivery. To rephrase G. Deleuze, we would say that from a formal possibility, the work then becomes a real possibility.

Thus, programming and notification constitute the two stages of the same work virtualisation process (using P. Lévy's expression). For this philosopher, virtualisation applied to the business world "consists in making the space-time coordinates of work a constant problem" (Lévy, 1998, p.16). The same applies in the digital age: work is a problem because its geographical position in social space is never determined in advance (Meil & Kirov, 2017). Work must therefore be redefined, programmed and notified each time, according to the situation, i.e., set and made visible in a structured way – on the basis of information that is issued by users and then captured, arranged and screened by a platform.

1.2. The Spatial Duality of Digital Labour

We propose to define the "spatial duality of digital labour" as the two moments of programming and notification of information which structure the digital space and give work its virtual reality (i.e., full legibility among stakeholders). Two remarks will usefully complete this presentation:

Programming is a coding operation that defines work through representations. The latter is exclusively embedded in a digital space and imposes itself through the interface between users and workers. In this digital space, programming is a user-activated feature of the platform which is provided with data. It is contained within digital labour, as defined by A. Casilli and D. Cardon, namely: "an eminently cognitive work that manifests itself through an informal activity, captured and appropriated in a market context by relying on tasks mediated by digital devices" (Cardon & Casilli, 2015, p. 31). Far from being reduced to a click, digital work is explicitly part of the process of interactions fuelled by a permanent flow of information production and exchange. As we will observe in the case of Uber (see next section), these flows and operations are the object of an extreme rationalisation that manifests itself in an advanced cognitive and international division of digital labour.

We must outline that programming represents a systemic breakdown/separation in the man/machine interaction, as the relationship between the worker (or platform user) and their work is cut. The worker is no longer attached to the machine that imposes on them a unit of time, space and action. Dematerialized and disembedded (in French, *décorporéisé*, Dudézert, 2018, p. 38), digital labour is a process carried by the community of users

through network infrastructure, relocating and desynchronising work and granting it more autonomy in a space of its own, the digital space. In other words, programming does not mean the end of work, as is often claimed in debates on the digitalisation of work, but rather that it is impossible for individual workers to represent their work and/or to acknowledge a specific working condition in the use of digital technologies. Equipped to interact and communicate with each other, workers and users experience digital labour as something distinct to their work practices and socio-professional identity. In short, digital labour is “abstract” work that has no immediate content or meaning for its authors.

Notification, as the second stage in the work virtualisation process, can be defined as a customised communications operation. It prefigures work as an image or representation of a service, apart from its temporality and place of execution. More precisely, notification gives work visibility and legibility with spatio-temporal coordinates (even more so, in some cases). Thus, stakeholders know where and when the work will take place and, more broadly, the conditions for its completion. In other words, the notification operation virtually pre-positions the material and human means of production service in the social space. Work is “addressed” by designating and signifying to the concerned individuals a coherent pattern of behaviour or a line of coordinated actions. Per E. Sadin (2021, p. 64), these information flows induce a new relationship with representations “which institutes data as the primary and essential instance of intelligibility and action” and which, without doubt, confers a performative dimension onto them (Abel, 2021).

In short, platforms as an ecosystem of work are shaping a new productive world. A digital, dual, virtual and timeless world, based on the programming and notification of work in the form of representations. The duality of this productive world stems from the fact that information processing operations, driven continuously by digital labour, are oriented in polar opposite ways. Thus, programming feeds on ‘bottom-up’ information flows, while notification feeds on ‘top-down’ flows. Programming and notification supply one another. They carry a “feedback economy” (Sadin, op. cit.) which suggests an endless virtualisation of work practices and lifestyles.

2. CASE STUDIES: THE UBER VIRTUALISATION PROCESS

2.1.Space virtualisation: the double division of platform work (cognitive and spatial)

In this second part, we are investigating the way in which digital labour is organised and managed by digital platforms through a case study based on a platform from the mobility sector. The qualitative investigation we conducted is a monographic study of Uber's activities in France and results from semi-structured interviews (employees of Uber France and drivers using the Uber app). Inspired by Ballon (2021), this chapter considers the

nature and scope of their productive activities, their socio-productive system, the production means that are engaged and their governance system.

