Developing Skills in a Changing World of Work:
Concepts, Measurement and Data Applied in Regional and Local Labour Market Monitoring Across Europe
The world of work is changing fundamentally and quickly as a result of technological transformation, demographic development and globalisation. The contributions in the anthology show for ten European countries that not only do the degree and speed vary significantly between occupations, sectors and firm types – the changes take on diverse forms in different geographical locations. Labour market actors at regional and local level need to know which skills, competences and know-how are required from the labour force so that they can set up their strategies in line with the future developments.

Regional and local labour market observatories, which are established in over 550 regions and localities in Europe already, can provide significant support in these processes as they have far-reaching experiences with applying a wide variety of methods to collecting, analysing and combining data. Furthermore, they are embedded in regional/local networks of labour market actors and actively contribute to shaping regional strategy processes evidence-based labour market policies.

The contributions demonstrate from different perspectives the approaches to skills and competence monitoring applied in various European regions and localities. In particular, the authors focus on the methods and sources of data and information, implemented instruments, resulting strategy-building and role of observatories in these processes. The compilation of approaches offers an overview of the state-of-the-art in labour market monitoring, which can be used for building up skills and competence monitoring frameworks at regional and local level.

**Key words:** skills, competences, skills and competence requirements, regional and local labour markets, evidence-based policy-making, labour market monitoring, applied labour market research, labour market observatories
Christa Larsen, Sigrid Rand, Alfons Schmid, Andrew Dean (Eds.)

Developing Skills in a Changing World of Work:
Concepts, Measurement and Data Applied in Regional and Local Labour Market Monitoring Across Europe
Foreword

Globalisation, technological progress and demographic change are having a profound impact on the world of work. These mega-trends do not only determine the number of jobs that are available but, most importantly, affect their tasks and skill content. Technological change is, for instance, contributing to the automation of many industrial processes and increasingly of some service-sector job tasks. Similarly, population ageing is driving new skill needs by increasing the need for health and care-related services.

Although the timing and the speed of these changes differ across countries, empirical evidence suggests that they will continue (or even accelerate) in the coming decades and quickly extend to emerging economies. The ability of labour markets to adjust to such changes and of firms to make most of new technologies and move up the value chain will, to a large extent, depend on the ability of their workforce to adapt and develop labour market relevant skills.

In such uncertain context, measuring all these dynamics becomes crucial in order to provide an evidence-based rationale to labour market policies, contribute to our understanding of these phenomena and develop solutions ensuring that no workers are left behind in a labour market that becomes more inclusive. The analysis of regional and local labour markets is also of paramount importance as these are the functional areas where demand and supply of skills meet.

This volume discusses several new approaches to measuring skill needs across European countries and provides invaluable insights into the fundamental aspects driving skill mismatches. Furthermore, it addresses the various strategies for filling these gaps.

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Introduction

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The Starting Point

The world of work is changing fundamentally and quickly as a result of technological transformation, demographic development and globalisation. However, a comparative view on regions and especially localities shows that these changes take on diverse forms in each case: the degree and speed vary significantly between occupations, sectors and firm types in different geographical locations. Accordingly, employees need to acquire skills and competences that enable them to retain their employability during the change processes that affect them. Firms and regions also need to address this issue, as their economic success depends the availability of relevant skills and competences.

Consequently, labour market actors have the task of capturing which skills, competences and know-how the employed and unemployed as well as graduates need in these change processes. The increased transparency serves as a basis for designing appropriate offers and approaches or for changing the existing ones with regard to future developments. Regional and local labour market observatories, which are established in over 550 regions and localities in Europe already, can provide significant support in these processes because of the four characteristics that they display:

- The application of mixed methods and use of data from different sources (holistic approaches): statistical data are usually not sufficient for depicting regional and local labour markets and the resources available for generating data are often limited. Therefore, further sources of data and information are used in order to adequately describe the developments in the labour markets. Against this background, elaborate practices have evolved in which statistical data are systematically connected to local expertise and administrative processes of organisations (e.g. Labour Offices), or, increasingly, to Big Data from the Internet (especially online job portals). In these processes, important practical knowledge concerning methods and content has been created. Furthermore, prognostic approaches need to be mentioned here, which contain both quantitative and qualitative elements.
• **Scientific insights concerning overarching developments**: in their work, observatories need to study overarching trends in society and the economy in order to determine how they influence development at the regional or local level. This especially concerns the developments in vocational education and training (VET) and higher education systems or in specific sectors, but also the politics and governance of the labour market. Accordingly, observatories have close connections to scientific research or are located at universities, which enables them to tailor scientific studies to the specific situation in the region or locality.

• **Process-orientation in regional and local monitoring**: the role of regional and local labour market observatories goes beyond generating information. Regional labour market monitoring requires a complex process in which demand-oriented (i.e. suitable and relevant) information is created for regional and local labour market actors. The observatories also support the interpretation of information and ideally ensure that all labour market actors share a common conception of the situation. This is why the observatories do not limit their activities to providing information and instead focus on the knowledge of labour market actors. The observatories provide further support by converting knowledge into action. This concerns the regional strategy processes of evidence-based labour market politics. After the strategies are implemented, the next step is evaluation, which can lead to adjustments. Correspondingly, regional labour market monitoring is an action-oriented cyclic approach. This makes it possible to continuously record changes in the labour market and react to them strategically.

• **A Europe-wide network as a resource for innovation**: the work of many regional and local labour market observatories in Europe is influenced by their limited resources (time, money, personnel) and often geographical isolation. To still enable innovations, the regional observatories have united to build the European Network on Regional Labour Market Monitoring (EN RLMM). In this network, good practices are exchanged, common projects are initiated and the concept of regional labour market monitoring, which addresses the needs for practical implementation of ideas, is systematically developed further. For over ten years, the network has served as a resource for the conceptual and content-based work of many regional and local labour market observatories. Furthermore, it provides them with important support for the application of continuous innovations in their field of work.

These characteristics of regional and local labour market observatories constitute an excellent prerequisite for developing a Europe-wide system for skills
and competence monitoring in regions and localities. Before envisaging what it could look like, changes in firm-based processes and work have to be considered in more detail.

The Changing World of Work in European Regions and Localities

Digitalisation is considered to be the essential driver of changes in the economy. The division of responsibilities is also changing within firms, bringing about new requirements for employees, for example in regard to communication, creativity and flexibility as well as taking initiative and assuming responsibility. Additionally, technical competences for dealing with new digital technologies are required. Firms can benefit from digitalisation only when its employees are equipped with the above-mentioned skills and competences fitting exactly its needs. It has long been clear that even well-qualified professionals do not have the appropriate skills and competences needed for retaining their employability throughout change processes. Furthermore, ever more employers understand that lifelong learning is crucial for employees if the firm is to remain competitive. In this situation, the professional education field, comprising vocational education and training as well as higher education, is confronted with several challenges. Often it is difficult to conceive what types of knowledge and which skills and competences need to be conveyed and practiced. Furthermore, curricula are difficult to change, since VET courses and degree courses last for several years and it is difficult to integrate the dynamic changes arising from digitalisation into them. Especially in the field of professional further education and the training of people who are already employed, aspire to return to their careers or are currently unemployed, there is a need for a suitable, often individualised format as well as opportunities for further education integrated into work processes. Currently, this poses great challenges for the providers of further education in many European regions. Transparency is needed in order to empower actors in the field of education. Regional and local labour market observatories can play a crucial role in creating it.

When talking about skills and competences, the two terms are often used as synonyms. Definitions and demarcations are considered less relevant, especially in the practice of observatories or in sectors and occupations. Instead, the
manifestations of single skills or competences are of greater interest. Moreover, no existing definition has been authoritative enough to establish itself in research as well as among the intermediaries in politics and administration or labour market actors. In Europe, the most frequently used definition is found in the ESCO taxonomy of the European Commission. It differentiates between knowledge, skills and competences. The definition for skills originates from the European Qualification Framework and denotes “the ability to apply knowledge and use know-how to complete tasks and solve problems. Skills can be described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments). [...] The term skill refers typically to the use of methods or instruments in a particular setting and in relation to defined tasks. The term competence is broader and refers typically to the ability of a person – facing new situations and unforeseen challenges – to use and apply knowledge and skills in an independent and self-directed way”.\(^1\) Accordingly, the term competence “means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. Competences are described in terms of responsibility and autonomy”.\(^2\) In contrast, knowledge can be clearly demarcated: “Knowledge means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study”.\(^3\) OECD definitions are also used in addition to the ESCO taxonomy. In the OECD Skills Strategy – unlike in ESCO – skills and competences are used as synonyms. They are understood as a bundle of knowledge, attributes and capacities that can be learnt. Further concepts of skills and competences are used in many studies: for example, in regard to individuals they often refer to “key competences” as well as work- and organisation-specific competences. Additionally, the use of the term “hard skills” for technical and methodological competences and “soft skills” for social-communicative competences is widespread. Apart from the professional or subject-specific competences, the focus is on those competences that can be used in all professional fields. In the empirical re-

\(^1\) https://ec.europa.eu/esco/portal/escopedia/Skill.
\(^3\) https://ec.europa.eu/esco/portal/escopedia/Knowledge.
search literature there is a widespread consensus that these are so-called “transferable” skills or competences. The various concepts of skills and competences are, for example, applied when developing competence profiles for specific occupations or areas of activity.

Compared to the numerous definitions of skills and competences, the description of skills and competence acquisition and development in particular is a “black box”. Especially, this concerns their application in the field of education, even though first attempts have been made to explore the learning processes (opportunities for learning as well as willingness and motivation to learn), the framework conditions facilitating learning in organisations (time, support, spaces, financing, voluntariness) as well as the situation in regions or localities (networking of labour market actors, steering of communication, regional and local strategies). However, the insights are rather fragmented and lack descriptions of application processes relevant to practice.

Furthermore, at the moment a process that takes place at earlier stages of monitoring has received heightened attention – the question of how to build up the so-called “signalling”. This means that the relevant labour market actors in the field of education, but also in placement services or governance, learn within a narrow time frame which changing skills and competence requirements are currently being developed in individual firms located in a region or locality (cf. Restuccia and Taska in this volume suggesting to orientate towards the Talent Pipeline Management Initiative implemented in the U.S.). This example conveys that in the field of education and in employment services many regional/local actors increasingly orientate towards the skills and competence requirements of the firms. The latter are often seen as customers whose needs are to be met with flexible and appropriate offers. Consequently, some labour market actors, especially those in the field of education, have to re-adjust their self-perception. Eventually, these changes lead to a break-up in the pillarisation of employers and education providers. Education providers especially have been observed to take crucial steps towards leaving the silo mentality behind them. Such processes are not very distinct in countries with highly formalised VET systems (e.g. Germany and Austria), unlike in countries with less complex and locked-in structures (e.g. England, Scotland and Italy). Despite the opening of the field of education in many regions and localities, there is still need for support from third parties to improve the communicative connections between
these two pillars and contribute to the optimisation of skills and competence development. Regional and local labour market observatories assume a special role in this process.

The Role of Regional and Local Labour Market Observatories in Accompanying Skills and Competence Development for the Changing World of Work

Regional and local labour market observatories carrying out labour market monitoring have good prerequisites for building up a regional and local skills monitoring framework. In the first instance, this arises from the experiences that they have with combining quantitative and qualitative methods as well as different sources of information and data when creating transparency for labour market actors. The holistic approaches to depicting the situation in regional and local labour markets have been applied for many years almost out of necessity. Conceptually, most observatories are built on the matching approach from labour market research: they bring together the demand from firms with the regionally and locally available supply in regard to occupations, sectors and qualification levels. Matches or mismatches can be calculated on the basis of structural data. However, this approach does not allow observatories to take into account all changes in the behaviour of firms or employees, graduates and the unemployed, as structural data are essentially observations of the past. Therefore, to position and validate structural data, many observatories resort to local expert knowledge, which enables them to estimate the situation currently as well as in the near future. The perspectives of as many actors as possible are thereby taken into account. In many observatories, very mature practices for extracting expert knowledge have been established that are oriented towards focus group and Delphi methods. By incorporating expert knowledge (bottom-up) it is possible to capture and specify the skills and competence requirements that arise in regional and local firms. As the examples in this anthology demonstrate, experts can make statements related to sectors and occupations, depending on where they are located. At the moment, observatories are systematically extending their expert circles in order to determine and measure skills and competence needs.
Moreover, the examples from European regions presented in this anthology demonstrate that the matching approach is often implemented using instruments known as Occupational Barometers (cf. Maleszyk; Sosnowska for Poland as well as Plaimauer for Austria in this volume). In this approach, experts are of major importance and the information created this way is highly accepted in regional and local evidence-based planning and political decision-making. Other examples show that besides using structural data as a basis for validation by regional and local experts, Big Data from online job-portals is applied as a means of gathering further information increasingly often (Mezzanzanica et al. for Italy and Baruffini for Switzerland in this volume). Especially in the last three to five years, many observatories have tapped into the Big Data from online job-portals and occasionally also social media in order to enhance their understanding of the requirements of firms. Apart from qualification levels and occupations these data deliver information at the level of skills and competences, thus constituting an excellent basis on which local experts can rely on when validating skills and competence requirements. Furthermore, in many cases, further information sources such as observations at job fairs (cf. Oding for Russia in this volume) or simple electronic employer surveys (cf. Sosnowska for Poland and Atin for Spain in this volume) are used to describe skills and competence needs as precisely as possible. Moreover, some observatories capture future skills and competence needs by using foresight techniques or quantitative prognoses, which are validated through qualitative expertise.

Secondly, the close connection of observatories to research institutions helps them implement regional and local skills monitoring. Scientific insights on overarching trends in particular can be used as reference points. In regard to the demand for and development of skills and competences, scientific studies make clear that the exclusive focus on the labour market is too narrow. On the one hand, the emergence of skills and competence requirements and their development needs a well-founded understanding of the processes of organisational change resulting from digitalisation. On the other hand, the essential role of organisational culture has to be recognised, as it frames the development of skills and competences (cf. Fontana et al. and Di Nicola et al. in this volume).

Besides the organisational processes, the skills and competence needs of specific target groups are important, be it Generation Z, which is gradually joining the labour force (cf. Panzaru and Iotu in this volume) or low- and unskilled em-
ployees, who are supposed to receive additional workplace training. For these groups especially, competences based on attitudes and motivation are partially more important than subject-specific knowledge (cf. Atin and Serrano in this volume). An important target group in the firms are women, especially in regard to their further development and careers. Here, fundamental research insights urge actors to take a broader view on skills and competences (cf. Di Nicola and Cioce in this volume).

The emergence of specific skills requirements within firms is manifested in the labour market as the demand for skills. The other side of the coin is related to the educational sphere. Even there, scientific insights are necessary in order to comprehend why offers for skills development are designed in a certain way. This, for example, is related to the unemployed whose workplace integration is to be supported through skills development (cf. Keil and Splittgerber in this volume). Additionally, important scientific research on how to break up the pillarisation between firms and education providers is carried out in observatories, and these insights enrich our understanding of labour market developments.

Thirdly, the strong process-orientation of regional and local labour market observatories means that they do not perceive themselves just as producers of information and data, but as framers for the development of regional strategies with the ultimate goal of matching supply and demand. Especially in the case of regional and local skills monitoring, the established networks and communication structures of observatories are very helpful for deliberations on skills requirements, skills development and designing suitable approaches, which are often taking place outside of formal structures. Regarding these functional trust-based networks, the region or locality simultaneously sets the framework and constitutes the source for the identity of the actors. Consequently, not only labour market actors, but also other actor groups from civil society as well as representatives of the regional and local politics are often involved. This way, as in the case of the Skills Escalator in Exeter (cf. Dean and Neild in this volume), all training offers can be directed towards the acquisition of specific skills and competences by involving the regional economy and politics. The concept of the Resource Center, which is employed in St. Petersburg, Russia, is slightly different, since it works as a clearing house between supply and demand and offers a broad information base that facilitates the optimal
matching of supply and demand of skills and competences (cf. Oding in this volume).

Fourthly, as the observatories’ resources are limited and they are geographically isolated in their localities, they receive considerable impulses for innovation from the EN RLMM. For over ten years, most of the regional and local labour market observatories in Europe have been connected to each other through the network. Correspondingly, a well-established practice of exchange between the observatories and third parties from international organisations, research, administration and politics has been developed. It involves the definition of topics, which need to be framed and developed further through the Annual Meetings, Anthology or network projects. The Anthology serves as a stock-taking on the topic of regional and local skills monitoring and prepares the basis for targeted and focused exchange at the Annual Meeting. These two channels for exchange enable the representatives of observatories to further their insights into concepts and approaches and serve as a platform for presenting the experiences that they have gathered with their implementation. Moreover, many European observatories have implemented innovations in their line of work that emerged from the exchange within the Network and the pooling of available resources. Therefore, a specific focus of the Annual Meeting of 2018 will be on the role of taxonomies in regional and local skills monitoring. In particular, the advantages of top-down and bottom-up approaches regarding the applications in observatories will be explored, since taxonomies need to account for the quickly changing environment shaping the development of skills and competences (cf. Bobkov et al., Djumalieva et al. and Žakelj in this volume). The contributions to the anthology explore the different ways that regional and local labour market observatories can implement regional and local skills monitoring.

The Structure of the Anthology

The 22 articles in the Anthology enable insights into the topic of regional and local skills monitoring at three different levels. Chapter 1 assembles the contributions concerned with change processes in firms and the associated skills and competence requirements, while Chapter 2 explores the different avenues to regional and local skills and competence monitoring as it is currently imple-
mented. Chapter 3 focuses on the fundamental question of the use, necessary adjustments and further development of taxonomies, which are of great importance as dominant sorting structures in regional and local skills monitoring. These pivotal thematic lines need to be taken into account when building up sustainable approaches to regional and local skills monitoring.

Chapter 1 presents research results that can serve as the orientation point for building skills monitoring. Renato Fontana, Carmine Piscopo und Erika Nemmo focus on the so-called digital professions and the relevant cross-cutting competences and soft skills. They impressively elucidate the relevance of fundamental skills and competences in this context, which can also be of importance in other economic sectors and firm types. Patrizio di Nicola, Alessia Cremonini, Michela Cossu and Stefano Scravaglieri explore the central role of management in change processes and stress the importance of taking the role of office leadership during these processes into account. The contribution by Carsten Kampe, Daniel Porep and Anja Walter extends the focus to further sectors and actors in the firm and considers which soft skills and competences are needed in firms. Further perspectives are introduced by Eugenia Atin, Raquel Serrano und Ibon Zugasti from the Basque Country in Spain, who reflect upon future skills developments in relation to the programme “50 Strategies for 2050“.

Chapter 2 showcases three different approaches to the implementation of skills monitoring in regions and localities. To start with, in Sub-chapter 2.1. the focus lies on economic sectors, occupations and firm types. Three contributions describe the implementation of Occupational Barometers. Piotr Maleszyk as well as Marta Marzena Sosnowska show how different data sources can be connected in two Polish regions, with the aim of capturing information on skills and competences that is as detailed as possible. In both regions, local experts play a very important role in validating data from other sources. For the quality of data it seems to be essential to include as many different expert perspectives as possible. Claudia Plaimauer demonstrates for Austria that the use of expert knowledge goes beyond the validation of structural data and can take on an independent status.