The qualitative data we collected has granted us with a better understanding of the Uber value chain and allowed us to construct analytical tools to apprehend how their business model can be sustained through greater virtualisation process. By doing so, Uber shapes a work ecosystem through a new space and a singular temporality which organises digital labour. It appears that platformisation comes with the virtualisation of the driver's workplace, relying on the company's ability to read the different sides of the market and sustain stakeholders' utility levels. Thus, from the interviews, we have observed that Uber's business model is sustained through a double division of work into its cognitive and spatial halves. Our purpose here is to reveal that platform work is mainly cognitive in nature. To virtualise work and make it cognitive, platform work is divided into three types of work (conceptual, empirical and crowd work) operated on three different territorial scales (global, regional and local). This division is based on different ways to frame, collect, treat and produce information or data in several locations.

In our case study, the virtualisation process results from the double work division and shapes the platform work ecosystem into three types of spaces (digital, market and professional) (Figure 2).

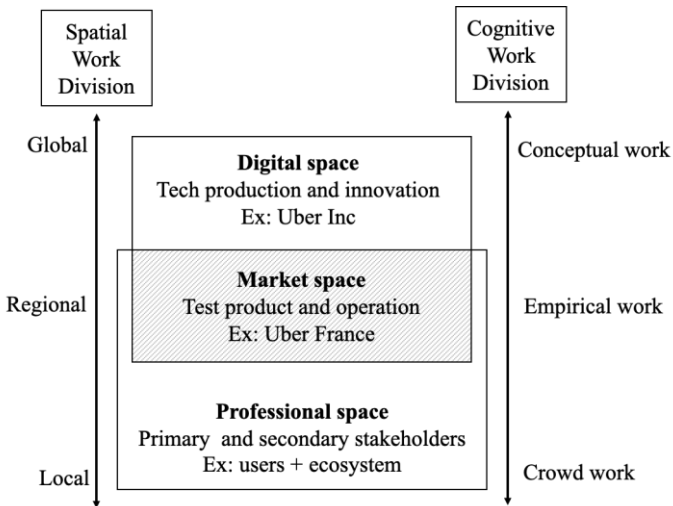


Figure 2. The platform's double work division: cognitive and spatial

From digital to professional

On one side, conceptual work in the digital space aims to focus mainly on computational models and algorithmic design that are usually created from a global perspective. In our case study, it consists in the main Uber tech subsidiaries in the United States (San Francisco, Seattle, New York), Canada (Toronto) and the Netherlands (Amsterdam). *“Engineers are grouped together by theme”* and types of products, in what Uber employees call *“central teams”*. For instance, *“the payment algorithms are designed in Amsterdam”*.¹ The conceptual work is primarily theoretical, intended to organise and frame the professional space. While speaking about the chain of decision-making, one of the interviewees illustrated their conceptual work:

*“We got an idea for a premium model from someone in Amsterdam who said, ‘but actually, I designed a model this weekend and I thought it was a good idea to make a premium [model] like that’, so we [The Uber France teams] tested it and so on”*². It comprises the creation, organisation and management of an abstract, autonomous and closed digital space (cognitive division of labour), a space that prefigures the professional space for the deployment of materials, activities and social relations of work in the various territories.

On the other side, we can find the professional space made up of digital activities among platform users (primary stakeholders) but also of the externalities related to secondary stakeholders (such as traditional firms or local authorities). The professional space is sealed within Uber’s digital space, as all the information flows through its digital platform. The professional space is, at the same time, divided between individuals, connected by the matching organised by the platform and determined both spatially and temporally. Each ride or meeting point is defined in the Uber digital space and corresponds *in situ* to an infinite number of potential situations in the professional space, which is physical. Once a ride is ordered for a determined distance and cost, the driver is notified of the opportunity (with payment attached) and the passenger is notified of the driver’s arrival. One interviewee, speaking about her first ride as a driver, said:

“I pressed ‘go’ without knowing what I was going to do. When you press ‘go’ you get connected and then at some point a bell rings and then it tells you to go to that place, pick up a certain person and bring them to this place. Okay, no problem. At the beginning, [...] I had a hard time managing my schedule. I had set myself 5 to 6 hours working a day. At the beginning you think you’re free, but soon you realise that you became addicted to these platforms, to the point where you forget how long you’ve been connected. There is a maximum time

¹ Interview n°1, Uber employee, from the French operations department (19 February 2020).