The following contributions apply the matching approach from labour market research to different data. Pierre-André Gericke and Alfons Schmid draw attention to the fact that many newly unemployed people were formally over-qualified in their most recent job. They show how competence development in
the workplace affects one’s further professional career and analyse the differences between East and West Germany as well as various occupations. Using Big Data from online job portals, Dan Restuccia and Bledi Taska demonstrate which occupations have developed skills gaps in the U.S. In the cluster of articles following sector-specific approaches, Moreno Baruffini demonstrates how a regional labour market observatory can capture skills requirements in a demand-oriented manner for the commercial sector in a Swiss Canton. Aleksandra Webb and Ronald McQuaid turn to the Early Learning and Care sector in Scotland and show how skills development can also be used for improving the attractiveness of a sector. The final contribution in this sub-chapter is by Mario Mezzanzanica, Fabio Mercorio and Emilio Colombo, who show in a very detailed manner how data from online job vacancies can be used to measure the requirements for digital and soft skills within professions and evaluate the probability of job automation in the next step.

Sub-chapter 2.2 covers the supply-side of skills: two contributions focus on socio-demographic definitions of target groups in the labour market while two others concentrate on qualification-based target groups. In the case of the former, Generation Z is in the centre of attention. Ciprian Panzaru and Alina Iotu report on the self-perceptions of Generation Z in regard to their skills and juxtapose them with the expectations and perceptions of employers. Furthermore, Patrizio Di Nicola und Mariaroberta Cioce address women’s skills potential for career development as a result of motherhood. Regarding the qualification-based target groups, Eugenia Atin und Raquel Serrano explore the case of low- and unskilled workers and how their employability can be improved through targeted skills and competence development. Rolf Keil and Bettina Splittgerber address the target group of long-term unemployed and consider how to facilitate their re-entry into the labour market. The authors demonstrate how the skills development of this target group can be addressed at the juncture of employers, occupational safety administrations and placement services.

Sub-chapter 2.3 focuses on regional and local approaches. Andrew Dean and Ben Neild demonstrate how in the Exeter region, the Skills Escalator helps to systematically connect different offers in a specific skills field, identify gaps in the skills supply and develop a skills offer precisely fitting the needs of the region, making it attractive not only for employees, but also for employers. Simi-
larly, Nina Oding explores the interplay between the innovative economy and skills development in St. Petersburg, Russia, showing impressively how very different data sources can be brought together with the aim of capturing skills needs. This particularly exemplifies the potential of observatories for skills development.

Chapter 3 is dedicated to taxonomies, which are used to frame regional and local skills monitoring. In their contribution, Vyacheslav Bobkov, Vadim Kvachev and Irina Novikova consider the taxonomies for skills monitoring that are used in different parts of the world. They advocate for the development of an overarching international system, which seems plausible in regard to global labour markets. Tjaša Žakelj argues that the ESCO taxonomy is well-suited for the countries of the European Union and demonstrates which challenges have arisen for Slovenia in the process of establishing a skills monitoring system based on the ESCO taxonomy. Jyldyz Djumalieva and Cath Sleeman point out that the pre-defined, i.e. top-down taxonomies, are too static to take into consideration newly emerging skills and competence needs and therefore cannot do justice to the dynamic developments. They suggest assuming a bottom-up approach that is developed using Big Data from online job portals and involves developing taxonomies on the basis of clustering. Both approaches provide a good basis for further discussion about the possibility of combining pre-defined taxonomies with flexible elements. Finally, Anna Grochowska suggests a possible route outside these taxonomies: the concepts used to frame regional skills monitoring can vary between regions or localities based on their economic structures and development.

Next Steps and Perspectives

The contributions in this anthology not only offer important proposals for those interested in regional and local skills monitoring, but also form the basis for the Annual Meeting in 2018. There, the Network members will discuss the state of the art in skills monitoring and develop further approaches. The Network Meeting gives a good overview of the existing examples of good practices, explores how all European observatories can be further engaged in this discourse and considers which role different European and international organisations could play.
We would like to thank all the authors for their valuable contributions demonstrating that combining various perspectives – both in this anthology and at the Annual Meeting – is necessary when addressing the complex issue of skills monitoring. Therefore, we appreciate the opportunities to approach innovative topics in the EN RLMM and are looking forward to further steps and topics.

Last, but not least, we would like to thank Amelia Wallace for her careful and diligent proofreading of this year’s contributions.
1. RELEVANCE OF SKILLS AND COMPETENCES IN A CHANGING WORLD OF WORK

Cross-cutting Competences and Soft Skills in Digital Professions: Knowledge-sharing and Social Stratification in the World of Tomorrow

Renato Fontana, Carmine Piscopo and Erika Nemmo

Introduction

The advent of what has been called the “post-industrial” and “post-modern” society by some (Touraine 1970, Bell 1973, Offe 1985, Lash and Urry 1994) and “network” (Castells 1996) or “knowledge society” (Rullani 1994) by others has deeply changed our way of perceiving, living and relating. At the basis of the various definitions of contemporary society there is a common denominator enabling a transformation that we are still unable to grasp: the advent of Information & Communication Technology (ICT). ICT has become part of our daily life, permeating places and “non-places” of our existence, radically and cross-cuttingly changing the working contents and approaches of almost all professions and, at the same time, creating jobs that did not exist up to a few years ago. It is natural, therefore, to expect from a store man or a waiter the digital skills required to use an app for localisation or registering orders, just as we are not surprised by a friend of ours who works in the field of computer science performing a job we find impossible to understand. If we are not familiar with the job title, we are not even able to form an idea about what they do in their profession or what it is needed for.

The objective of the following considerations is twofold. First of all, we wish to reflect on how skills change and grow; secondly, we aim at understanding the consequences of the on-going changes in terms of social stratification inside the composite aggregate that we call the labour market.

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Let’s start with the first item. What is the direction taken by skills today? What are the tools we need to dispose of in order to face the zeitgeist of knowledge society? In sum, is it easier or more difficult to produce, work and express one-self today than when the Taylor-Ford model prevailed in the industrialised Western world? Do not expect exhaustive answers; we do not have any.

We know, however, that the world of skills is more articulated in comparison to the times mentioned above. In the following pages, we will in particular talk about the on-going transformations in the world of digital economy, reflecting on:

- Technical-professional skills;
- Cross-cutting a-contextual skills;
- Socio-relational skills.

While the first item reminds us of scenarios well-known in literature, the second one makes us think that ICT professions are going through a socio-professional stratification similar to the one experienced by traditional professions and trades during the Second Industrial Revolution in the second half of the 19th century. In this context, the suspicion emerges that the representatives of some medium- to low-profile professions are excluded from acquiring cross-cutting skills that would enable them to work better and manage important discretionary spaces. Unfortunately, training is expensive. This would make us imagine configurations similar to those of enterprise power structures as we have known them so far: a sort of concentration without centralisation (Sennett 2000: 55).

As we shall see, technical-professional skills, i.e. those connected to a specific and delimited working task, are less important in the ambit of the activities carried out in an organised context. On the contrary, acontextual, cross-cutting skills prevail in the various ways of working. In other words, on the Web, tasks are gradually being transferred to machines, while the skills that count are the ones that go beyond the “technicalities” and look at the need to sell to a potential user/client the product of one’s intelligence such as goods, services, knowledge, innovation, culture, ideology, etc. In the ambit of the so-called cross-cutting skills, the socio-relational ones are the most important as they get the consumer hooked, make them think that the product is more than necessary to improve their own and/or family’s quality of life or social status and get
them to buy it. The socio-relational skills make them feel like the centre of the universe – as somebody who is unique and special.

The purchase is not simply an economic transaction based on mutual gain between the seller and the buyer, i.e. between the subjects who represent the offer and the demand on the market, respectively. It is much more than that and goes beyond it. The purchase of a product often means moving into a new world “full of opportunities” but also becoming part of a “community of intents and values”, as happened, for example, to the people who centuries ago knew the meaning of “good neighbourly” relationships, where they shared not only time together, but also customs and traditions day after day.

The enterprises of the sector considered in this paper therefore do not limit themselves to searching for professionals with high technical skills, but instead look for skills consonant with the on-going digitalisation process, where standardised and Taylor-like processes are replaced by de-standardised ones displaying a high rate of uncertainty. The greatest skill today is knowing the starting point of a project without knowing the precise arrival point. The imagination of a path and its re-modulation in reality is certainly an essential phase for organisational systems and their protagonists, especially in the meanderings of the sharing economy. This is done step-by-step to avoid being overcome by anxiety and to try to keep the process under control instead.

The spread of ICT certainly requires a continuous updating of technical-professional skills, but in our view, what counts more is the recognition of the cross-cutting technical-professional skills in sociological terms. As we shall see, work becomes easier for those who willingly accept communication and being part of a team; in contrast, it becomes more difficult for those who do not know how, cannot or do not want to relate to the other actors of the production process, both in- and outside the labour market circuits. We pass from the valorisation of strictly contextual skills to the introduction of skills separated from specific professional codes.

The skills connected to digital platforms seem to have a “soft” connotation, since their main applications are firstly to allow the protagonists of the organisational arena to relate to the outside world and, secondly, to adapt to it. Therefore, enterprises do not simply look for professionals with a sound technical/engineering background; sometimes they search for professionals with strong communicative skills directly. Hence, the hypothesis we aim to follow is
that technical competences are melting in front of the extraordinary opportunities offered by the Web and by the professional profiles connected to social logic, whether real or virtual.

**Digital Technology as a Socio-relational Practice**

To evaluate and understand in detail digital skills, which are increasingly demanded by the current labour market, we need to step back 20 years to when the debate over digitalisation (it would be more correct to talk about the “Internet”) and its impact on the socio-economic sphere was centred on the concept of the “digital divide”.

Indeed, at the beginning of the new millennium, the digital divide was considered a critical issue and was at the centre of public and political debate: it was such an important factor that it was able to undermine territorial economic development. The theme was discussed during the G8 held in Genoa in 2000 and an international co-operation programme was introduced:

> “Digital Opportunities for All: Meeting the Challenge, contained a vision of global development based on the power of information technology to promote sustainable growth, advance social justice and strengthen democratic governance” (DOT Force 2002).

Digital development has always been considered the perfect tool to face the criticalities of the modern age, where the gap between rich and poor, personal freedom and oppression, opportunities and injustice flatten our society into two extreme positions between those who have and those who have not. From the scientific point of view, the theme was not yet widespread or developed and the studies proposed various perspectives centred more on the relationship between the man and machine and on the opportunities for being globally connected. For this reason, digital technology had to be managed in a different way.

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4 “In July 2001, G8 leaders endorsed the Genoa Plan of Action, a product of the work of the Digital Opportunities Task Force. The DOT Force, which was formed following the 2000 G8 Summit in Okinawa, represented both a unique model of international co-operation and a new way of responding to the challenges of development. It brought together committed leaders from government, industry and civil society, drawn from G8 member countries and from the developing world, to conceive a forward-looking action plan designed to expand the use of digital technology and to universalize its benefits” (Digital Opportunity Task Force 2002: 2).
way. Specifically, the Internet had to be a universal tool, a project capable of removing gaps and of favouring inclusion.

However, in the past, the public debate on the Internet was forced to discuss the theme of infrastructural accessibility, using exactly the categories it was trying to fight against: those who have and those who have not. The spreading of digital technology was mainly intended to increase the possibility of access to a personal computer and an internet connection with or without a modem. A few years later, thanks to rapid technological development, the concept of the digital divide started to find other interpretations. Scholars analysed the issue, trying to identify the possible factors that were compromising the spread of digital opportunities, including socio-economic variables. In the mid-2000s, the digital divide was already considered to be more than a problem of access to information. No-one could have imagined at the end of 2000 that new digital devices would have once again changed the social landscape.

Among the categories of products and services that had the economic and cultural strength (and perhaps the luck) to overcome concerns about the access to technology, we can consider mobile devices, social networking sites and Web 2.0 services. Thanks to the extremely wide global diffusion and the high profitability of these three tools, we rapidly overcame the infrastructural limits (connections, lines, and devices), generating a quick multiplication in the opportunities linked to productivity, entertainment and interpersonal communication. We could therefore think of a drastic reduction in or the disappearance of the digital divide, but that would be an incorrect deduction. On the one hand, the problem of Internet access is certainly much smaller today than it was in the past. On the other hand, we cannot consider the digital divide an out-dated concept. Today, the digital divide is no longer linked simply to access but also to the skills and opportunities that technology can generate. The issue is no longer geographic (between rich and poor countries) or technical (related to the availability of lines and connections), but cultural and educational.

This important change in the interpretative paradigm requires a considerable intellectual effort to understand a new world that is always connected and in which people work, interact and live using digital contents and tools.

Hence, the analysis perspective is expressed in terms of Digital Literacy (Gilster 1997), that is, the ability of the individual to use digital resources in a context totally immersed in technology.
“A person who is digitally literate goes beyond just being a digital information consumer to seeing themselves as someone engaged in the activity of digital information creation. In an age of unprecedented opportunities for digital commerce interactions, social and political engagement, and lifelong and life wide learning and collaboration, the digitally literate citizen must be an active and ever-vigilant participant, constantly evaluating those opportunities for their benefits and their downsides” (Meyers et al. 2013: 362).

Information, for example, is just one of the possible activities. In reality, all of the tools that technology makes available are used intensively in the labour market and in most areas of private and family life. However, as Sonia Livingstone (2011) underlines, “they are not yet so embedded in the social practices of everyday life as to be taken for granted”. Indeed, on the one hand, new digital citizenship includes new social, communicative and cultural opportunities, but on the other hand, it introduces new rights and duties that up to few years ago were either unknown or not as important.

The new digital era, thanks to the pervasive action of the few relevant enterprises that manage the universe of web services, has to face a knowledge gap in the usage of new digital practices in which the differences between rich and poor, levels of education and work opportunities do not affect the management of the risks associated with these new digital tools. In other words, the technical diffusion caused by leisure and economic opportunities was quicker than the diffusion of the socio-educational knowledge related to digital media usage.

This brief examination of ICT digital technologies are useful for framing the paper’s subject from a socio-centric perspective in which ICT cannot and should not be confined to technically-specialised knowledge. It is fundamental to start considering ICT professions not only from the point of view of productivity, but also in terms of the relationship with and responsibility towards consumers. Indeed, ICT professions today are rapidly developing and the debate over the use of digital technologies engages entrepreneurs, computer scientists, consumers, and the political world. In other words, nobody can be excluded from the decision on how to use technology. ICT is a reality that connects places, businesses and people without making distinctions. We can therefore deduct the cross-cutting nature of a theme that is independent from the will of the single individual. To this day, it is hard to identify jobs with no connection to the digital world. ICT skills, or at least a basic consumer knowledge of them, become essential for working in even small entrepreneurial realities (e.g. in a
small suburban pizzeria). The contents we use daily and most of the relationships we cultivate use devices and software connected to the Web and its digital services. Based on this fact, digital skills are transformed into a basic requisite not only to be able to work, but also to socialise. Once again, digital technology proves to be not just a simple programme code, but also a series of socio-relational practices in which both the users and the quality of the connections they establish are a real added value in economic terms.

Additionally, the new ICT production logic place the user and his/her needs at the centre of their development. The product itself is considered more and more secondary and flexible. It is no coincidence if businesses, independent of their sector and size, have finally understood the importance of branding and communication. It is a very slow process of cultural and entrepreneurial growth that puts businesses and, in particular, their employees under strain because of the extremely fast technological development.

A recent study by Capgemini Digital Transformation Institute (2017) observes three particularly interesting phenomena:

- **The digital talent gap is widening:** every second surveyed organisation acknowledged that the digital gap is widening. Moreover, over half (54%) of organisations agreed that the digital talent gap is hampering their transformation programmes and that their organisation has lost competitive advantage due to a shortage of digital talent;

- **Fears of skills redundancy could drive attrition:** overall, 29% of employees believed that their skill set was redundant or would be in the next one to two years, while more than a third (38%) believed their skill set would be redundant in the next four to five years.

- **The talent gap in soft digital skills is more pronounced than in hard digital skills:** the report identified that people with experience in soft digital skills, such as customer-centricity and a passion for learning were most in-demand as these skills were considered increasingly important characteristics of a well-rounded digital professional.

On the one hand, we can observe the rapid obsolescence of specialised skills caused in part by the continuous innovation of products and services; on the other hand, we can notice the ever-increasing relevance of socio-relational aspects known as soft digital skills.
<table>
<thead>
<tr>
<th>Change management</th>
<th>Helping an organisation transform itself by focusing on organisational effectiveness, improvement and development.</th>
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<tbody>
<tr>
<td>Collaboration</td>
<td>Processes that help multiple people or groups interact and share information to achieve common goals.</td>
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<tr>
<td>Comfort with ambiguity</td>
<td>Feeling comfortable and confident acting in an environment of uncertainty or constant change and having a higher risk tolerance.</td>
</tr>
<tr>
<td>Customer-centricity</td>
<td>Committing to a top-tier level of service for the customer and considering the customer experience above all.</td>
</tr>
<tr>
<td>Entrepreneurial mind-set</td>
<td>A state of mind that orientates human conduct towards entrepreneurial activities and outcomes; being drawn to opportunities, innovation, and new value creation and able to take calculated risks and accept the realities of change and uncertainty.</td>
</tr>
<tr>
<td>Data-driven decision-making</td>
<td>Using data and insights to develop a theory, testing the theory in practice to determine its validity and making business decisions.</td>
</tr>
<tr>
<td>Organisational dexterity</td>
<td>The flexibility to perform varied roles, actions, or activities with skill and grace and the ability to transition between roles, actions and activities quickly and effectively.</td>
</tr>
<tr>
<td>Passion for learning</td>
<td>A deeply ingrained enthusiasm for seeking out and acquiring new information and knowledge, often across a variety of fields and topics.</td>
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In this direction, we find the definition of the concept of “soft digital skills” provided by the AGID (2017) particularly interesting, as it highlights the importance of the topic for the future of enterprises, pointing out that digitalisation will require a more articulated mix of competences. In this mix, technological skills are complementary to soft skills, such as critical thought, creativity, emotive intelligence, leadership and change management qualities. Furthermore, in the report by the Capgemini Digital Transformation Institute (2017), we find points about the critical aspects of ICT skills within businesses. As a consequence of the poor availability of qualified staff, enterprises have adopted innovative recruitment, training and work strategies in order to defend their competitiveness in the market.
Digital Soft Skills in ICT Professions

In 2016, a small normative revolution had the merit of highlighting the quick change taking place in the ICT professional environment. The e-CF\(^5\) became a European standard and was published officially as the European Norm EN 16234-1. For instance, the number of ICT professions listed in the e-CF doubled in comparison to the number listed in the previous 2010 CNIPA manual used in Italy. We moved from 21 professional profiles in 2010, all characterised by a tight connection to computer science jobs (systems engineer, web security expert, analyst, programmer, etc.), to about 40 different professions in 2016.

In only a few years, the ICT market has evolved, defining a number of professions, but being especially useful for determining the professional needs requested by enterprises. With a market undergoing such rapid change, the competitiveness of the labour market has become intense and sophisticated. The AgID Report 2017 emphasises this aspect: Italian enterprises suffer in terms of management, creativity and communication skills. The sectors perceived as the most critical are the innovation of the production logic in the ICT industrial sector (63.6%), supply (59.1%) and the digital management of customer care in the ICT sector dedicated to trade and services\(^6\) (54.6%) (AgID 2017: 34).

With reference to the ICT profiles, the AgID report (AgID 2017: 32) instead notices a particularly critical situation for project managers and security analysts and advisors.

\(^5\) European e-Competence Framework (e-CF) version 3.0.

\(^6\) For the research methodology see AgID (2017).
Figure 1: Business priorities creating a demand of new skills and technological trends

Source: AgID (2017).