² Ibid.

limit with Uber, after 10 hours of connection they disconnect you. [Apart from that], they call you with rides, they say 'keep going'."³

The programming algorithm is built to adapt to different factors (such as supply and demand levels and location) and to notify users about the evolution of price opportunities and types of rides.

*"At the beginning of connection for new drivers [...] we are given very big rides that are quite attractive. [...] Then, as we get more and more connected, Uber ends up getting us, we get less and less attractive rides, less and less price mark-up"*⁴. By notifying about price incentives on a map, they continuously adapt to maintain the service. *"There are a lot of false mark-ups. From time to time there can be a lot of customer requests and very few offers, [...] it [Uber] creates a price mark-up, [...] displays [a map] on a certain location it's [...] red and you have 2.5 price mark-up on your rides [...]. So, the drivers run that way. Once there, we only have [...] basic, standard rides [...]"*⁵

The market space

The market space is the intermediary and hybrid space where the digital production is organised to be tested in the professional space. *"[O]perations and engineers are not [...] in the same place. [For the] Operations we try to be as close to the market as possible. Um, so typically we're organised in Europe, it's mainly centralised in Amsterdam where we have the largest teams. But to understand the local specificities and to talk to the drivers, to talk to the users, there are still teams based here [in Paris]. [...] And then, of course, there are daily discussions with the product teams, obviously the central team, to respond to the needs of the users, the drivers, or the regulatory changes"*⁶. The regional market spaces work in coordination with each other. They learn from the failures which certain regional entities have had and share their best practices. *"We are still a very young company that is growing very fast, that has made a lot of mistakes, and that also has a lot of successes. And so, what is interesting is that... already there are ideas which come from us, but there are ideas which come from England, [...] from Australia, [...] from anywhere"*⁷.

In the market space, Uber models are to be implemented and tested at the national level, so this mainly consist of empirical work. The model is tested by the firm on the field, each terrain being a regional or national one, often subdivided, for instance, into towns, districts

³ Interview n°4, Uber driver n°1 (2 July 2021).

⁴ Ibid.

⁵ Interview n°5, Uber driver n°2 (10 September 2021).

⁶ Interview n°1.

⁷ Interview n°2, Uber employee, head of public affairs (19 February 2020).

or even road segments, etc. *“We do price tests all the time. We do dispatch tests all the time”*⁸. The data gathered from usage can be considered as test results and useful feedback for both spaces: market and digital. *“It is a permanent interaction between the field and the product”*⁹.

In summary, the cognitive division of platform work brings together in the digital chain activities that are both direct (drivers and customers, in the case of Uber) and indirect (Uber employees). Combined, they contribute to the organisation and management of mobility through a workplace virtualisation process. To illustrate, for each particular ride request, the Uber virtualisation process leads to the construction of a driver-customer meeting point in an abstract space/plane of a digital screen. But the division is also spatial, and in that sense, it designates a dynamic of singularisation for this meeting point, which is a form of engagement in the real and physical world requiring concrete problems to be decided upon and resolved. The process is part of an open temporality, crossing or coming up against other action schemes, other temporalities, other scales and other actors.

2.2. Uber network and off-network externalities: distribution within the digital and professional spaces

As the virtualisation process arises, externalities of a different nature appear. Digital platforms rely on their ability to sustain different types of externalities (or network effects: Isaac, 2021). They can be found when the value or utility of a user derives from a good or service that depends on the number of users of compatible products (Katz & Shapiro, 1985). Among the various network externalities, cross-network externalities are two-sided and multi-sided market prerogatives and prerequisites (Rochet & Tirole, 2003). In the case of Uber digital platform, characterised by the existence of a digital space and a professional space that are linked but independent of each other, it can be assumed that externalities arise in the digital space where drivers and customers are virtually connected (cross-network effects) and that others unfold in the professional space and are captured by the platform once the service has been provided (direct and cross-network effects) (see Figure 3).