From the data of the AgID report it is clear that the professional figures connected to the creation of relationships B2B or B2C are almost more important than the product itself. In particular, in terms of security, a significant part of the real offer is dedicated to training procedures and practices that guarantee the offer itself. In other words, the creation of engagement and education processes are milestones, especially in high profile ICT offers.

As indicated in the report by the Capgemini Digital Transformation Institute (2017), AgID (2017) also confirms that recruitment strategies are strongly geared towards the search for new professional figures with complementary skills and soft skills. Not incidentally, nearly all enterprises (AgID 2017: 33) report making use of synergies with universities in the search for or training of flexible professional profiles capable of easily adapting themselves to market requirements.

Besides the statistics, what we are observing in this period of technological development is the need enterprises have to provide reliable services and prod-
ucts. To be made, sold and used, these products require complex professional profiles that never existed before. Technical and ICT skills are only one part of the requisites because socio-relational skills have an increasingly essential role. The competitiveness of the offer is continuously increasing and the diversification of supply must be accompanied by a process of demand education. In other words, the consumers, and the enterprises in the B2B market need to be educated on the usage of the new services, creating requirements and new productive opportunities. Concretely, what is needed is communication, training, assistance and more networking in general. It is in this framework that the figure of the “digital maker” is born, not only as a result of the work flexibility that characterises our age, but also as a professional figure inserted into the process of ICT production growth in terms of creativity and quality. These digital makers are practically the bridge between the abstraction of digital imagination and the new consumer of the future.

ICT, Skills and the Labour Market

When studying the social and cultural phenomena that characterise post-modern society, we cannot but accept their growing level of complexity and the subsequent impossibility of fully understanding interconnections and scenarios of development. With this premise, which is necessary in order not to confuse certain thematic choices with a reductionist attitude, we think it is possible to identify two “reflection paths”, or macro-transformations in the relationship between ICT, work and skills:

• The transformation of computer science and digital skills from technically-specialised skills to skills required for the majority of professions (especially in the service sector but also in the industrial sector). Being able to use ITC tools is no longer the prerogative of certain professions, but at a basic level it has become a sort of “cognitive technology” (Calvani 1999) that redefines socio-relational skills exactly because they are used with tools that have changed their ontology (Ferraris 2011);

• The birth of new ITC professions characterised by a considerable “volatility” of technically-specialised skills and by a variety of cross-cutting skills typical of “knowledge professions”.

Setting aside the first aspect, which is important to mention for its socio-cultural effects yet to be fully outlined, this short paper focuses on the second
aspect with the aim of exploring the relationship between technical and soft skills with regards to the self-perception of ICT professionals and the organisational context of the enterprises in this sector. ICT workers are, in our opinion, a particularly interesting target of analysis for at least two reasons:

• Their profession has an easily recognisable, technically-specialised nature, but at the same time, it is “new” in the labour market and, in our eyes, does not have a strong connotation in terms of cross-cutting and socio-relational skills;

• They are professionals who we imagine can fully incarnate the paradoxes of the knowledge society since they are both “producers” and, at the same time, “products” of the New Economy. Using the words of Arendt (1958), ICT workers are *homines fabri*: they create the world of mankind.

The considerations that follow are based on research carried out by five Italian universities. It lasted three years and was financed by the Italian Ministry of Education, University and Research at the PRIN (Projects of Relevant National Interest). In this regard, the unit based in Rome, directed by Renato Fontana, placed its attention on the new makers:

“The main question [...] on which our reflection is based is if there is and to what extent a connection between pre and post-industrial society, or – more modestly – what are the similarities and the differences between the conventional craftsman and the digital maker, to provide a profile significant from the sociological point of view to the many workers who work in close contact with the new technologies and in particular with the ICTs (*Information & Communication Technologies*)” (Fontana 2013: 78).

The research made it possible to interview 40 ICT professionals (mainly computer scientists and graphic designers), of whom 95% worked in organised contexts (especially small and medium-sized enterprises). The interviews – each one hour long and based on a biographical questionnaire – developed a *corpus* of around 400 pages. Here it is possible to make interesting conclusions based on the theme of cross-cutting skills necessary for professions characterised by “cognitive dexterity”⁷.

⁷ “We talk about ‘cognitive dexterity’ rather than simply of ‘cognitive activity’ because the interviewees clearly recognise the difference between a purely mental activity and one which implies something tangible, even if only through the screen of a computer, with actions that have practical consequences: ‘I don’t have hammer and chisel, but I have a mouse and my software tools, so I create something’ (computer scientist)” (Fontana 2013: 131).
Analogic Skills, Digital Professions and Hybrid Organisations

They are sitting at a desk. Their toolbox is a computer. Their work consists of creating virtual objects. They deal with the speed of innovation, the time and space of globalisation (or the absence thereof) and the culture of personalised consumption. They find meaning in their job in the possibility of being creative, the capability of making something useful for others and the satisfaction of having built a good quality product. They are digital makers, who have a lot in terms of values and skills of the traditional craftsman, but are also emblematic of the post-industrial era because of their privileged relationship with technology. What changes are the tools and procedures, but not the essence of the job.

Here is what one computer scientist of a medium size says: “In my opinion, a craftsman is somebody who works using tools, as we do, if we have to make a comparison, on one side there is a hammer, an electric saw [...] on the other side, there is a mouse, a computer, there are programmes”. In response to the question: “What capabilities should a person have to do your job well?”, the answers surprisingly do not concern the technical-professional skills, i.e. knowledge of any particular programming language but instead mention skills that are fully defined by the ISFOL (Di Francesco 1998) as cross-cutting skills:

- The ability to diagnose (diagnose one’s skills and attitudes; diagnose problems);
- The ability to relate (communicate, work in team and negotiate);
- The ability to face problems, strengthen self-learning processes and find solutions.

Moving from the premise that a skill is distinctive of a profession only when it is a factor that allows employees to perform the profession itself (and not just to facilitate it), an analytical reading of the interviews allowed us to identify three core skills in the ICT profiles:

- Possessing passion and quality-oriented attitudes;
- The ability to learn how to learn from the Internet;
- The ability to communicate and work in team.

In the following pages we will try to summarise, using the words of the interviewees, the distinctive self-perceptive elements of these skills by connecting the necessary competences to the organisational contexts that should favour
their development. The professional dimension of these emerging figures clashes, in fact, with the reality that enterprises seem only partly capable of seeing the need to grow professionally for the digital craftspeople to create opportunities for organisational development. Equally important is the fact that it also clashes with an educational system still resistant to the concept of “skill didactics”. Hence, interesting paradoxes are created between the rhetoric of innovation and actual practices, between the needs of the single individual and the production processes, and between the characteristics of labour demand and the real needs to be satisfied by who is hired. To create a picture, even if approximate, of this market sector, we will see how the vision of “time” and market forces work as a counter-balance to the skills mentioned above.

According to our research, the first distinctive soft skill of ICT professions is “being quality-oriented”. It is a sort of cornerstone on which the points of contact between traditional craftsmen and digital makers are placed. “Total Quality Management” is certainly a concept unknown to traditional craftsmen. The attention to quality that characterises both the traditional craftsman and the digital maker is not connected to the efficaciousness with which they answer the customers’ requests or the efficiency of the production process, but is linked to factors related to one’s deepest professional identity.

A craftsman is intrinsically interested in the quality of the product because it is not simply an object (whether material or immaterial), it is the result of his personality and creativity; it is a sort of extension of his identity. In other words, the craftsman “cares that the work itself is well done. [...] his work is not simply a way to obtain another order. [...] The craftsman is the representative figure of a specific human condition: that of being personally engaged in what one does” (Sennett 2008: 28). This concept appears in many of the interviewees’ declarations:

“I basically see myself as an artist, I see myself as a painter, I have my software tools and I shape things. Indeed, my work has a common style, all of it has something in common that is mine. Even if I am making a tutorial video to explain how to use a cream for haemorrhoids – It happened to me! - [...] in any case I try to add something of mine [...] I can express different feelings in my work and I realise this when I look at it: when I’m sad I use a much duller palette of colours; when I’m happy everything is intense, oversaturated. I follow my instinct, my sensations. I am aware that work done in another moment would be completely different. It is like freezing a part of me in that moment. I think that all craftsmen do the same.”
Being quality-oriented is not, therefore, a cold organisational asset but the “visible face” of the passion for one’s work. Craftsmanship in a digital profession can be found exactly in this attention to detail as an expression of the value of aesthetics in one’s work.

Modern enterprises consider quality to be an aspect imposed by competitiveness and the customer, who, unlike in the past, is capable of comparing goods and expressing their specific needs. This different connotation of being quality-oriented is a source of intrinsic tension: if quality is an identity-related element, it cannot be sacrificed or compromised; if instead it is only one of the elements of a product, it has to be commensured and negotiated according to the customer’s needs and the time one has at their disposal. In the words of an interviewee:

“The difference between us and real carpenters is that if you go to a carpenter and ask for a piece of furniture, he will tell you that he will give it to you in a month’s time, and he has to give you it in a month. He won’t give it to you before. If you come and ask us for a product and we tell you that we will give it to you in a month and you tell us ‘No, you must give it to me in 15 days’, we answer ‘Yes’, compressing a series of activities that cannot be done and that you have to take away because they seem superfluous in comparison to the production’.

Another interviewee reports:

“If you have few days to present work, some things have to be optimised as well as possible because you don’t have time, and that is something I miss because you are forced to work without stopping most of the time. Sometimes you say ’this is a nice project, I would like to dedicate more time to the details and do further research’, but you really haven’t got the time to do it and you have to rush”.

Instead of a quality that could be reached through what Mintzberg (1996) calls “input standardisation”, or the homogeneity of skills for those who add value to the production process, enterprises are more oriented towards “process or output standardisation”, the creation of uniformity in work procedures and/or the final product. Besides the fact that ICT professionals are not able to create the quality of work they are capable of creating as craftsmen, one interviewee, a project manager, says that in his experience at a big ICT enterprise: “[t]he main goal is to make sure that people can be as interchangeable as possible so that a person who is missing in a certain position can be easily replaced. Thus, discretion is kept to a minimum in each activity”. “Competitiveness”, as Sennett (2008: 43) underlines, “has taken away initiative from the workers and has de-
moralized them, while the ethic principle of a job well done for the pleasure of it that is typical of craftsmanship is not rewarded or even noticed”. What can then happen is that a skill that could be of value for the market even becomes an obstacle because being quality-oriented in terms of craftsmanship transforms itself into lack of motivation for the frustration of the working process.

“Learning how to learn” is one of the eight key skills identified by the European Union that all citizens should have for full social and work integration (Recommendation 2006/962/CE). It is therefore a strongly cross-cutting skill that should be possessed by all citizens at a basic level. The ability to learn is defined as “the ability to persevere with learning, to concentrate for extended periods and to reflect critically on the purposes and aims of learning” (European Parliament and the Council of the European Union 2006). In addition, “[t]his competence includes awareness of one’s learning process and needs, identifying available opportunities, and the ability to overcome obstacles in order to learn successfully” (European Parliament and the Council of the European Union 2006).

In the ambit of ICT professions, however, this skill, in addition to being cross-cutting, becomes an enabler as much and even more than specialised technical knowledge; having this skill is connected to the closeness of these professions to the “engine” of knowledge society: technological development. The tools used by digital makers are continuously developing a speed unprecedented in labour history. Our interviewees create new software for other makers and consumers of every kind, and to create them, they use the most advanced programmes and languages available on the market:

“The programmer has to continuously update him/herself because the programming languages change and the way of programming changes […]. You have to keep up with the times. New things are continuously created and you have to use and assimilate them”.

This process of continuous regeneration of technical skills makes the competence “learning how to learn” a vital skill, especially given the speed with which specialised skills become obsolete because of the “autocatalytic character” of technological innovation (Longo 2003: 53), which, especially in the world of communication and information, leads to an accelerated hybridisation process, creating maladjustment and tension. “In short”, a programmer summarises, “in my job sector, ten years are nothing, […] but technologically incredible things will happen”. The ability to learn how to learn in a purposeful and aware way is
a “must” for digital makers, most likely because of the “object” of their work. The Third Industrial Revolution, as it has been defined by some, was informal, born from the strength of a spontaneous innovation and based more on “testing by doing” than on a linear process of knowledge acquisition and application. The interviewees develop and use their ability to learn continuously by solving concrete problems and following mainly informal and non-formal processes.\(^8\) In this regard, the interviewees have pointed out a wide mismatch between the skills and knowledge acquired during their formal training and those requested and used in their current job position:

“ [...] an intellectual worker, a digital maker cannot make use of the theoretical training that Italy’s educational system seems to be permeated by and needs learning modules that also include the practical aspects of the job he/she will go on to do. As Sennett (2008) puts it, we need “expressive instructions”, with reference to the need to transfer knowledge and skills not only through language […], but also with the help of a ‘corporeal form’ […]” (Chiappini 2013: 152).

Hence, workers mainly learning two ways:

- **Gaining access to knowledge spread on the Internet** with “self-learning training activities”. According to one interviewee: “We train using the Internet. I buy many books […] also in English”. Another interviewee, a graphic designer, adds: “If you have a problem doing anything, the solution is on the Internet. […] You spend a lot of time using the Internet because nowadays it is the only tool that keeps you updated on the new technologies.” Learning how to learn in this context acquires a particular connotation because it is the object of a specific modality: “learning how to learn from the Internet”, that is, from what has been defined as our “widespread teacher” (Fontana 2013: 187), thanks to which we can make use of the knowledge of others without them being present as long as we know how and where to search;

- **Through a social exchange of knowledge in the workplace** that, as claimed by a programmer with about ten years of experience, is often based on: “stealing with one’s eyes […] for me it is normal that a person who is next to you has the ability to learn simply by being nearby. Yes, al-

\(^8\) Consistent with what is defined in the European Memorandum on Education and Lifelong Learning (European Commission 2000), we refer to learning processes that occur in organised contexts (companies, cultural and sport associations, etc.) differently than the structures traditionally dedicated to education and training (non-formal learning) or through daily life experience with modalities, which are not necessarily conscious (informal learning).
so seeing the work done by others is important because you should have a sensitivity that allows you to understand certain things.”

“Workplaces” or, more precisely, the ways and times in which work processes are organised, create tension and opposite poles. Theoretically, in fact, present day enterprises should know and recognise the importance of time for learning and socialisation as prerequisites for innovation and quality. At least when we consider the technological market, we should be surrounded by what Butera (1984) dubs “organism” enterprises or what Mintzberg (1996) refers to as “adhocratic organisations”.

The makers we have interviewed should mostly be employees of companies that adopt a “culture of complexity”, creating structures based on autonomy rather than mandate, as well as on spaces of social interaction, quality and the principle of re-unification of the creational phase with the executional one. All these elements were confirmed to a part of the professional identity of the interviewees but were not characteristics of the workplace in which the interviewees operate. In fact, the production process suffers strongly from the precept “just in time”, producing results quickly in order to respond to the customers’ equally rapid requests: “Once,” a programmer claims, “there was also the time and budget to study, experiment, reflect and test. Today, there is a different approach; there is the metaphor of the “iPhone” and the “touchscreen”. One can receive a product at the touch of a button.” Here an identity-related need of these professions is inevitably frustrated: “If you ask me the question ‘What are you missing in this moment?’ I will tell you I miss having the possibility of studying new things because I don’t have time! I haven’t got the time to study new languages or methods.” There is also the full awareness that the ability to learn by oneself cannot replace in toto learning by collaborating with others:

“In any case it is hard to grow professionally because I often find myself working alone, and I can increase my skills studying, willingly and often, some tutorials on the Internet, but I can’t compare my ideas with people who do the same job as me. So, if I grow, it is only because I have succeeded in finding some sources from which I can get inspiration and learn some extra skills”.

The ability to work in a team and communicate has also been recognised as an indispensable soft skill in digital professions, but notwithstanding this, the op-
portunities for its practice and development are present in organisational contexts only as a function of the production process:

“It is curious to notice how nearly all the workers interviewed seem to be aware of the importance of working in project teams and of keeping a high level of sharing and communication with their colleagues: ‘In computer science team work is very important. Because certainly, or probably, another person knows what you do not know. If there is this way of working, this exchange of information, in the end we can find a solution to the problem. This is essential also for the creation of new products.’ However, the speed imposed by the market on both production and consumption times forces the organizations to give in to these dynamics, sacrificing in concrete the production process. This is how one of the interviewees described the problem: ‘Lately the market has changed a lot; there isn’t much time to reflect; you have to work quickly and try to reduce all the possible bottlenecks to immediately find a solution. It is a market situation in which the customer needs answers immediately’. The anxiety connected to the project deadlines, and at the same time, to the need of keeping high quality outputs, risk to render ineffective the innovation process and to reduce the constellation imagined by Mintzberg [adhocratic structures] to a sort of assembly line [...]’ (Ungaro 2013: 146)

In the above text, the reference to the “assembly line” can only clarify the dichotomies in which the ICT professions are operating: proceduralisation against creativity; discretion against mere operability. These tensions between professional impulses and organisational and procedural requirements transform the makers into a middle class half way between the “new class of creatives” imagined by Florida (2002) and specialised workers with more advanced technical skills than twentieth century workers, but at the same time, they are similar to the latter in terms of the absolute secondariness of the soft skills.

If we were to carry out a “selective” reading of the interviews, we could outline the possibility of a new culture of soft skills: a culture in which it is normal for the market to ask for capabilities related to creativity, communication, learning, and attention to quality, not only for those who have managerial positions, but also for those who create something new or considerably improve something that already exists using their “cognitive dexterity”. An in-depth reading of the words of the interviewees, on the other hand, reveals the lights and the shadows of a way of organising work that does not abandon the old temptation to divide, classify, stratify and, especially, follow the market instead of trying to change it. Leaving aside any rhetoric, the makers live in a reality in which they perceive and are aware of the centrality of soft skills, but at the same time, they live in environments and conditions that do not favour the development
of these skills, and from a certain point of view are not even ready to admit their importance.

Nothing is permanent in this age of great change and our conclusions are far from being final. It seems, however, that the ITC sector of the labour market is fascinated by the organisational logic that prevailed in the factory life of the 20th century, as we can see in the ever-increasing specialisation and fragmentation of work. The likely unconscious result of this choice is the reintroduction of the typical pyramids, where those who “do” – the makers – are positioned at the bottom while those who “organise, coordinate and decide” are placed at the top. The former only need to have technical skills, often ignoring how important it is for them to have soft skills to keep their technical competences updated; the latter need instead to have a long list of “managerial skills” in which socio-relational skills assume a respectable position.

Conclusions

The observations we have just made do not allow us to draw conclusions on a topic that is so complex and in continuous development. We can, however, try to grasp two or three fundamental points that can be deduced from the information we have collected so far. To conclude, we will mention the digital divide, access to information, cross-cutting skills, and the professional profile of digital makers through the semantic path of knowledge sharing and social stratification.

The keyword that sums up the different angles from which we have tried to examine the direction followed by ICT professions is knowledge, or rather, knowledge-sharing. This is based on the widespread belief that, on the one hand, knowledge is more accessible now than it was in the past, and on the other hand, it is the most important factor on which the economic, industrial and production strategies of modern enterprises in the sharing economy are based. In the present-day literature, important scholars like Jeremy Rifkin (2001) claim that in this age, the wider spread of knowledge is possible and, therefore, so is the spread wealth and democracy. It is more than legitimate to have some doubts in this regard.
Let’s consider the digital divide, even if *en passant*. In the previous pages, we observed how it intersects especially with the cultural and educational dimensions. For a long time, education and the possibility to adapt to new cultural perspectives have been powerful instruments for dividing the populations of yesterday and today according to the historical needs of the predominant enterprises.