⁸ Interview n°3, Uber employee in charge of “driver growth” (6 April 2020).

⁹ Interview n°1.

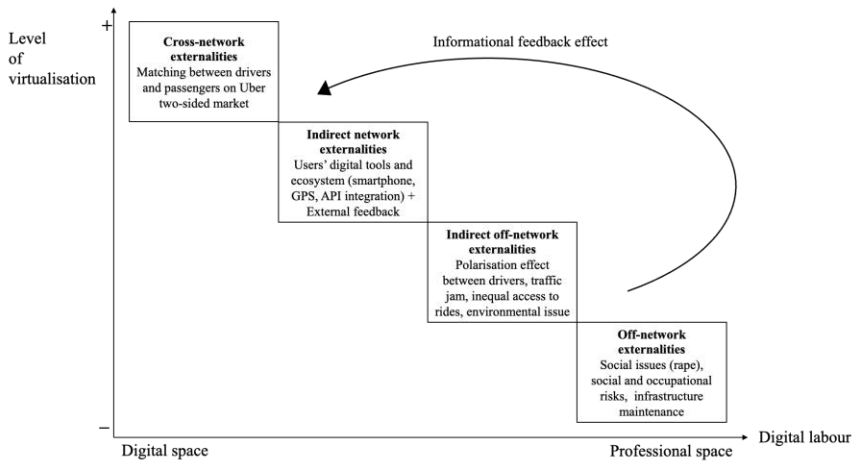


Figure 3. Platform socio-spatial effects: analytical proposal illustrated

We have also assumed that externalities must be apprehended by regarding two factors: 1) the level of virtualisation, i.e., the degree of proximity of the information digitised by Uber to the moment of its appropriation by the drivers; 2) their position, as digital workers, in a spectrum between the digital and professional space, depending on whether they receive notifications from the platform (information top-down effect) or send information (information bottom-up or feedback effect).

From these perspectives, the graph below is built to show the different distribution of externalities. By crossing the degree of virtualisation and the drivers' digital practices, a typology in 2 main categories of externality can be highlighted, depending on whether we consider digital labour as connected to the virtualisation process of work or to the professional space of the drivers.

In the first group, a distinction is made between:

- Cross-network externalities closely linked to the programmed matching of customers and drivers. Thus, the more the number of drivers increases, the more the platform will be frequented by customers and vice versa. The result of this interdependence is a self-sustaining cumulative dynamic that increases the platform's social utility and market value.
- Indirect network externalities linked to notification. They are based on the platform's opening to applications (via Application Programming Interfaces,

APIs) that offer drivers or customers access to complementary services. These APIs include the possibility for Uber drivers to access requests from hotel or restaurant chains or any other types of customers. The result is an expansion of the customer base that can enhance cross-network effects.

In the second group, the externalities do not have exactly the same basis, since the professional space in which the driver's job is carried out is not a closed one. Therefore, we will distinguish between two types of off-network externalities: those that can be recovered by the platform and those that cannot and/or which the platform does not want to internalise:

- Recoverable externalities are ones that the digital workforce has been able to capture and pass on to the platform. There are many. Indeed, we found externalities in the interviews – such as a polarisation effect between drivers, traffic jams, unequal access to rides or even environmental issues – that can all be considered as indirect, off-network effects. Once the feedback effect has revealed a problem or an opportunity, Uber will try to promote a solution through greater virtualisation of the professional space. If it represents an opportunity for the business model or if it jeopardises the platform's activity, the platform will find a way to internalise it through a deeper virtualisation process (new algorithms, new features, etc).
- There are other network externalities – such as social issues (including rape records), social and occupational risks or infrastructure maintenance – that won't be considered as market material and that Uber will not or cannot internalise. These must be carried out and managed by other stakeholders from the public space.