From this point of view, little seems to have changed. In a nutshell, education works as a, vehicle of exclusion, which leads to inequality among ICT professionals. The ones who count are those who have managerial skills with the ability to coordinate, mediate and communicate. If this is true, as we have tried to claim so far, knowledge sharing is simply a production factor like all the others. Its extraordinarily innovative cogency breaks up an organisational layout that tends to confirm the structure of the historically consolidated hierarchy. The digital divide, therefore, has not been replaced, but has been added to the factors that contribute to determining social stratification among the various types of professional figures.

The fact that more or less everybody has access to information does not necessarily mean that there are not disparities when it comes to converting information into knowledge. As a consequence of the redundancy of information workers need to separate what is useful from what is useless. This means adopting an interpretative key capable of enabling enterprises and professionals to cultivate the most satisfying strategies. Reading data with a theoretical conceptual framework is necessary for preparing efficacious decisions and following the most satisfactory paths from a competitive point of view.

The ability to decode information is an important part of the learning process that defines the cross-cutting skills of the digital economy. The makers, as we mentioned above, learn while they are working. Many intellectual professions work this way, even more so in areas where the compulsive urgency of innovation does not always permit knowing the output features (products or services) of the production line.

Most of the time in the digital world, the path to follow is unstructured and *in fieri*, so we feel we can affirm that enterprises look with greater interest at the standardisation of the output, that is, at guaranteeing the final result, while professionals care more for the standardisation of the input, that is, the possibility of professional growth while they are preparing or providing the final
product: learning by doing. In this sense, knowledge is the drive in ICT professions. The distinction between enterprise requirements and people’s training needs is not of secondary importance. But it is not enough.

We focus our attention on those we have called makers or, more generally, knowledge workers. This merely refers to a socio-professional aggregate of privileged people. And what about all the others? The others are in worse condition, but for reasons rather difficult to grasp, they are excluded from the analysis of the best research projects: We know little about them; their profiles have evaporated in the blinding light of the very strong on-going organisational transformations. They are weak, confusing and extemporaneous profiles for which the current literature shows no interest.

With regards to skills, we have already stressed how today, cross-cutting skills are the most important because they even define a new sociological subject and a new way to relate with the product of one’s work. The individual is defined by their ability to relate to other people (especially when communicating) and the ability to diagnose, face and solve problems or moments of empassee in the production process. They are also defined by the ability to strengthen various ways of learning, including the self-learning process typical of those who work on the Web. The abovementioned research by the Capgemini Digital Transformation Institute (2017) conveniently points out that soft digital skills such as the ability to learn and customer orientation are the most requested on the market and that they represent the most significant characteristics of a typical digital worker.

Thus, our professionals are inserted into the logic and practices of the Web. In a recent book, Niall Ferguson (2018) explains in a precise and compelling way that the network society contrasts the society of hierarchy. As an example of this, he takes the Torre del Mangia and Piazza del Campo in Siena, considering the former to be a vertical, centralist mode land the latter to be an horizontal, communicative one.

“Six centuries ago, in Siena, the Torre del Mangia of the Palazzo Pubblico cast a shadow over Piazza del Campo, that space of the shape of a fan that was, from time to time an outdoor market, a meeting place and, twice a year, a racetrack. The height of the tower had a precise meaning: it reached exactly the same height of the town cathedral, which was on top of the highest hill in Siena, to symbolize the same level of the temporal and spiritual hierarchies [...].
On the contrary, today’s technological companies, equally domineering, avoid verticalization. Facebook’s headquarters at Menlo Park, designed by Frank Gehry, is a campus of offices without partition walls and leisure areas: ‘a single room hosting thousands of people’, to quote Mark Zuckerberg, or (maybe more accurately) an immense *kindergarten* for geeks.” (Ferguson 2018: 463).

The same logic can be applied to the new Apple Park in Cupertino designed by Steve Jobs and his entourage and also to Google’s new headquarters in Mountain View made up of a series of light structures as if they were made of Lego.

To sum up:

“Silicon Valley prefers to stay low, and not only for the fear of earthquakes. Its horizontal architecture mirrors a real fact, that it is the most important hub of a global net: the central square of the World.” (Ibid.: 464).

The conclusions reached by the author, after underlining that we have been living in the “network age” since the 1970s, show how what many see as the ultrademocratic and equal regime of the web is a pious aspiration yet to be confirmed by the evidence of history (Ibid.: 458-464).

To sum up, we wrote in the introduction that we did not have answers, and indeed, we have not given any. In a certain sense we have kept our promise. In this paper we have tried to identify ourselves with the questions we have made understanding their meaning and tracing a direction to follow. We have tried to do it in a research sector that is still very slippery and full of empty spaces to fill up but is also of extraordinary interest for understanding how well-laid the hopes of cultural, social and political emancipation in the network society are in contrast to what one thinks of when we order society based on hierarchy.

We believe that digital technology is not only a tool, but also an expression of our society. For this reason, ICT professionals are closer to the concept of “knowledge workers” than to that of simple “technicians”, if only because technological development occurs exclusively thanks to the network that exists between individuals, intelligence and machines.

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Smart Working and Organisation: Which Managerial Skills to Lead and Manage Cultural Change?

Patrizio Di Nicola, Alessia Cremonini, Michela Cossu and Stefano Scravaglieri

Introduction

Nowadays, as a result of the evolution of Information and Communications Technology (ICT), we are living in a time of radical change in the world of work. Phenomena such as globalisation and digital and social technology give people a sense of limitlessness, freedom of expression and creativity in everyday life. This leads to a rethinking of the way people work and how people want to experience their work environment. At the same time, the boundaries between private life and the world of work have faded drastically: work today is supported by technology and hyper-connection and can be done anytime and anywhere (Eurofound and International Labour Office 2017).

These changes, compared to the previous paradigm in which the working day or “business moment” (Spender 2015) was determined by clearly defined working hours, presupposes the upsetting of the times and places of work but also of the ways in which to do it. This inevitably implies the need for an evolution of the skills of those who live in the work environment. If skills do not evolve, the risk seems to be a strong loss of the human workforce in favour of technology.

The debate concerning technology’s impact on work, employment and wages is as old as the industrial era (Brynjolfsson and McAfee 2015). Starting from the second decade of the 18th century, every new technological advance has sparked the fear of a possible mass substitution of the work force. Regularly, however, job losses have been replaced by new jobs. So, why are these technological innovations now considered an unprecedented threat?

1 Patrizio Di Nicola wrote the introduction and conclusion, Alessia Cremonini covered the topic of teleworking and smart working, Stefano Scravaglieri wrote the section on managerial skills and styles, while Michela Cossu presented the case studies and edited the final version of the paper.
According to Ford (2009, 2015), we are seeing a change different from those in the past, because it is proceeding in an exponential way so that companies cannot keep up with it. It seems that, in the United States, 47% of jobs are automated and the tasks created in the last 100 years are not able to absorb the jobs that are being replaced because of automation, as they only employ 10% of workers (Frey and Osborne 2013). Moreover, Ford continues, over the past 40 years the average worker’s productivity has doubled compared to their compensation. Until the 1970s, however, these two lines grew together. This seems to mean that before the technology helped the worker, but now it weakens their value.

Can this phenomenon impact the people’s working autonomy in an irreversible way? It is very improbable because (Brynjolfsson and McAfee 2015):

> “When it comes to governing and shaping the physical world, man retains many advantages. We are much more skilled and inventive than any machine, and we are relatively light and efficient in terms of energy consumption. In addition, our senses provide us with rapid and multidimensional information that allows precise movements and controlled actions.”

It makes no sense, therefore, to think of stopping progress. Instead, we need to understand that progress must be managed and exploited with new approaches and tools. Technology must be seen as what it was created to be: a tool for enabling and empowering human skills.

According to Brynjolfsson and McAfee (2015), however, the offer of a valid and competent workforce is not the only way to preserve human economic importance; the availability of capital to spend or invest also guarantees that humans will not to fall into irrelevance. But while the authors talk about economic capital, here we want to refer to human capital properly: the best way to help workers in the current environment is to equip them with expendable skills and encourage general economic growth.

This leads companies to ask themselves:

- Is our technology an enabling factor?
- Is our office a place that facilitates work
- Are our people able to work anytime and anywhere?

In this paper, we will discuss three case studies describing three Italian market organisations to analyse the readiness of managers and the skills necessary to drive change towards Smart Working (SW). The goal is to improve employees’
work experience, employee participation, autonomy, and the connections between people, technology and space. To achieve this goal, people need to improve their technical and managerial skills. These companies are demanding this change as they recognise that the balance between private and professional life is a driver of economic growth, competitiveness, increased participation in the labour market, gender equality, solidarity and sustainability. This change process, which includes the redesign of offices, technologies and organisational behaviour, involves the whole organisation and sees the joint, integrated effort of the Facility Management (FM), Information Technology (IT) and Human Resource (HR) functions. Through the qualitative and quantitative analysis of the use of spaces, technology and offices, along with techniques for listening to workers through focus groups and workshops, it is possible to study the characteristics of the organisational population, the formal and informal networks within it, and the culture, values and artefacts that guide them explicitly and implicitly. Thus, it is possible to understand:

- The characteristics of these new workplaces;
- The necessary skills that allow managers to lead others through this change (e.g. an evolutionary mind-set, awareness, change management skills);
- New employees who “live” in the new workplace.

Our objectives are to respond to the following questions: How are organisations and managers approaching this cultural change? What are the skills they need? What are the most fitting leadership models?

**Teleworking vs. Smart Working**

Phenomena such as globalisation, outsourcing, company internationalisation and technological development have disrupted – and constantly disrupt – the way in which work is organised, paving the way for new production paradigms that weaken the centralisation of mass production (Di Nicola 1995):

“Companies relocate, exploit existing networks (communications, research, urban) and advocate the emergence of new infrastructures, they themselves become ‘networked’. In this context new forms of work performance take hold, once defined atypical and today, however, increasingly ‘typical’”.

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Teleworking is one of these new forms, but its origins date back to the 1970s when it was developed in the information sector in the state of California (Nilles 1975, quoted in Eurofound and the International Labour Office 2017), while ICT-based mobile work emerged later with the spread of wireless devices, such as laptops and smartphones, that allowed employees to work not only from home, but from anywhere they needed (Messenger and Gschwind 2016).

Telework originally meant work done entirely at home or at so-called telecentres, but today we consider it an extension of the “mixed” forms as, thanks to ICT, the worker is able to accomplish tasks from anywhere. So, whether you are talking about teleworking, e-working, telematic work or networking, the new technology and the global cabled economy open up new prospects for employment and wealth (Di Nicola 2001). It therefore seems that there is no single definition of the term “telework”, but several studies\(^2\) agree that it is work regulated by a sort of agreement, executed at a certain distance from the main office and developed and carried out thanks to ICT (Bergum 2007).

However, even if ICT has changed work inside the office, its use outside the company's walls has proved slower than expected due to various human, social and organisational factors, primarily the social need for people to meet with others (Eurofound and the International Labour Office 2017). In fact, Butler's research (2016) confirms that sharing a social space maximises learning as well as tacit and explicit knowledge. Colleagues learn from involvement in the daily activities of the work environment, which, in turn, helps performance and coordination. For this reason, since the 1970s, open spaces were introduced, though not always with a positives results. In fact, on the one hand, the decrease in barriers increases connectivity and helps the transfer of knowledge. On the other hand, job satisfaction can diminish, instilling a sense of social control and reducing creativity.

Today, the physical workplaces, rather than being neutral containers, must therefore increasingly represent an opportunity for people to indicate personal involvement in the organisational culture and to participate in the values and beliefs of the organisation (Hardy et al. 2008). Organisational culture also manifests itself in the workplace artefact, where it can be seen and perceived in a consistent way (Miller et al. 2015). In particular, the literature suggests that the

place, mobility and intensity of the use of ICT can have positive implications for working conditions, people and, consequently, for business results as well. The numbers are clear. According to the analysis of the Polytechnic University of Milan’s Smart Working Observatory and Eurofound, today, 37% of Danish workers work from home. In Italy, which still lags behind countries such as Greece, Poland, Czech Republic, Slovakia, Hungary, Portugal and Germany, the number of Smart Workers is up 14% compared to 2016 and even 60% compared to 2013 for a total of 305,000 workers, or 8% of the total workforce (Di Fausto 2017).

These changes are considered beneficial for employers, employees and society. For the employers, it means reducing the cost of labour in terms of the necessary space, as well as increasing employer-branding and talent retention. For employees, it means an improvement in work-life balance, also thanks to the reduction of commuting costs. Finally, for society, this reduces the need for transport and therefore decongests urban traffic, which has a positive impact on the problem of pollution and energy consumption. In addition, it stimulates economic growth in remote regions and improving social inclusion (Eurofound and International Labour Office 2017, Di Nicola 2001).

However, SW has its principle impact on people: Smart Workers appear to be more productive, organise their personal and professional time better, have calmer and more constructive internal relationships and are better and more effective in teamwork and networking. As a result, if 70% of potential Smart Workers were to effectively switch to the Smart Business Model, per capita productivity would increase by 15%, which is equivalent to about €13.5 billion in benefits for the country in addition to a reduction in CO₂ emissions of 136 kg per year (Di Fausto 2017). The risks, on the other hand, demonstrate the importance of “preparing the ground”, because if people are not put in adequate physical, mental and technological conditions, many problems must be expected (Di Nicola 2001). Once again, workers’ skills and the abilities of companies (and managers) become central for protecting them from obsolescence, compounded by the speed with which changes take place.

According to the “Smart Working Manifesto” by Clupperton and Vanhoutte (2014), the four cardinal starting points for a Smart Project are:

- **Culture, leadership style and organisational behaviours**: sharing values, trust and transparency principles, new behaviours and leadership styles
from top management, widespread communication and emerging collaboration, responsibility and decision-making autonomy, attention to and greater focus on results, flexibility and personalisation;

- **Work spaces and physical layout**: spaces redefined according to individual needs and task characteristics, i.e. Activity-based Working, the creation of thematic spaces dedicated to creativity, and internal mobility;

- **Technology**: knowledge sharing and knowledge networks management, an enterprise social network and community to develop relationships and sense of belonging, virtual workspaces, unified communication and social collaboration to facilitate internal and external collaboration, and BYOD;

- **HR systems and organisational policies**: employee value proposition and employer branding, personal enhancement and development, performance management and reward systems, time and space flexibility, desk sharing, labour law implications, and psycho-physical wellbeing.

According to Methodos et al. (2015), it can be said that SW and teleworking are not synonymous or equivalent: SW is not a reaction to the opportunities offered by new technological solutions; it does not respond to the desire to “do something new” for the youth, to make the spaces more attractive, or to simplify the organisational rules that determine the management of HR or work times and places. In fact, SW can involve teleworking but it does not end with it: working smart means providing an approach to work organisation that aims to achieve the best results with added value, combining virtuous flexibility, autonomy and collaboration and offering people the most suitable tools and workplaces to do so.

Making SW, then, means adopting a global and strategic approach to modernising working practices, based on the change of three aspects: place, platform and people. While the first two are key enablers, changing behaviour means changing the way people think about their work and empowering them to work in different, “smarter” ways (HM Government 2013). This also implies the need for skills to manage change in a structured way, as it impacts organisations and organisational culture, which, if it is completely in line with the values, motivations and needs of people, can release a large amount of energy and promote an organisation’s ability to succeed (Harvard Business Review 2018).

Chen and Nath (2005), use Schein’s Culture Model to talk about a “nomadic culture”, which is a collection of artefacts, beliefs and basic assumptions that provide employees with the flexibility to work anywhere. In this process, man-
agers must embody an effective culture of team management and capitalise on their people's management skills to meet their new needs. The goal is to improve the employee work experience, formal and informal connections between people, technology and space, participation and autonomy (Methodos et al. 2015).

This cultural structure facilitates the mobility of services, information and employees through various devices, networks and positions, supporting and promoting the so-called “limitless workforce” characterised by a lack of spatial and temporal limitations to working efficiently and effectively. Workers can use ICT to work at any time and in any place if organisations provide them with this enabling technology. Organisations have to facilitate the change to a nomadic culture, as technology alone is not enough. In an organization that uses nomadic computing technology to support the flexible behaviours of its employees, if members do not share the beliefs and assumptions of such a culture, the opportunities to work smartly will be unexplored and technologies underutilised (Chen and Nhat 2005). When artefacts (technology) are in conflict with basic beliefs and assumptions (values, culture, and organisational behaviours), the process is unsustainable. Therefore, to create a successful work environment, management must help foster an environment based on trust rather than control where the worker carries out his activities in a conscious and deliberate way.

Activity-based Matrix

Thanks to this technology, we can work anytime and anywhere (Eurofound and International Labour Office 2017), and it is therefore possible to question the traditional working model of sitting at a desk in the office from 9 am to 5 pm. This can at least be done for some types of work: there will always be a share of work requiring presence in a specific place (time- and place-specific) as in the case of front office staff, for example.

The change is that there will be new possibilities for carrying out tasks; there will be jobs that are flexible in terms of time and place (e.g. commercial and maintenance personnel) and jobs that can be carried out in a specific place, but with flexible hours (this is the case of teleworkers) or vice versa: carried out at a specific time, but in any place. The former is the case for workers who have the most need for different spaces and a connection with colleagues. Tradi-
tional offices, with many individual workstations and some meeting rooms, are limiting for the performance of their activities.

More generally, it is necessary to reverse the dependent relationship between where the work takes place and the type of work performed. In traditional offices, only the spaces assigned as the workstations or meeting rooms (the independent variable) are used exclusively, regardless of the type of work performed (dependent variable). The advanced working environments, or SW environments, are instead characterised by a wide variety of individual and collaborative work spaces to allow for the possibility of working outside the office while at the same time guaranteeing the connection with “present” systems and people. This logic is at the base of the Activity Based Work paradigm.

The attention to the connection between the way of working and the work space dates back to the early 1970s when Allen and Gerstberger (1973) described the IBM “non-territorial” office, a space designed without walls and permanent posts in order to improve and increase the sharing of problems and the exchange of experiences within the group. In their study, which lasted one year, Allen and Gerstberger reported not only an improvement in internal communication, but also specify that the staff perceived more privacy, fewer distractions and had the impression of having a larger office, despite the amount of space not changing.

In 1985, Philip Stone and Robert Luchetti introduced the concept of “activity-setting” with the article “Your office is where you are”. The concept is based on the fact that the individual workstation is not suitable for work performance (Luchetti and Stone 1985): people need access to quiet spaces, shared equipment, different sized meeting rooms and teleconferencing facilities. In the article, the biggest challenge is staying in touch while you are “away from your desk”. In addition, topics such as the need to stay in touch with the office, being able to book appointments, plan meeting places and reserve equipment in a simple way are introduced.

Luchetti and Stone's article was so futuristic that it took another 15 years before Activity-based Working’s essential characteristics became recognisable in important projects, such as London designer Sevil Peach’s work for Barclays Capital Holdings and Erik Veldhoen’s work based in the Netherlands for Interpolis. In 1995, Veldhoen published what became the milestone on the subject,
“The Demise of the Office”, and the consulting firm Veldhoen + Company was seen as the creator of the modern term “Activity-based Working”.

Through the Activity-based Working Model described by Myerson et al. (2010), the offices are redesigned according to the “three B model”\(^3\): Brick, Byte, and Behaviour, factors that represent the strategic intervention levers in the change management process towards SW:

- **Brick**: work spaces must be comfortable for workers and must enable better performance, both individually and in groups;
- **Bytes**: without digital tools, agile work would probably not exist, but technological availability is not a sufficient condition. We need to have an accurate knowledge of the tools to be able to govern and use them to their full potential;
- **Behaviour**: working in SW mode requires careful attention to employee behaviour because there are none of the space-time limits normally present in the work context, and it is therefore necessary to shift the focus to a measurement of the results obtained compared to the pre-established goals, shifting attention from control to trust and employee empowerment.

The SW methodology puts the person at the centre of the initial phases: it is necessary to use tools to listen to those who actually live in those spaces and working environments and use its tools: the workers. In the design project, then, according to IFMA (2014), it is important to define and identify the four types of work spaces, which focus on the employees’ ability to:

- **Contemplate**: time and space for creative inspiration and to recharge and relax (take a break from work);
- **Communicate**: lively areas, characterised by noise or cross-groups (coffee area, lobby);
- **Collaborate**: areas to work together (working capsules, meeting rooms);
- **Focus**: relaxing space to focus on work (cells, capsules).

The Smart Workplace philosophy, therefore, moves the desk paradigm from possession to access: the worker will not necessarily have an assigned desk, but will have the possibility of choosing his own post within a "spaces menu" (see Figure 1), depending on the activity and the mind-set that this activity requires. In this way, the worker acquires autonomy over the “four Ts” (Pink 2009), that is to identify the:

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\(^3\) Also knows as the “3 P Model”: Place, Platform, People.
- Activities to be performed (Task);
- Space and time appropriate for that type of activity (Time);
- Need to carry out the activity individually or in a collaborative way, depending on whether it requires focus or creativity (Team);
- Technological tools and processes to carry them out effectively and efficiently (Technique).

**Figure 1: Activity-based Work Matrix**


In general, we can distinguish four types of spaces, depending on the interaction of two axes (individual vs. collaborative work and a focused vs. a creative mind-set), as illustrated in the image above:

- Spaces for individual work that requires high focus or concentration;
- Spaces for “formal” collaborative work that requires a high focus;
- Spaces for collaborative and creative work that requires and brainstorming activities;
- Spaces for creative and individual work characterised by the activation of divergent thinking.

The current problem, according to Miller et al. (2015), is that organisations operate with business models, structures and designs that are inadequate for workforce engagement. In fact, according to research by CoreNet (2012) and Gallup (2013), 50% of company workspace is unused and 70% of employees are disengaged. For this reason, physical offices must be radically rethought. As reported in Methodos et al. (2015), space appears today as a place of culture and flexibility; the office is the place where technological tools and the most suitable spaces to work are available, and it is also the place where the compa-
ny culture moves. It follows that it is crucial to concentrate on creating specific places around which common spaces are developed that allow high levels of flexibility. Moreover, the space destined for interaction will be increasingly broad, both because a strong need for such spaces is emerging and because different research shows that through the so-called “casual collisions” – especially among workers that are heterogeneous in terms of role and sector – we can also generate a positive cross-fertilisation in terms of economic performance. The horizon becomes a sort of “planned serendipity” that many companies are encouraging by acting to create furnishing solutions, invest in design in general or even by recalling their teleworkers.

Activity-based Work is commonly understood as the possibility offered to people to use specially designed work stations to better support the numerous activities carried out in a work environment. Rather than forcing people to do most of their work at a single assigned desk, it encourages employees to recognise that different work activities can be better supported by spaces and functions designed specifically for that task. The introduction of Activity-based Work therefore requires innovative approaches to space, technology, people and culture. In other words, it should be seen more as a strategy for the transformation and evolution of the company than a methodology for the workplace (Leesman 2017).

What are the advantages of Activity-based Work observed by scholars? Surely, they include social interaction and communication (Mosselman et al. 2009) as well as increased information and knowledge sharing among employees (Peponis et al. 2007). This contributes, on the one hand, to breaking down organisational silos and strengthening relations between the different divisions (Black and Kuan 2011) and to creating a greater understanding of what others do the organisation on the other. While breaking down silos allows for greater work efficiency, the increase in organisational awareness allows workers to feel more satisfaction and loyalty to the company. Whyllie et al. (2012) also believe that a desk-sharing policy strengthens and encourages knowledge-sharing and can lead to better organisational performance and space efficiency. Finally, according to a study by Millward et al. (2007), staff with a personal location tended to identify only with their own working group, unlike those without a personal workstation, who had a stronger identification with the organisation. Not only that: Activity-based Offices cost and pollute less, the benefits identified
above lower the risk of emotional health problems, and as a consequence, fewer days of absence will be required due to illness (Bodin-Danielsson and Bodin 2009).

Managerial Skills and Styles

About ten years ago, when Smart Working and Activity-based Working were still beginning, a report by the Chartered Management Institute (2008) assumed that in 2018 it would be customary to have virtual teams operating remotely under manager supervision with the task of enhancing the complementary skills of both younger and older workers. The report also hypothesised that emotional intelligence would be as important as skills, competences and showing “wisdom”, which would be much appreciated in increasingly multi-generational work teams.

Finally, the same report suggested that:

- Organisational roles and job descriptions will become obsolete to the extent that they have hampered collaborative work;
- Organisations will recognise and reward more facilitating changes and the possession of management skills;
- Project management skills will become necessary for everyone;
- Innovation and creativity will characterise many types of work.

In fact, to date, this is not yet the practice, but it is a very strong trend. What emerges above all in terms of skills is that, in order to enjoy the workspaces and do business, the behaviours linked to the organisation of work (such as project management and the ability to define work priorities) and relationship management (from empathy to networking) are relevant. Also, in the historical excursus of the previous paragraph, it has been shown that Activity-based Work was born first to stimulate collaborative behaviours and team work. Some key competences, such as sharing, social intelligence and, above all, emotional intelligence, will become fundamental. Otherwise, the sought collaboration will either not be activated or not work at all (CMI 2008).

Smart Workers’ Skills

In general, we can distinguish two types of skills: professional and behavioural (Costa and Gianecchini 2013). The first ones are contextualised technical skills
and include the “know what” and the “know how”: the empirical knowledge and the meta-knowledge (De Montmollin 1984). The latter are more transversal, can be applied in different contexts and are distinguished by: motivations, traits, the self-idea, knowledge and skills (Spencer and Spencer 1993). The first two of these (also called distinctive skills) are difficult to develop and evaluate while the last two (threshold skills) are more visible and modifiable with experience and training; the final concept, the self-idea, is in an intermediate position (Boyatzis 1982). An error that is commonly committed is to consider people as isolated, thus neglecting all the situations in which aggregates are created that give rise to collective entities and behaviours with relatively autonomous objectives that are not the simple sum of individual objectives (Costa and Gianecchini 2013).

This situation is increasingly relevant in the knowledge economy (Rullani 2004), in which network technology induces and facilitates collaborative and sharing behaviours that amplify and enhance individual skills (Costa and Gianecchini 2013).

In SW Activity-based contexts, teams can operate more dynamically and have better physical and virtual spaces in which to interact. Not always having everyone seated at “contiguous” desks at the same time, however, brings attention to the communication dynamics the team members. Effective work sharing must be facilitated so that everyone can have access to the information they need, regardless of who has produced it and where they are. These behaviours are facilitated when a new culture of “presence” is affirmed that allows “teamwork” to be considered work that is carried out at a distance.

A fundamental skill is therefore the flow of communication management, both virtually and in person. Already in 2012, research by McKinsey showed that 28% of working time is spent managing e-mails (this value is also confirmed by a 2017 study by Adobe, see Figure 2). What we see in the Activity-based Workplace is a reduction in the number of e-mails circulating, especially during working hours. When you need information, you get up and go directly to the source, eliminating at least two e-mails (the request and the answer), obtaining the information in real time (instead of waiting for the interlocutor’s answer) and avoiding all the subsequent e-mails that could arise in case of misunderstandings. Above all, reducing the number of e-mails is very important because
it can be replaced at least in part by personal contact and collaboration (either physical or virtual).

**Figure 2: When do people check e-mails**

![Diagram showing email checking habits of Millennials](https://doi.org/10.978.395710/3154)

Source: Dietzen (2017).

Furthermore, time management competence is particularly important. In offices where no one has their own space and everyone instead shares all spaces, knowing how to organise time becomes physiological and far from obvious. If you book a desk all day and leave it empty for much of that time because you are in a meeting or in other places, you are misusing a corporate resource and probably – given the scarcity of resources – making it unavailable for some colleague. Time management is also fundamental for the management of meetings, which itself is a competence to be managed. In Activity-based Workplaces, there is an increase in meetings and therefore in the use of meeting rooms because people are asked not only to be more collaborative, but also to not hold meetings in places that are not suitable for this purpose (such as open space or corridors). The problem of meetings, as will be seen, is a hot topic in these case studies and is often linked to the absence of delegation and empowerment within a team, which leads to inviting all of those who can make decisions (typically the leaders).

Other very important skills stimulated in SW environments are creativity, innovation and contamination. This happens in the Activity-based Workplace in particular because, unlike traditional offices, they foresee the availability of specific creative spaces that allow the brain to work in “free-floating” mode and carry out activities such as problem-solving and lateral thinking both in an individual
and a collaborative manner. Dedicating special spaces means institutionalising these behaviours as very important and encouraging people to propose new ways of working, stimulating reflexes and helping employees to have intelligent work behaviours and attitudes (HM Government 2013).

Smart workers must have the autonomy to choose the most suitable place for carrying out their activity and, above all, the competence to make this choice. As illustrated in the previous paragraph, in Activity-based Work Environments, people have, on average, about ten different spaces available. Each space is linked to a unique combination between the same characteristics and nature of work that must be done, and it is therefore sufficient to analyse these variables (task, mind-set and the characteristics of the space) to choose the right place.

In this case, we are talking about new skills, and it is the company that has to take charge of properly training its people, providing the knowledge and tools to be able to work smart. It is essential to manage the transition to the new workplace with a proper process of change management.

**Figure 3: Changing the space and mind-set**

As we can see in Figure 3, changing the space without transforming people’s mind-sets would be ineffective, it would only be a superficial change; people would adapt the old way of working to new spaces. Where this has happened, typical perceptive distortions have occurred. We believe that the meeting rooms are always full, we close ourselves off in collaborative workspaces, we...
always book the same desk, and we complain that the new office is overcrowded and does not have spaces suitable for everyone. Almost always it is the classic self-fulfilling prophecy of Merton: people misuse the office and responsibility is attributed to the office, not the people. This phenomenon emerges particularly in those organisations that have adopted an Activity-based Model without carrying out an appropriate change management process, underestimating the “people” variable, not understanding its importance and possible impact.

Management of the cultural change must therefore be part of any SW project, ranging from simple “remotisation” to the more complex change of the Activity-based Working paradigm, from support for the continuation of “traditional” behaviours to the understanding of “new” behaviours and, above all, the acceptance of change in order to reduce resistance to it.

In terms of skills development results, recent data from the Italian Smart Working Observatory are comforting. Figure 4 shows the percentage of people in the company who show a “fully satisfactory” mastery of certain skills with a distinction between those working in a SW environment and the rest of the staff working in traditional environments. It is clear that the percentage of those who work in SW possess many important technical skills that are superior to those of the rest of the staff, including digital security and virtual communication as well as soft and managerial skills such as creativity, leadership, teamwork, self-empowerment and knowledge networking.
Figure 4: Activity-based workers’ satisfaction vs. others’ satisfaction

Source: Polytechnic of Milan (2017).

Are the competences named up to now completely new and the result of SW? The ability to organise work, manage time and relationships with others, organise an effective meeting, understand when to replace an e-mail with personal contact, innovation, creativity and contamination are behaviours that organisations have been waiting for their employees to develop for years. If anything, the issue is today they have become a necessary condition for surviving in organisations, particularly since it has been ascertained that collaborative work and innovation produce more value than individually focused work.

The risk to be avoided is maintaining a traditional office culture that, for example, relies on personal interaction and decision-making only by people who are physically present, cutting out those who are not permanently present (HM Government 2013). Furthermore, Black and Kuan (2011) state that the lack of opportunities for employees to personalise their work space can have a negative effect on morale. Thus, people could begin to “mark the territories” by leaving personal objects, for example, to claim a certain space for themselves. It could therefore be said that the first distinctive competence of the company becomes its culture, understood in this sense as a set of behaviours born and perpetuated in the company that are naturally transmitted to the new recruits (Schein 1984). In a context in which the immaterial resources linked to human
capital assume an increasingly decisive weight, and the individuals’ knowledge and their ability to apply it is a prerequisite for successfully completing their tasks and achieving their goals in line with organisation’s strategic objectives, it is an unavoidable necessity to give an increasingly substantial part of the individuals’ skill assets management.

Managerial Skills

As mentioned previously, in order to be a successful Smart project, management must favour the creation of a work environment based on trust and not on control, where the worker carries out his activities in a conscious and deliberate way, creating and transmitting a common vision. The role of the manager becomes more and more central within Smart Environments and Organisations: the manager is called to activate managerial behaviours and practices in a credible manner. Management becomes crucial to ensure that Smart Environments and Technologies become real enablers and contribute to the engagement of workers.

Is the change that they are called to make really a new managerial evolution? Are the skills that the Smart manager has to develop really new?

In recent years, various studies have attempted to understand the fundamental qualities that a manager must possess in order to influence their organisation effectively. The theory of multiple intelligences postulates that managers must possess problem solving skills, effective decision making in complex situations and the capacity to manage relationships; in this context, the concepts of emotional, cultural and managerial intelligence were developed (Costa and Gianecchini 2013).

According to Goleman (1998), emotional intelligence is the ability to recognise and manage one’s own feelings and those of others, which motivates relationships with others and manifests itself through personal competence, understood as awareness, self-control and motivation, and social competence, which depends on empathy and social skills. Cultural intelligence (Early and Mosakowsky 2004) is defined as a person’s ability to act effectively in situations characterised by cultural diversity. Finally, managerial intelligence (Menkes 2006) can be defined as the set of skills that a manager must demonstrate to be successful in working contexts (Costa and Gianecchini 2013).
Factors such as leadership ethics, a relationship of trust with their employees, openness to listening and the style of transformational leadership are important to create an environment of trust in which workers can be effectively engaged (and therefore more productive) because they are empowered and involved by their managers to achieve collective goals and are encouraged to become innovative problem solvers (Kahn, 1990). In fact, Rensis Likert already claimed in 1961 that the productivity of workers depends on (Likert 1961):

- A low pressure to obtain it;
- A more detached hierarchical control;
- The reactions in case of errors are not punitive but rather aimed at understanding and oriented towards development.

There are essentially four managerial and leadership styles that the author has observed (Likert 1961):

- Authoritarian-exploitative;
- Benevolent-authoritarian;
- Advisory;
- Group participatory.

The leadership model that Likert discusses is not limited only to the establishment of a good relationship between boss and collaborator, but also requires important changes in the organisational structure, system and communication (Bonazzi 2002). The focus is on respecting the autonomy of each employee and the importance of the continuous and collaborative exchange of ideas. According to Likert, the communication process influences the workers’ perception of their environment and consequently their behaviour, which influences and determines the organisational climate. The fundamental skills that managers are required to have today are not far from those identified in the organisational and managerial theories of the last 60 years. What is the difference then?

The substantial difference lies in the fact that in environments and organisations that decide to pursue SW, the perpetuation of authoritarian leadership styles, which are more based on control and micro-management and less on worker responsibility and creating a climate of trust, can become the source of failure for the Smart Model. In fact, the first significant change is the shift from the “management by presence” style to the “management by results or objectives” style (Drucker 1967). Too often we are still seeing companies with the inability not only to plan, but also to correctly manage the relationship be-
tween urgency and priority. This means that the last task that arises or the one most pushed by the leader or a contingency becomes the first to be completed. This not only creates work inefficiencies, but also distorts the perception of the relationship between the boss and employees. We tend to keep the whole team close to manage the work on the basis of emergencies that come up and sometimes lose importance in a short time (when supplanted by a new emergency), nullifying the work done in the meantime. People who spend more time in the office are valued and rewarded and are naturally more likely to take on an emergency, whatever it may be. All this makes it very difficult to manage people in environments where teams are virtualised and remotised and can therefore operate anywhere in the office or city. On the contrary, it may lead to inserting elements of rigidity into flexible work, such as the policy of holding meetings exclusively in person.

Excessive planning can also represent a form of rigidity when it is not respected; when the time allocated to planning and re-planning becomes excessive, the role of the manager to inspire and transmit the purpose becomes more and more decisive. Letting people find the way to accomplish tasks and supporting them in their work and in the relationship between team members and the rest of the organisation through cognitive processes activation gives meaning to workers’ experiences. The manager must be a continuous and constant activator of “sense-making” processes (Weick 1969).

Management by results should be the norm everywhere. It is important for team managers to take care of other things, such as communication development and reporting protocols consistent with the team. It is also essential to maintain team cohesion. When working in different ways, in different places and at different times, relationship management is a very delicate activity to avoid inefficiencies and bad moods.

Finally, another fundamental theme is relationship management with new hires because they faces disorientation entering in a SW environment and interacting with virtual teams, because they do not have sufficient knowledge of the work processes, activities or the distribution of responsibilities. In other words, they do not have organisational awareness. To handle this situation, new recruits typically do not immediately work remotely, but they need to be accompanied by colleagues with more experience as mentors in order to be empowered and made autonomous.
For decades, the literature has been talking about the importance of open, transformational, communicative leadership aimed at clarifying goals and expectations, giving feedback, encouraging empowerment, managing relational and group dynamics, and supporting the team spirit through the liberation of knowledge and resources. The outcome of these communication behaviours is effective leadership that promotes clear roles, engagement with the organisation and tasks, and highlighting the importance of employee participation in group performance (Hamrin 2016). Ulrich et al. (2009) have developed a “Leadership Code”: a set of five rules of good conduct for leaders, who must be the strategists of the future and “make things happen”. They must be able to manage and retain talent in order to develop human capital through the search for continuous growth in terms of personal skills (personal proficiency). This is the basis for the others to function properly; the leader must mediate on his or her physical well-being, social ability, and intellectual and spiritual evolution.

The Smart Working Observatory of the Polytechnic University of Milan created the Smart Working Leadership Journey, a tool that aims to guide and support leaders in the process of changing managerial styles with respect to four principles of leadership, built with the input of managers who have experienced this kind of change (Methodos et al. 2015):

- **Sense of Community**: it is important to create an environment of trust and mutual knowledge to facilitate coordination, collaboration and relationships between people even virtually or at a distance;
- **Empowerment**: managers must learn how to empower, encourage the diffusion of a culture based on delegation, autonomy and evaluation for objectives and results, so as to allow the evaluation of the results of Smart Workers, favouring empowerment and professional growth at the same time;
- **Flexibility**: the ability to promote and manage the organisation of work activities in a flexible and adaptive way to balance personal and professional needs;
- **Virtuality**: the ability to balance the use of digital technologies and other modes of interaction, choosing from time to time the method and most effective tools with respect to the objectives, encouraging a joint, balanced use of technology and in-person meetings.

Already in 2014, research by the CEB showed that in recent years, 67% of people have increased the amount of time they spent collaborating with other people. For 60%, the daily network of people with whom we interface is at...
least ten people, if not more. Another 60% say that, in order to carry on their work, they have increased the trust they place in others. It follows that this is not a matter of changes to the managerial role. The managerial skills required have been the same for many years now, especially since work has already been flexible in large companies for a long time, because work teams are almost always confronted with other geographically dispersed teams.