3. DISCUSSION: FROM THE DIGITAL TO THE PROFESSIONAL SPACE (AND BACK AGAIN), DIGITAL GOVERNANCE AND SOCIO-SPATIAL EFFECTS

We defined the platform workplace as the organisation of two independent but linked spaces within the public space: a digital one and a professional one. According to this duality, it is possible to identify different categories of externalities and elaborate a typology of socio-spatial effects. The workplace is a source of interactions or informational feedback between the two spaces that impact the management and value propositions of the Uber company. Considering the different scales of platform intervention allows for a better understanding of the consequences and limits of its action: between the socio-spatial effects that are internal to its network and those that are external, as well as between those that can be evaluated by Uber and those that cannot. Externalities are

moments of stakeholder involvement, whether their management is delegated (from Uber's perspective) or requires the intervention of stakeholders in the ecosystem, such as certain public administrations (cities, regions, ministries).

From our analysis, it might seem that the operation of work platforms provokes a circular dynamic: on one hand, work as representation can be considered the output or the programming-notification sequence (point of arrival); on the other hand, this output would also be the input or the starting point of a reversed process of information feedback from the data transmitted by actions carried out in real time through digital labour. In other words, the transition from representation to action (or from virtual work to real work) does not stop the process of virtualisation of work. On the contrary, it reopens it through a feedback effect (from real work to virtual work) which internalises an ever-wider range of data (behaviours, events, hazards) to improve the quality and accuracy of the same virtualisation process.

This expansive dynamic suggests an enclosure of the digital space on itself, comparable to Marx's general formula of capital (M-C-M). Platform work would refer to an autopoietic system, inclusive and always in touch with events (Isaac, 2017). This approach seems excessive to us, since it does not comprehend the latent tension between the virtual and timeless digital space and the social space of labour deployment in real time. Indeed, the circularity and closing of a digital space built on computerised temporality is opposed to the linearity and opening of a social space built on multiple and emerging temporalities. In other words, virtual work can never be completely merged with real work. The digital processing of the information collected may well reduce thresholds of uncertainty regarding the reading and interpretation of notifications, but it cannot eliminate the feedback effects induced by the play and variety of social interactions induced by the immersion of real work in the social space, which economists call externalities.

Many field surveys conducted in France and abroad (Brugnières, 2020) show how precarious the functioning balance on platform work is (Azaïs & Dieuaide, 2020). Whether it is based on "just in time" or "just in place" logic, the work virtualisation process depends to a large extent on a compromise between the temporal pressure exerted by algorithms and the resulting intensification of work in the field. As research by Wells, Attoh & Cullen (2020, op. cit.) shows, the Uber drivers' strike in New York City clearly highlights drivers' strategic ability to turn the algorithm to their advantage by collectively refusing to respond to customers' requests for rides. The supply scarcity was supposed to provoke a mechanical price increase of rides and ensure a transfer of value. We might also mention the numerous legal disputes brought by drivers to have their service re-classified on an employment contract. In our presentation, these conflicts mean that work platforms abuse virtualisation but also that the intelligence of algorithms, rooted in digital labour and the community of internet users, cannot capture the variety and complexity of the collective dimension of the general framework of experience.

In this context, it can be understood that platforms are having difficulty keeping their promises of independence and freedom addressed to digital workers (Abel, Dieuaide, Jan & Zarka, 2022). The virtualisation process cannot be reduced to a looping of drivers' behaviour and experiences, coupled with standardisation that is compliant with business model expectations. Nor can it unilaterally impose a mode of cognitive rationalisation and rely on a reduction of work to a semantic, a visual or an image that would predetermine and clear up the agenda (Chatterjee, Suprateek & Siponen, 2016). Work platforms cannot ignore the reflexive way in which digital workers interpret, appropriate and sometimes elude the prerequisites and promises that are addressed to them. In this sense, it could be argued that digital labour is not the manifestation of a new identity of the worker, such as the one embodied in the automaton figure (Casilli, 2015). At this stage, it is safe to write that the "game remains open".

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