Case Studies

In 2017, we conducted a qualitative and quantitative analysis in three large Italian companies that were undertaking radical changes towards a Smart Model, where space and technology were perceived as the only determining elements for the adoption of a “new way” of working.4

The change management project towards the SW paradigm started with an in-depth analysis of the organisational workforce in order to identify the behaviours in which it was necessary to intervene. In fact, the organisational behaviour (variable “behaviour” or “people”) is the basis for defining the equipment of technology and spaces (variables “bricks/place” and “byte/platform”). Once the behavioural profiles of the workers had been identified, the most suitable spaces for carrying out work activities and enabling technologies were studied. The analysis continued with qualitative surveying tools in order to gather useful information, define perceptions and expectations, involve different people belonging to the various departments (in order to improve the effectiveness of actions in terms of satisfaction) and valorise ideas and reflections using bottom-up logic.

Moreover, the working methodology to transform the office into an Activity-based Work involved a deep analysis phase to understand the quantity and variety of space required in the office (Hardy et al. 2008):

- A Space Occupancy Analysis that measures how space is occupied during the working day;

4 For privacy reasons, the names of these companies will not be mentioned. Two companies are publicly owned and operate in services (which we will call Company A and Company B), while the third is private and works in the logistics sector (Company C).
• An analysis of work processes and interactions between people, both from the organisational point of view (how it should be done) and from the point of view of people (how it is actually done);

• An assessment of the technology used, the use of printers and storage methods.

The goal is to understand the junctions between one channel and another and assess any difficulties and obstacles that the worker faces to achieve their goals and improve their experience. The outputs are:

• **The Customer Journey Experience Map**: the graphical representation of the journey experienced in a typical day of work by the employee built based on the results of preliminary interviews;

• **The Feel Map**: a representation of the emotional baggage that the employee experiences when he engages with the company during a typical day of work, measured in terms of engagement, productivity and mood;

• **The Synthesis Map**: a final synthesising document that allows researchers to plan the new experience.

The research methodology used is divided into three macro moments: observation, perception and declaration (see Table 1).
Table 1: Data synthesis

<table>
<thead>
<tr>
<th>Observed</th>
<th>Tools</th>
<th>Target</th>
<th>Company A</th>
<th>Company B</th>
<th>Company C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Space Occupancy</td>
<td>Entire staff</td>
<td>600</td>
<td>405</td>
<td>174</td>
</tr>
<tr>
<td>Declared</td>
<td>Employee Journey Survey</td>
<td>All staff except for top management</td>
<td>60% c. 565 people (redemption 94%)</td>
<td>60% c. 217 people (redemption 54%)</td>
<td>60% c. 132 people (redemption 76%)</td>
</tr>
<tr>
<td>Perceived</td>
<td>Focus Group/ interview</td>
<td>Top management</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Di Nicola et al. (2018).

During the Occupancy Study, researchers went into the field to observe how people live in spaces. For the Working-behaviour Analysis, on the other hand, the declared population was analysed based on their behaviour and their daily work life using the survey tool, while the workshops listened to the employees’ points of view on their own “employee journey”. Finally, the organisational vision was investigated using interviews and focus groups with top management, which allowed for the three dimensions to be compared. The total sample of the study consisted of 1,179 people. The response rate was above 50%, while about 60% of the entire workforce and 100% of the top management were involved in qualitative analyses.

In terms of work methods and the use of space, there is generally dissatisfaction with one's working space, which is usually considered not very comfortable or welcoming. As expected, the analyses have shown that the lack of space functionality has a negative effect on work performance, influencing the efficiency, effectiveness and corporate image.

In general, people declare themselves quite stationary in terms of the use of space (Company B), preferring their desk, where they report spending more
than four consecutive hours (Company A and Company C). However, satisfaction with their desks as a place to perform individual or collaborative activities is very low. Even when it comes to the choice of office space, there is strong dissatisfaction; there is a lack of break areas, private spaces and spaces to make phone calls or conference calls (Company B, see Figure 5).

**Figure 5: Space satisfaction in company B**

![Bar chart showing space satisfaction in company B](https://doi.org/10.978.395710/3154)

Source: Di Nicola et al. (2018).

It is interesting to note the difference between the declared and the actual values. In the case of Company C, for example, the observed presence of personnel in the workstations is less frequent than it is perceived by people: more than 40% of employees, at the time of analysis, were absent or temporarily absent (i.e. present in the office but not in their location, see Figure 6).
In all three cases studied, collaborative work is perceived as very frequent. However, people claim to have the need for some types of spaces that are currently lacking or not present. For example, in the case of Company B, there is a widespread tendency for collaborative working (82%) but for 48% of people, the office is a “binding” place in terms of the tools, documents and materials available that are necessary for teamwork.

As part of collaborative work, the hot topic of meetings is included. The increase in the frequency of meetings must be balanced by greater efficiency, which can be achieved by reducing their duration. However, knowing how to organise and manage a meeting well is a quality that is very rare; meetings generally start late, end up running over, and invite too many people, and usually, nobody is prepared for the meeting, not even the organiser. In the cases analysed, the presence of spaces dedicated to this type of activity is very limited or the spaces are badly used. In most cases, they are “dedicated” exclusively to members of high managerial levels.

In fact, from the organisational analyses carried out with the Employee Journey Tool, the time spent in meetings is always when the mood, and often also the productivity, is lower (Company B, see Figure 7).
In this regard, it is interesting to note how the way the work is performed is perceived differently between collaborators and managers: the former sees a clear predominance of individual work at the expense of collaborative work, while the latter sees a balance. Furthermore, it is difficult for the leaders to organise the work: only 7% can respect established plans, as they prefer to work on emergencies or on the management of short-term operations while neglecting strategic planning (Company C).

Finally, collaborative work often results in poor levels of empowerment: about 60% of people believe that they are not autonomous in the production of their “output” (Company A and C) and that they need frequent input from leaders/collaborators. In fact, in all three situations, there is a perception of low autonomy, poorly shared objectives, unclear tasks and limited sharing of information useful for carrying out an activity.

Can collaboration only take place in person? Almost everyone considers “re-motisation” feasible and even the leaders do not see space-time constraints in the organisation of work. In the case of Company B, 100% of the leaders believe that it is possible to work from different “places” (71% even at different times) and 74% of respondents consider it feasible to have at least one day a week of remote working. The percentage rises to 93% in the case of Company C and is above 50% in Company A. The fundamental element, in all three cases, is the provision of adequate tools for advanced communication, which make it
possible for interactions to occur at a distance with the same effectiveness. Furthermore, the provision of laptops and smartphones would reduce the need for physically storing printed documents. For example, in Company C and A, people print emails to “read better”, or “write on it”", while documents and presentations are printed to present them in a meeting with one's own boss.

Ultimately, in the three companies studied, it can be stated that:

• The need for collaborative work is strongly felt but limited. It must be stimulated with proper environments, technologies and functional behaviours;
• It is important to increase the variety of activity-based spaces by providing areas for privacy, breaks and different types of collaborative work (formal and informal);
• Mobile technological equipment should be increased and be functional for the different types of work done;
• It is appropriate to work on managerial behaviours to facilitate an organisational culture based on the Smart Model to facilitate change.

Conclusions

Will technological evolution make the role of the individual superfluous in the organisation? The answer is no. The problem, if anything, is cultural. Technological evolution has travelled at a faster rate than society and its organisations. And this happens because technology is designed, sold and used at a speed much faster than the speed of changes in organisational behaviour and the skills necessary to achieve the objectives that technological innovation allows (Varvelli 2004).

Work, as is clear, is no longer rigidly standardisable, either in processes or in definitions. An error that many studies that fear the end of human work in favour of machines seem to make is analysing the labour market by dividing it by occupations rather than by categories of tasks performed, which in fact overestimates the potential negative effects of automation. As Arntz et al. (2016) explain, if you introduce a task-based approach, which allows you to analyse the daily activities carried out within the same occupation, you can see how the percentage of jobs at high risk of replacement is very small. In Italy, for example, an unpublished study carried out by INAPP, a research institution within the Ministry of Labour, shows that there is an undeniable correlation between
job redundancy and job loss indices, but also that from 2011 to 2016 technological unemployment affected only 1.5% of workers (Sacchi 2018).

The progressive globalisation of the market has favoured the growth of “free agents” to the detriment of full-time work performance. The entrance of the workers from Generation Y into the world of work and the increase in the phenomenon known as the “Sheconomy” (Holland 2016) expand the boundaries of the places where work activities take place and impose the need to create new a work-life balance, but above all upset the normal vision of the same concepts of work, job and tasks.

Paradoxically, the challenge for politics and institutions will be to increase investment in new technology. In fact, the danger of automation seems to be smaller precisely in the countries that invest the most in ICT, robotics and Artificial Intelligence and at the same time spend more on tertiary education and generally promote better educational policies: in short, in those countries that invest in the evolution of skills. For organisations, on the other hand, it is crucial to design a wide range of physical environments that can effectively integrate different ways of work at any time and apply the technologies to support its deployment (Hardy et al. 2008).

Olson (1982) stated that organisations and employees would no longer be bound by a standard work environment based on hierarchical office structures and defined work programs. Today, in fact, the former must change their physical and hierarchical structures, their own styles of leadership and control over the output; the latter must rethink their approach to the workplace and how work is done (Chen and Nath 2005).

Organisations that show a gap in the management of change and in the development and maintenance of necessary skills must provide solutions to reinforce them as soon as possible because their absence in Smart Work environments is dangerous for the organisational climate and productivity and prevents opportunities from being seized, which leads to needing more time to pay back investments. Furthermore, concretely demonstrating the necessary skills in Smart Environments allows you to recover the productivity that is lost in traditional offices. Shorter meetings, fewer e-mails, problem solving and optimal time management are all elements that allow you to recover a lot of time to allocate to work or – why not? – not work, thus investing in organisational well-being. This is a good summary of the old adage “doing more with less”.
Unlike in the past, managerial skills can no longer be lacking or inadequate and must be applied correctly and with more discipline so that people and organisations working in Smart environments can really benefit from it. Changing management initiatives to align behaviours, styles of leadership and culture to the new way of working represents the critical factor for success in every SW project. Often, resistance from managers for fear of losing control over people is among the first three barriers found in SW projects, together with the low commitment of top management and the possible difficulties coordinating people (Methodos et al. 2015).

It follows that the path to SW must be included in a general change of mind-set and values, but its implementation must be progressive and carefully take into account the starting state in terms of organisational rules, legal and union protections and safety issues. An effective path towards SW must be managed with a systematic approach that simultaneously affects flexibility, empowerment, accountability, trust, a focus on results, collaboration and innovation (Methodos et al. 2015). In fact, such a process (Di Nicola 1996):

“Requires a great cultural change, which should be done in the right way: it needs managers who can evaluate their employees based on goals and results (and not according to the hours they spend in the office), it needs responsible and motivated workers, and trade unions willing to change. Only a culturally open attitude by all the players in the process, but above all by businesses and trade unions, will allow us to overcome the undeniable organizational, regulatory and sociological difficulties”.

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Carsten Kampe, Daniel Porep and Anja Walter

Introduction

Digitalisation in Germany has become a social megatrend and is no longer questioned. There is also a consensus that in the future more and more businesses will have to address issues concerning digitalisation in order to compete in the market. This is linked to far-reaching changes in the labour market. Individual occupations and jobs will lose their significance, while the demand for others will increase. The skill set and competency requirements for a large number of jobs have already changed and will continue to shift further in the future. Despite the ubiquitous nature of the topic, it is surprising that only little is known about the quality of digitalisation processes within companies.

Against this backdrop, the skilled labour monitoring (FKM)¹ unit of the “Specialist and Labour Workforce in Brandenburg” project, promoted by the Brandenburg Economic Development Board², analysed corporate digitalisation processes in-depth in two empirical studies. The project was sponsored by the Brandenburg Ministry of Employment, Social Affairs, Health, Women and Family (MASGF)³ with funds from the European Social Fund and the Federal State of Brandenburg.

In 2016, an explorative survey was conducted on the state of digitalisation development in Brandenburg. The basis for the survey was 84 case studies in enterprises across Brandenburg that mapped out the current digitalisation processes and examined their effects on organisation as well as job content. Qualitative semi-structured interviews with managers and human resource

¹ In German: “Fachkräftemonitoring” (FKM).
² In German: “Wirtschaftsförderung Land Brandenburg GmbH”.
³ In German: “Ministerium für Arbeit, Soziales, Gesundheit, Frauen und Familie, Land Brandenburg” (MASGF).
managers were conducted at selected businesses. The aim was to investigate companies in which digitalisation processes that followed the trend of “Economy 4.0” could be observed in order to establish what the scope of development has been in Brandenburg in recent years. We were looking for the pioneers and trendsetters who illustrated the potential offered by digital transformation. Accordingly, the exploratory analysis was not intended to be representative. What was investigated was not the state of digital development in Brandenburg, but the digitalisation potential in Brandenburg that can be empirically surveyed.

Based on the findings of the exploratory study, an extensive inquiry was conducted in 2017 into corporate digitalisation and its impact on the labour factor. Within this project, different scientific methods were used. In addition to preparing literature and statistics, a representative telephone survey was conducted involving over 1,000 undertakings in selected industry sectors in Brandenburg. This investigation aimed at generating statements that could be generalised. Different research hypotheses were analysed in greater detail based on the findings of the exploratory pre-study. Both empirical studies complemented each other accordingly.

The actual statements endorsed the impact of corporate digitalisation processes on the competency requirements of the workers in the focus groups. In this way, the analysis took up the findings of both underlying studies. In this context, the following two questions served as guidance:

- Have the competencies that businesses require of their employees changed as a result of digitalisation?
- What skills and areas of expertise have been affected by the changes in competency requirements?

Before looking more closely at corporate digitalisation processes in the Federal State of Brandenburg, further description of the terms competency and digitalisation is provided and the technological change in the digitalisation process is described. This change represents the essential framework for analysing the transformation of competency requirements. Subsequently, the main empirical findings of both studies with respect to changes in competency requirements are outlined. At the end of this analysis, a summary of the key findings is provided.
Definition of Terms: “Competencies” and “Digitalisation”

Two terms – “competencies” and “digitalisation” – are the key reference terms for the following studies. As they are not uniformly defined and are used in a range of different contexts, the terms and the associated concepts need to be first described in detail.

What Do We Mean by Competencies?

A variety of definitions exist for the term “competencies”. Each definition’s approach is essentially derived from the perspective and the particular interests of various studies. It therefore follows that different disciplines use different definitions. In addition, the term “competency” overlaps with other terms in various areas, such as “qualification”, “education”, “knowledge” or “abilities” (cf. Zürcher 2010: 1ff.).

A definition of the term competencies may be traced back to the psychologist Franz E. Weinert. Competencies are “the cognitive abilities and skills that individuals possess or can learn for solving specific problems and the associated motivational, volitional and social readiness and abilities that enable them to use these solutions responsibly and successfully in a variety of situations” (Weinert 2001: 27ff.). Central to this definition is the description of competencies as the ability of individuals to solve problems. Abilities are multi-layered and include both intellectual and social skills. Either they are an innate ability or they must be learnt. They are used for problem-solving in different, not clearly defined situations. In this way, they relate to specific challenges and enable the individual to successfully solve problems in different contexts. In addition, for this analysis, it should be noted that the acquisition of competencies takes place not only in formal, but also in informal learning contexts (cf. Zürcher 2010: 4).

What Do We Mean by Digitalisation?

In recent years, the increasing digitalisation of the economy and the concomitant changes have been much discussed and publicised. In addition to published works, which show the possibilities for digital solutions and their applications (amongst others agiplan et al. 2015, Fink et al. 2016, Bischoff 2015, Roth et al. 2015), there are various empirical studies on the state of digitalisation in Germany, such as the BMWi DIGITAL Economy Monitoring Report (2016), the
Germany Index published by the Public IT Competencies Centre at the Fraunhofer Institute for Open Communication Systems FOKUS (Opiela et al. 2017) or the studies published by the Institute for Employment Research (IAB) (Dengler and Matthes 2015, Arntz et al. 2016, Bogai et al. 2017, Buchet et al. 2016, Warning and Weber 2017). Because of the range of topics addressed in the scientific and public debate, it is no surprise that there is a vast number of approaches to the definition and working methods. Depending on the area of interest in question, the analysis and conceptual thinking are centred on a different aspect of digitalisation, which influences the particular understanding of this term. In view of the complexity and multi-layered potency of the subject under investigation, a generally accepted (and thus necessarily highly abstract) definition of the terms seems less expedient.

Due to the specific focus of the underlying investigation, a practical approach to the concept of digitalisation is used here, as a term that reflects the interrelationship between technology and work organisation. In accordance with this approach, the extent of digital penetration is determined firstly using technology and secondly by the corporate and possibly inter-company networking of digital technologies. Accordingly, a high level of digitalisation always implies a high degree of networking. According to this interpretation, the deployment of digital technology without relevant changes to process chains implies a low degree of digitalisation, regardless of the type of digital application and associated investment resources. In conclusion, digitalisation at a corporate level means the networking of different areas of operational service provision based on information technology (IT). For the empirical study, within the business telephone survey, digitalisation was operationalised using a 5-option response format. These options were:

- No IT (no IT-based or IT network-based solutions);
- No networking (IT-based solutions not networked with other processes);
- Internal networking (IT-based solutions in an operating area networked with other processes within this operating area);
- Cross-area networking (IT-based solutions in an operating area networked with the processes of other operating areas);

Whereby sophisticated digital solutions typically always also rely on process networking. High-tech solutions – the so-called stand-alone solutions – are virtually impossible to find (cf. Kampe and Walter 2017).
• Fully digitalised and networked (IT-based solutions which network both internally and across all operational processes).

In the following analysis, the findings are focused on businesses that had at least the digitalisation status of “no network” and used some form of IT in their operations.

**Technological Change and Digitalisation**

The digitalisation of production and operational processes, in addition to facilitating interfacing with customers and vendor companies, is having an impact on businesses across all industries. The “Industry 4.0” concept, which has dominated Germany for many years, fails to mirror current developments and has led to an inappropriately narrow view of future prospects. Digitalisation processes may be observed in all areas of the economy and are not just restricted to the (further) automation of industrial production. Agriculture has been impacted by this change just as much as the manufacturing sector, as have all kinds of personal and corporate services.

What is new in current developments? The use of computers and the internet in virtually all areas of life has now become completely standard. This applies to most areas of the economy. For a long time now, the industrial and service economies have hardly been conceivable without digital technologies. For many years now, high-tech combine harvesters, modern CNC-milling machines, online shopping and banking, fully and semi-automated manufacturing lines in industrial mass production, etc., have characterised Germany as a place for business. Considering how long these technologies have already successfully been in use, it is somewhat surprising that the terms “Industry 4.0” and “Economy 4.0” were able to shape the political and scientific debate in Germany in such a way in recent years. Many of the developments we see are hardly revolutionary, but rather represent evolutionary processes that have a long operational history promoted by businesses with a purpose in mind. Within the context of digitalisation, we may observe the emergence of a new type of products, allowing customers to increasingly configure consumer goods according to their personal preferences. Part of this process leads to leaps forward in development, the emergence of new markets and strong economic growth.
The key payoff of digital change, according to the findings of empirical studies, lies in the comprehensive reorganisation of operational production and service processes. What can be observed is the extensive networking of virtually all operating areas and functions. Here, sub-processes are coordinated so that the overall process can be planned and calculated in the shortest possible time. Relevant optimisation potential may be harnessed by partially automating individual process steps. However, only the interconnection of formerly separate operational processes will allow development margins to open up to comprehensive rationalisation, the development of new products and services and, thus, growth. To achieve such digital integration, a comprehensive and integrated view of operational (and, in part, also inter-company) processes and procedures is required. Technically, it must be possible to coordinate different operational areas within the business (production, process control and administration, etc.) by means of appropriate interfaces enabling a seamless workflow. From an organisational standpoint, formerly separated and often sequential processes have to be parallelised and closely interconnected. When the digital integration is successful, the often-long process chain turns into a compact process block that operates much faster, more cost-effectively and more flexibly than before digital innovation.

This change in technological framework conditions within a business will not remain without consequences for the employment factor. Skill and competency requirements for employees are impacted in addition to organisational aspects of work processes. Digital integration may only succeed if employees are able to operate in complex solution-oriented contexts. Even small errors can cause extensive damage in a highly integrated system. Digital systems work when employees from the different operating areas (production, planning and personnel management, etc.) are able to detect such errors early on and respond accordingly. The following section describes these effects in tangible terms by presenting the empirical findings of the underlying investigations regarding the effects of digitalisation on the competency requirements of businesses.

Changes to Labour Through Digitalisation

The spread of new technologies and the concomitant emergence of new forms of processes and organisation for businesses are having an impact on the la-
bour market at various levels. Both job content and the organisation of working processes are affected. Technical innovations have always resulted in shifts in the labour market. Before now, there was never any reason to fear unemployment caused by technological advancements. Both the industrial revolution as well as the shift to the service economy have led to a widening of the salaried labour market. But the kind of employment as well as the qualifications and competencies associated with it change over the course of technological advancements.

The quantitative effects that the digitalisation of the economy may have on the working world as a whole were investigated in a study by the Institute for Employment Research (IAB)\(^5\), the Federal Institute for Vocational Education and Training (BIBB)\(^6\), as well as the Institute for Economic Structures Research (GWS)\(^7\). A complex macro-economic model was used for a scenario analysis on the quantitative and qualitative future of employment. The findings have shown that no significant changes in the level of employment – i.e. the total workforce in Germany – are to be expected. However, changes in the nature of jobs can be detected. Specifically, occupations in the manufacturing industry will decrease. This will concern, for example, machinery and line control as well as maintenance jobs. On the other hand, an increase can be expected in other sectors of the economy. This will apply, primarily, to service-related jobs, for example to IT and scientific occupations. In terms of skill level, the study has concluded that academic education will continue to gain importance, whereas the majority of losses will occur in vocational education and training (Wolter et al. 2016 and Bogai et al. 2017 on the same subject).

It is clear that the digitalisation of the economy will affect job content and employment relationships for a large number of workers. Where the path in the various sub-segments of the (Brandenburg) economy will lead, however, is still an open question. For example, there are some indications that the demand for low-skilled jobs will continue to decline in highly automated and technical (industrial) manufacturing. The greater the degree of technical automation progress, the more simple job tasks that are likely to be performed by machines and robots. This may be the case, for example, for simple tasks in logistics and

\(^5\) In German: “Institut für Arbeitsmarkt- und Berufsforschung” (IAB).

\(^6\) In German: “Institut für Berufliche Bildung” (BIBB).

\(^7\) In German: “Gesellschaft für Wirtschaftliche Strukturforschung” (GWS).
machine assembly as well as data collection and entry that were previously performed manually. However, in areas where automation, amongst other things, reaches its limits due to high capital expenditure (small light industry and trades businesses and personal services, etc.), there is a chance that the Economy 4.0 will also open up good jobs for low-skilled workers.

It has also become clear that specific, somewhat traditional know-how may become considerably less relevant due to digitalisation or be at risk of becoming obsolete and disappearing completely. For example, the operation of agricultural machinery has changed immensely. In the meantime, farm workers have had to learn to interpret error messages and react appropriately. In addition, it is now primarily about configuring agricultural machinery and less about its operation. Traditional agricultural know-how is becoming less and less important, at least in industrialised farming. At the same time, technical occupations will become increasingly more relevant, and this sector is no exception. This process is even more pronounced in dental laboratories. In this field, digitalisation may lead to the occupation of dental technician becoming obsolete altogether. Here, a whole profession may be facing fundamental changes in content and/or its extinction.

Even though in certain occupations dramatic shifts appear possible due to digitalisation, the changes in competency requirements will be much more far-reaching. It is likely that almost all occupational groups will be affected, even if their existence per se is not threatened.

**Competency Requirements**

Digitalisation entails new competency requirements. The exploratory survey has shown that, across all industries, human resources are being used more flexibly. Workers need to deal with new tasks more often than before or are needed elsewhere in the production process. While formal qualification requirements will lose some importance, IT skills, by contrast, as well as methodological and social skills, will gain in relevance. Increasing internal communication requirements, as well as increasing responsibility for the entire operational process will become especially important, precisely in relation to digital integration processes. Both contexts were cited by numerous managers as a challenge. Systematic strategies for action, however, could not be identified for
dealing with these emerging requirements. It is noteworthy that the outlined changes in competency requirements are more or less pronounced at all skill levels. Academics and skilled workers might still be reasonably adept at dealing with the new competency requirements. But increasing requirements that are also relevant for jobs requiring no skills are to be expected. In the future, it is more likely that demand will focus on unskilled workers who are able to perform standardised tasks in complex contexts and, at the same time, detect errors in the overall system. Such competency profiles are likely to be sparse in the Brandenburg labour market and are more likely to reduce the employment prospects of the most low-skilled workers.

The need for well-trained, skilled personnel with relevant qualifications meeting changed production requirements will continue to rise. In this case, there will be a greater call for IT skills on the one hand and, the ability to interpret large and, in part, multi-dimensional datasets and information on the other. Both of these skill sets will be fundamental for certain tasks and may be better described as technical requirements. Only if workers are in the position to interpret the flow of information in complex processes will they be able to also use this knowledge for optimising production. Technical expertise alone is not sufficient for successful digitalisation. Based on the empirical findings and reviewed literature, at least five competency areas may be identified that, depending on the job task, are more likely to either grow in relevance or be only marginal, namely:

- (Job-related) technical skills for handling specific requirements of everyday work;
- Diversified technical competencies in the area of application and control;
- Process- and problem-solving competencies for ensuring the functioning of complex procedures as well as for organising development and adaptation processes;
- Social skills for dealing with colleagues, partners and customers, ensuring situation-appropriate reactions in networked production and service processes;
- Self-development or self-learning competencies for maintaining the ability to react to future developments and/or becoming providers of development steps themselves.

The quantitative business survey has confirmed that, in the course of digitalisation, a broad competency setting is gaining importance and the competency
requirements for employees in Brandenburg businesses are changing accordingly (see Figure 1). Specifically, technical requirements have increased. Almost 70% of businesses stated that the need for technical expertise had increased. Additionally, the percentage of businesses that have reported significant changes is the highest in this particular area (17%), underscoring the far-reaching operational impact of digitalisation and providing an example of the challenges faced by businesses in mastering this process.

The second most notable consequence of increased technical requirements is the increased demand for process know-how: 12% of the respondents referred to a strong increase and 48% to a modest increase in competencies in this area. In addition to process know-how, 47% of the respondents mentioned a growing requirement for interdisciplinary skills, i.e. cross-disciplinary knowledge. Both contexts are an indicator of the increasing density and growing complexity of production and service processes as part of digitalisation. Both aspects confirm that as part of digitalisation, individual employees will have greater responsibility for the overall operational process, which is a development that was mentioned by businesses in the unstructured interviews. Workers will need greater knowledge of the overall process and their colleagues’ jobs in other operating areas in order to fulfil this responsibility.

**Figure 1: Changes in relation to technical requirements**

![Figure 1: Changes in relation to technical requirements](https://doi.org/10.978.395710/3154)

For all the three aspects mentioned, requirements increase with the level of digitalisation of a business (see Figure 2). Notable, however, is that in fully digitalised and networked businesses the proportion of businesses with increasing technical demands and requirements for process know-how decreases slightly compared to cross-sector networked businesses. This is possibly because technical requirements and the requirements for process know-how increase, especially for the direct implementation of digitalisation, and decline again after networking fully. However, requirements for interdisciplinary knowledge are the highest for fully digitalised and networked businesses. Overall, a clear difference may be seen between businesses with on-going networking and businesses with no networking. For businesses with networking, over 50% of the businesses in almost all technical areas reported increasing requirements as part of digitalisation. This was especially pronounced with regard to technical requirements.

Figure 2: Businesses with increasing technical requirements in relation to the degree of digitalisation

The increasing requirements for process know-how and interdisciplinary knowledge may be interpreted as evidence that digitalisation results in increasing compression and an increase in the complexity of production and service processes. In this context, more than one-third of the businesses also reported increased communication needs (see Figure 3). The fact that digitalisation involves the entire process chain is confirmed by evidence that all forms of communication requirements, i.e. in-house teams, cross-area teams and communication between employees and customers as well as between customers and suppliers, have increased in a significant portion of businesses. Most businesses reported an increase in terms of internal cross-team communication requirements. This suggests that internal digital networking processes especially generate corresponding communication needs. On the other hand, the proportion of businesses that report no changes in communication flows is relatively high, ranging from 55% to 65%. It is quite possible that technological developments precede organisational change and businesses have yet to identify their increasing communication needs.

Figure 3: Changes in relation to business communication needs

![Bar chart showing changes in communication needs](https://doi.org/10.978.395710/3154)


Similar to technical and communication requirements, there is a clear correlation between those requirements and the level of digitalisation. There is also an obvious difference between networked and non-networked businesses.
Most businesses with an increasing communication need fell within the group of businesses with cross-area networking. In contrast, the proportion of businesses with increasing communication needs was slightly lower for fully digitalised and networked companies. The exception was external communication with customers. In this case, most businesses in the fully digitalised and networked group reported having increased communication requirements. It is conceivable that communication with customers across the full spectrum of digital development has intensified and has been further promoted through the use of digital solutions. Businesses in the cross-area networking group reported having increasing communication requirements in relation to in-house team and cross-team communication. This suggests that internal communication requirements arise in the direct digitalisation process specifically. Upon attaining full digitalisation and networking, the communication requirements will then gradually decline. Overall, however, there is a very clear difference between networked and non-networked companies with regard to increasing communication requirements. This finding makes it clear that increasing digitalisation also gives rise to a growing need for communication.
Figure 4: Businesses with increasing requirements in communication needs in relation to the degree of digitalisation

The findings from both the business survey and the qualitative interviews have shown that, in addition to the ability to interpret technical information and use it in a targeted manner (i.e. for generating knowledge from the data), cross-area and cross-company communication in networked production systems is becoming increasingly important. In addition, digital integration processes also increase the responsibility of individual employees in the overall operational process. The difficulties related to human interfaces are often underestimated in the technology-driven debate. Just because purchasing, production and sales are part of the same chain does not mean that the various players also understand each other and co-operate accordingly. Co-operation often fails because the parties involved do not speak a common language and embrace work cultures that are fundamentally different (cf. Kampe 2008). The potential of cross-area and cross-company co-operation will only be fully realised if it is possible for employees to understand that they are part of an integrated system and are
able to act accordingly. So far, it seems that businesses have only partially succeeded in addressing the social dimension of competency development in a targeted manner. Necessary cross-area communication and coordination is more likely to occur randomly if it is based on social relations. Structured processes and re-skilling concepts are hard to find. The strong technological bias of the debate seems to prevent any focus on the newly emerging communication requirements. What still needs to be investigated is how (Brandenburg) businesses deal with the social dimension of digitalisation and to what extent re-skilling providers (can) respond to emerging competency requirements.

Where exactly competency requirements will develop as part of a rapidly progressing digitalisation process can scarcely be evaluated at the current time. There is a need for tools that allow researchers to create an up-to-date picture of the shifts in competencies at the operational level so that training providers and job creation agencies may react appropriately. It is necessary to determine which opportunities exist for building a competency monitoring system for Brandenburg that could provide such information. For example, a systematic review of online job vacancies could be a possible tool for providing such information. In addition, there is a need for greater awareness and advice to comprehensively understand the form of emerging competency requirements. There is also a need for more than just technical expertise. Digitalisation also calls for new forms of organisation, communication, and corporate leadership. This is certainly acknowledged by many business managers but exactly how it will be possible to systematically meet these diversified requirements appears to be virtually unknown. It is necessary to examine to what extent the job training advisory service organisations could, if necessary, be fine-tuned further with regard to the special challenges of digitalisation processes, for the purpose of improving the response to changing requirements. Chambers of commerce, business consultants and employment agencies will likely be required to increase the critical mass of their services portfolio in order to keep pace with digitalisation themselves.

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8 Similarly, the challenges in the provider-customer interface relationship should not be ignored. In order to satisfy customer needs, we have to succeed in measuring and understanding this aspect.
Summary

Opportunities for digital integration should become an even greater focal point in the debate on business-oriented digitalisation. Associations, scientific institutions and advisory service providers should always address the issue of how operational organisational structures can be optimised as part of digitalisation, in addition to the question of single technical solutions. Further technical developments may only fully reveal their impact if they are precisely integrated into operational processes. Failing this, the CNC milling machine will be nothing more than just a better, somewhat innovative-looking band saw. Digitalisation, at an operational level, primarily means the networking of different service areas. Networking goes a bit beyond operations and concerns customer and supplier relations.

Operational digitalisation goes hand in hand with changes relevant to employee competencies. Although these changes specifically concern technical knowledge in dealing with IT technologies, as well as in the preparation and interpretation of digital data, the changes in competency requirements will by no means be restricted to these aspects. With digitalisation, there is an increase in the need for knowledge of the overall business process and individual room to manoeuvre in this context. In conjunction with digitalisation, an increasing communication need will arise in many businesses, not only in relation to internal communication but also regarding external communication with customers and suppliers. The shift in the competency requirements involved is complex, and technical and managerial knowledge will be required as a basis for action for result-oriented process management and problem-solving while social and communicative skills will be needed to apply digital technologies in practice.

The pressures on human resource policy will increase further during the digitalisation process. A need will arise for new qualifications and competencies, which will probably evolve further in an ever-shorter period of time. Both personnel recruitment and personnel development will increasingly become a key factor for business success. This requires, among other things, the review of existing training and re-skilling standards and, if necessary, adapting to new requirements. Traditional career paths and vocational courses in the widest range of disciplines will be required to equip people for the reality of a digitalised economy. Re-skilling options will be necessary to address new emerging
competency requirements, and life-long learning will face the challenge of satisfying a specific and, in part, extensive demand for training and further education.

It may be assumed that businesses may only harness the full potential of digitalisation if they take into account the multi-layered nature of changing competency requirements. Transforming technical knowledge into digital techniques therefore appears to be a necessary condition, but it will not suffice on its own. To be able to reach operational digitalisation potential, it will be necessary to create knowledge and awareness of the overall operational process and promote social cohesion within the company in such a way that the necessary communication processes may be followed up as far as necessary. For the full deployment of digitalisation at an operational level, co-operation between technological change and changes of working processes and competences will be necessary.

References


50 Strategies for 2050: Work and the Digital Revolution in Spain

Eugenia Atin, Raquel Serrano and Ibon Zugasti

Background

In the same way as many companies, countries such as Spain are experiencing dizzying changes in their job markets, mainly derived from intense demographic and technological transformations that affect companies and professionals. On the one hand, emerging interdependences between technology and the ageing active population are highlighting significant maladjustments, pointing towards regional scarcity of a qualified workforce. On the other hand, we are witnessing a growing concern in light of future scenarios warning us of potential massive unemployment due to greater technological progress, and we could already be witnessing some of its main consequences.

In 2015, the Millennium project, an international think-tank set up over 20 years ago, began a global prospective study on the “Future of Work/Technology 2050” involving over 300 experts from 50 countries. The study assumed the future of work to be a global challenge and that it would take us one or more generations to make the changes required to improve our perspectives in light of three 2050 scenarios suggested for humanity. The project also recommended that territories should define strategies to ensure a more optimistic future using dialogue and consensus with key agents from different fields of knowledge and experience (culture, education, science and technology, business, politics and society).

Within the framework of this global study, in the summer of 2017, the Telefónica Foundation decided to tackle this project for Spain as a whole, relying on Prospektiker for technical assistance. The resulting publication, “50 strategies for 2050: Work and the Digital Revolution in Spain”¹ (Fundación Telefónica 2018), analyses the possible effects of technological changes associated with the digital revolution in Spain, paying close attention to the world of work.

¹ In Spanish: “50 estrategias para 2050. El trabajo y la revolución digital en España”.

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The report thereby suggests 50 strategies, looking forward to 2050, so that Spain might overcome difficulties and make the most of opportunities tied to the forthcoming intense transformations. The most significant aspect of this for us, considering the EN RLMM topic in 2018, is that many trends and challenges identified for Spain and almost a quarter of the strategies are related to education and skills and the need to organise actions that allow us as a society, companies or professionals to develop the appropriate skills, knowledge and attitudes. Experts who have worked together on this project place particular importance on learning and developing digital skills within key strategies to tackle our future challenges.

In the publication “50 strategies for 2050: Work and the digital revolution in Spain”, developing appropriate skills seems to be essential to remain employable in the future (Fundación Telefónica 2018). These skills are tackled using different concepts that talk about values, behaviour, attitudes, skills, etc. that should also be considered in different spheres (administration, companies, society, etc.). This article focuses on particular strategies that should be considered for specific implementation in Spain. Throughout the article, we aim to answer the following questions:

- Which occupations and sectors might be most affected by changes in the most “substitutive” skills and technologies?
- How can skills and competences be developed?
- What should the education, methodologies and formats be like?
- What roles do different agents assume?

Changes in the Most “Substitutive” Skills and Technologies: The Occupations and Sectors That Might Be Most Affected

The “50 strategies for 2050: Work and the Digital Revolution in Spain” study (Fundación Telefónica 2018) works from the conclusions drawn from the international study on the “Future of Work/Technology 2050” to tackle relevant change factors that might affect the labour market in Spain. This led to a Delphi survey and three collective reflection workshops with national experts from different fields (universities, companies, science and technology centres, specialists in the sector, the economy and the job market). Both the survey and the
workshops aimed to identify and prioritise the main long-term trends that will affect Spain depending on our demographic, socio-educational, economic, political and technological conditioning factors and agree on the main strategies necessary to help the country to identify the most positive future scenario.

The survey results in Spain show that our experts are convinced that technological progress is going to transform how the world of work as we currently know it is organised, and it is going to affect products and services in all sectors and businesses while also changing the demand for skills by modifying most occupations. However, it is complicated to start assessing the impact of technological progress on businesses and professions that are as yet a mystery, and the study results suggest an increasingly hybrid future of work, in which digital technology would incorporate new aspects into most traditional models.

Consequently, some people are backing a scenario in which job losses due to automation processes and the wide-ranging use of Artificial Intelligence (AI) would be compensated for by creating new jobs in new fields such as augmented reality, nanotechnology or synthetic biology, thereby achieving long term equilibrium. In the most optimistic scenario, many jobs would disappear as traditional employment, but new alternatives would be generated through technology.

The technologies that are predicted to have the greatest impact on employment include robotics, AI and integration and the synergies between these technologies. Especially the effects of the relationship between all existing technologies and any new technologies that might emerge over the next few years are the most difficult to assess, but could perhaps have the greatest impact by 2050. The next most significant group includes e-commerce, self-driving cars, 3D/4D printing and the Internet of Things (IoT). On the other hand, participants in the study give the lowest scores in general to the following technologies: mobile/cloud, drones, nanotechnology, and augmented reality.

For people answering the Delphi survey in the Telefónica Foundation study, this is a complex matter of assessment, given that it is necessary to think about what this activity will be like in the future and about the possibility that unexpected and disruptive progress might be made (complementary effects, new jobs, etc.). In turn, the impact of these technologies is not equally disruptive, and although they all have the power to substitute existing technology, some act as facilitators of the process and others are directly disruptive.
these answers, e-commerce, mobile/cloud and AI might be the most disruptive, because they are changing consumption patterns naturally.

In the short term, drones, robots and driverless cars might reduce jobs in very specific professions due to their ability to automate mechanised, repetitive tasks. On the other hand, technologies such as augmented reality, nanotechnology or synthetic biology represent new fields of business rather than changes to current activities, and they can generate new employment rather than destroy it, although their impacts are predicted in the longer term.

Regarding the use of technology in economic activities, according to the experts, the most affected economic services will be those that have already been digitalised or are likely to undergo significant digitalisation. Services that have already been digitalised today are just the tip of the iceberg for what can really be achieved with digitalisation, and services that are yet to be digitalised, but are likely to be, will not take long to be digitalised and completely transformed. The primary sector, construction, manufacturing and transport seem, in theory, to be the economic activities where the most jobs will be destroyed. Robotisation (including driverless vehicles), 3D/4D printing, nanotechnology and synthetic biology will have a strong impact on these businesses. There will also be a negative effect on businesses that communicate the most with their customers through digital channels (finance and insurance) and businesses with physically located production or easily controlled production, allowing the use of algorithms and robots more easily.

Other service activities will also be affected, but it is possible that they will be able to increase their capacity to generate employment due to opportunities in the new economy. Thus, it is predicted that businesses where customer service is very important will be maintained, and there will be growth among businesses that represent information and communication, creative scientific activities and any enterprise related to leisure. Good job expectations might also be perceived in the fields of defence and security.

Due to an increase in free time, cultural and creative industries are thought to be opportunity sectors, as are care and health-related activities, thanks to greater demand arising from gradual ageing. Virtual reality, robotics and AI are expanding and converging technologies that are going to create platforms and ecosystems where hundreds of millions of people can make progress in the world with specialised knowledge or by boasting creativity and initiative.
Table 1: Which business sectors would be most affected by the digital economy? (0 = minimum, 10 = maximum)

<table>
<thead>
<tr>
<th>Business sectors</th>
<th>Delphi Spain average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information and communication</td>
<td>7.47</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>6.80</td>
</tr>
<tr>
<td>Professional, scientific and technical services, administrative and auxiliary activities, and other service activities</td>
<td>6.63</td>
</tr>
<tr>
<td>Industry</td>
<td>6.11</td>
</tr>
<tr>
<td>Public administration: defence, social security, education, healthcare activities and social services</td>
<td>6.10</td>
</tr>
<tr>
<td>Distribution and transport (wholesale and retail; motor vehicle repair; transport and storage; and hospitality)</td>
<td>5.88</td>
</tr>
<tr>
<td>Activities of households as employers; undifferentiated goods- and services-producing activities of households for their own use</td>
<td>5.18</td>
</tr>
<tr>
<td>Others: real estate</td>
<td>5.18</td>
</tr>
<tr>
<td>Construction</td>
<td>4.00</td>
</tr>
<tr>
<td>Primary sector</td>
<td>3.37</td>
</tr>
</tbody>
</table>

Source: Atin et al. (2018) based on the results of the Delphi survey.

Consequently, ICT penetration and continual digitalisation will affect all sectors of society and the economy in terms of demand for skills in the use of technology. These new technologies have the potential to influence how we enjoy ourselves (more interactively), transport, health care, etc. and will create new jobs requiring new skills and professional competences, some still unknown. However, on the other hand, this same technology and the progress predicted for the future are going to automate and even replace tasks that have been performed by people until now.

The risks are considerable according to the Spanish experts. Many jobs that are currently being developed in Spain are relatively unskilled and repetitive, so greater technological progress implies the risk not only that these jobs will be lost, but also that the quality of work in the digital economy will worsen. There is a fear that the use of online technologies to create work markets will cause a
downward spiral of salaries and working conditions, transferring the risk and responsibility from employers to workers.

Regarding occupations and skills, repetitive tasks will disappear in any of these sectors with greater emphasis on analytical work, decision-making and programming. Digitalisation will continue to reduce the demand for routine and manual tasks, whilst increasing demand for tasks requiring low and high qualifications and interpersonal and problem-solving skills. However, cognitive tasks that until recently were considered impossible to automate are increasingly at risk, according to the experts.

For the study participants, future trends will move towards fluid work that can be quickly adapted and changed depending on the environment. A work culture will grow that promotes participation and motivation, providing people with opportunities for continuous learning and creating more flexible positions through innovative platforms. More technical and specialised occupations will be required favouring innovation, flexibility and mobility among workers. We are talking about a flexible, decentralised, knowledge-based workforce based in remote places and working together in different countries and time zones. This will lead to redefining contracting, work and employment processes with a boom in working in a network and flexible hours.

This situation would also lead to growth in the demand for intensive services in multidisciplinary and polytechnic skills and in knowledge, with the creation of business micro-climates tending towards creativity and innovation. Productivity will increasingly depend on the capacity to generate, produce and apply knowledge-based information, and companies will increase their investment in this area in response to requirements for becoming more competitive. Furthermore, over the next few years, organisations will move their structures towards interconnected and flexible teams, emphasising workforce culture and continuous learning. This would also provide a boost for entrepreneurship and self-employment, leading to worldwide market searches.

Based on the responses obtained, there is consensus regarding all work categories, starting with areas most subject to protocols and most capable of incorporating robots, that will be affected by automation, thus redefining their tasks. For the team of experts that took part in the Delphi survey and the workshops, the occupations that are most likely to be automated are jobs where creativity, empathy and subjectivity are not heavily emphasised. The greatest employ-
ment substitution will take place in the most mechanical, administrative tasks with production that is easy to locate or control, such as machine operators, basic occupations, etc. that allow for the easy use of algorithms and robots. In this respect, the greatest impact regarding job losses might be predicted in professions that handle analogue information or involve motive force and precision.

The professions offering the most opportunities will be technology-related, given that they will have greater capacity to understand and anticipate the upcoming changes and to assume a position as modulators and direct users of the new work tools. In addition, there will also be opportunities for scientific and intellectual professions as well as management and top administrative positions. The more knowledge, specialisation or originality that can be brought to the position, the longer it will take to automate it. Also along these lines, professions linked to creativity and humanism will tend to remain for longer because they provide content for the technology. In addition, it is acknowledged that where there is less need for training, there will be more possibilities of being replaced by technology. On the other hand, some low-skilled jobs will survive, as they are more focused on personal services where human input is high, as well as any job where empathy, proximity and human contact has an important influence, such as caring for old or dependent people.

In this scenario, different opinions from the survey warn of the risk of job market polarisation over the next few years. On the one hand, highly qualified professionals will be required in a variety of sectors (engineering, computing and programming, etc.) providing high social value and remuneration. On the other hand, there could be professionals who are occupied in socially and labour-intensive services but have always been under-valued and poorly paid, although they cannot be replaced by machines and would have a very high replacement cost.

However, some of the consulted experts believe that despite these extremes, new technologies provide an opportunity for many profiles, although they might have negative effects in the short term. Along these lines, current occupations can improve by aligning with technology, not seeing it as substitutive, changing how they work and staying up-to-date. This points towards the possibility of increasing intelligence levels, the growing importance of soft skills, the capability to manage teams comprised of humans, robots and AI, and the pos-
tive effect that these new technologies might have on the leisure economy, the well-being of self-regulation, living longer, emotional tourism, etc.

How Can Skills and Competences Be Developed?

To avoid these risks and make the most of the opportunities brought about by developing skills and competences, education stands out as the priority field of action in Spain in the Telefónica Foundation study. Consequently, almost one third of all suggestions made by the experts taking part in the prospective workshops in Spain for the “50 strategies for 2050” focus on the field of education and learning.

Competence learning in Spain has had its ups and downs. The latest Education at a Glance report by the OECD (2017) provides key information pointing to positive aspects of changes made over the last few years, such as improvements in education level and an increase in further education percentages and the proportion of people holding further education qualifications related to the fields of science, technology, engineering and maths. However, the report also details significant challenges for the country in terms of school drop-out figures, the need to consolidate the vocational training educational system, the low proportion of young adults signed up for vocational training, the gender gap in science teaching and the lack of participation in continuous training initiatives.

Conclusions from their analysis also point to the fact that higher achievement in education increases job prospects and reduces the risk of being unemployed. In Spain, the unemployment rate for young adults who have not completed higher secondary education is 30%, compared to 20% for those who have finished high school and 16% for those who have completed further (tertiary) education. Along these lines, for many of our experts, the selective extension of new technologies could worsen inequalities in our society. In the same way, greater technological unemployment and occupational restructuring towards a dual work market could widen the salary gap between professionals with high qualifications, high global mobility and high purchasing power and unqualified workers, whose work is only local and precarious.
As a result, the study conclusions suggest that digital education is essential to positively tackle the accelerated technological change and the Fourth Industrial Revolution in Spanish society. It will be necessary to boost training in STEM disciplines to make people more employable in the new economy and a digital education will be an essential right from infancy to secondary school, along with developing strategies to include citizens in digitalisation. Experts also prioritise the need to take on entrepreneurial attitudes and “soft skills” such as empathy, a critical spirit, collaborative creativity, resilience and values linked to common interests such as solidarity and co-operation.

**What Should the Education, Methodologies and Formats Be Like?**

To tackle these future challenges, changing values in society, the use of technologies in learning, training for unknown professions, and a more complex and global world, education in Spain is facing the challenge of reinventing itself and changing. In our experts’ opinion, the educational strategy that we pick today will be decisive for us to be able to successfully tackle technological, social and economic changes, but also to boost the values of respect, gender equality, social justice, co-operation and the defence of the common good.

Considering these proposals, education in Spain should become decentralised with more flexible training focused on acquiring skills rather than obtaining credentials or qualifications, feature modular teaching that allows knowledge transfer and encourages skills-retraining for human capital, and make teaching more about practical experience, among other things. Universities will have to adapt to the new environment and draw up more dynamic, flexible programmes.

Consequently, the study participants highlight how conductivity, progress in cognitive science and the new system of values and expectations from the digital generation are changing the educational paradigm. The meaning of education is being transformed to the extent that formal learning and informal learning are increasingly acknowledged and in demand. It is estimated that over the next five to ten years, progress in digital didactic technologies will allow online courses to provide professional skills-training to more students than the combined offer of classroom education from the universities. Along with expanding
free educational resources, free access to information (in-forming), which helps you search for friendships, joint projects, colleagues, groups, identify yourself and exchange opinions, will be increasingly consolidated as a means of learning independently.

New digital learning technologies are also transforming adult learning, with new chances to get training anywhere and at any time that follow more personalised learning itineraries and suit student lifestyles. Along this same line, continuous learning will either become the norm or the gap between people who have different levels of access to knowledge might widen and exacerbate social inequalities.

The most outstanding trends in the study also point towards significant changes in the education centres and institutions as we currently know them: schools open 24 hours a day, increased compatibility between the work performed by teachers and other professions, educational programmes that include different disciplines, personalised educational experiences, and the transfer of education to the private sphere of each home, etc. Schools will increase their role as networks where students can interact with teachers in collaborative learning. Classrooms could become transparent spaces where the Internet and the major Big Data information centres would be the main points of access to information. And in this future, the role of public administration would become important for guaranteeing the quality of education and the distribution of public resources when faced with increasingly diverse curriculums and contents.

As far as educational contents are concerned, trends show that specific skills will be increasingly necessary in diverse academic disciplines and that skills should also be updated with new pedagogic practices. This will affect the teachers’ skills profiles and their ability to apply teaching methods. In addition, aspects such as creativity, problem-solving skills, teamwork and project work and values such as tolerance and interaction with the digital world will be important in the school curriculum.

For our experts, teachers will need new pedagogic skills to apply new focuses: so-called “21st century skills”, such as critical thinking, innovation and technological literacy plus the application of digital didactic technologies aiming for a more student-focused education and towards personalised learning.
Following these trends, the action strategies highlighted by our experts emphasise the importance of flexibility in the education system and its capacity to assume a multidisciplinary and disruptive focus that values acquiring knowledge, skills or competences over gaining a qualification.

The Roles of the Different Agents

Consequently, education is one of the pillars of any future plan, and public administration should be one of the areas in charge of it. However, it should not be the only one, as this is a task for all social agents. In this environment, companies should rethink their role in contributing changing the model and breaking the duality in the labour market. As a society, we have to examine the systems for reinsertion into the job market, above all for people who are most vulnerable to technological change, taking into account social protection models or “flexi-security” schemes, and implement tools and strategies that allow us to manage human capital in a time of an ageing global population and technological change.

According to the participants in the Delphi survey, we need to be prepared for a profound change in resources, the material conditions of society and the symbolic conditions of the subjects, which together will construct a new narrative around the economy and society. This then highlights the risks of not considering the absorption capacity of the technology and other destabilising elements that we should be tackling.

Social dialogue and citizen participation will also be essential. Citizen participation networks could be promoted to debate goals and reconfigure the welfare state. Thus, strengthening citizen participation and social mobilisation in general are believed to be necessary for an educational focus on critical pedagogy, working towards a model of society based on the concept of the common good. Currently, the social system generates a great deal of individualisation and in light of this, it is considered necessary for us to have focus points for acting as a network.

Along the same lines, some of the experts clearly do not agree with the over-biased view of the “technocracy” and contend that the central element should be people. A warning is raised concerning the fact that, in the current devel-
opment scheme, greater economic growth generates greater inequality and worsens some global challenges such as climate change, with some even going so far as to suggest “downturn” schemes.

The majority agree that ethics are fundamental in a future scenario of accelerated technological development, leading us to think about how to strengthen ethical values among organisations and people. In this context, it is believed that the rhetoric of blaming people needs to change. Education should respond to training citizens beyond meeting the needs of the business world. It is believed that when faced with scenarios of technological change, the educational system should be used to provide training on humanist culture. Human beings should stand out from technology and developments like AI through education and learning.

A “humanist technology” concept is supported as the driving force behind the Fourth Industrial Revolution, which also encourages a cultural change towards a society that is a combination of individual freedom, growth, employment, equality, ethics, living together, working together and empathy.

Table 2: 50 strategies for 2050

<table>
<thead>
<tr>
<th><strong>1. EDUCATION/LEARNING</strong></th>
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<tbody>
<tr>
<td><strong>Idea 1.1.</strong> Incorporate job market intelligence systems into education and employment policies: develop prospecting systems and prospect job market needs with accessible information.</td>
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<tr>
<td><strong>Idea 1.2.</strong> Make sure that the education system is flexible: design a more flexible education model (syllabus, ranking, certification system, etc.) that gives a multidisciplinary and disruptive focus. Expand education to combines formal teaching, informal teaching and the use of ICT to support lifelong learning.</td>
</tr>
<tr>
<td><strong>Idea 1.3.</strong> Redirect the education system from a collective focus to an individual focus: personalised education aimed at developing individual capabilities, talent creation, creativity and values. Education in creativity applied to all training cycles.</td>
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<tr>
<td><strong>Idea 1.4.</strong> Refresh knowledge for the university and the teaching staff: include new factors in the selection processes (industry professionals), modernise educational methodologies and train teaching staff. Back dual training whilst maintaining equilibrium without falling into the trap of only training according to the needs of businesses.</td>
</tr>
</tbody>
</table>
| **Idea 1.5.** Develop pedagogic methodologies aimed at resolving challenges and boosting self-employment, learning and auto-education: inductive learning methodologies (teaching by
questioning and challenging) and teaching programmes that bring learning into the real world. Neuroscience applied to the way we teach and how we learn.

**Idea 1.6.** Generalise digital education and include ICTs in teaching: training solutions adapted to the knowledge society including ICT and making further use of them in education (MODs, etc.).

**Idea 1.7.** Back educational models of excellence: the educational model as a strategic approach. Design advanced educational programmes aimed at employability, making students more competitive and capable and the internal and external mobility of students, teachers and staff.

**Idea 1.8.** Promote educational programmes focused on STEM skills: require the inclusion of science, technology, engineering, maths, and programming at all levels of education.

**Idea 1.9.** Pay more attention to the 0 to 3-year-old stage: key stage for developing creativity and personality.

**Idea 1.10.** Highlight the importance of education in humanities and creative disciplines: need to strengthen STEM skills (Sciences, Technology, Engineering and Maths) without forgetting the importance of education in social and human sciences to generate critical thinking, ethical values and the development of creativity.

**Idea 1.11.** Create hybrid education models: debate the relevance and obsolescence of master classes and the traditional education model. Back mixed models and the importance of effort, but also new learning formulas that are more collaborative, the inclusion of technology, etc.

**Idea 1.12.** Develop lifelong training models: this will be key for the “2050 Future” plan to strengthen lifelong learning programmes we are currently lacking.

**Idea 1.13.** Increase literacy training: understand the importance of education for all persons regarding basic skills.

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**2. GOVERNMENT/POLITICS**

**Idea 2.1.** Back the role of an independent “Tzar” in the government: include CEOs or expert leaders that do not hail from the political field to make decisions on AI and other technologies, ensuring that criteria are upheld in policies and giving policies and plans more stability.

**Idea 2.2.** Strengthen the public sector’s role in boosting technological progress: exemplify the role of the public sector with the intensive use of technology and the application of solutions for social services and challenges (public purchasing), the direct promotion of technological start-ups and other support policies. Incentives for private initiatives and public-private and public-public collaborations for social purposes.
**Idea 2.3.** Strengthen the government’s role in the regulation and control of technology: regulate aspects related to technological innovation that could be ethical (control of use, regulation of impact), technical (quality, security, standardisation) or legal (property, competence).

**Idea 2.4.** Develop natural environments and resources for experimenting: implement natural environments and resources for experimenting with innovations and technology. Include sandbox systems to create safe spaces for experimenting with innovations and technology.

**Idea 2.5.** Subsidy programme to help patent applicants: direct subsidies through public funds.

**Idea 2.6.** National adaptation plan for climate change and energy transition: setting a National Plan that prioritises policies and measures to adapt to climate change and the energy transition.

**Idea 2.7.** Apply AI to governance for decision-making: use AI to improve anticipation capability and prevention plus the efficacy and efficiency of public plans and programmes. Evidence-based policies (political research, social initiatives, social protection, decent and worthwhile work).

**Idea 2.8.** Participation of civil society in social policies: social policies with the leadership of collective social action (social start-ups) and the development of guaranteed income.

**Idea 2.9.** Governance based on trust, transparency, credibility and an open culture: encourage values in governance (ethics, (real) transparency, flexibility and efficacy). New governance models based on greater social participation (inclusion of technology, autonomy of local development, etc.).

**Idea 2.10.** Implement strategic educational policies.

**Idea 2.11.** Smart Citizens take centre stage: strengthen citizen platforms to articulate participative processes in decision-making for the future of cities. Citizens are responsible for the city, and they get involved.

**Idea 2.12.** Strengthen the government’s role in cyber-security: IoT, smart grids.

**Idea 2.13.** Manage a more multicultural society in light of increasing immigration.

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**3. SCIENCE AND TECHNOLOGY**

**Idea 3.1.** National implantation strategy for science and technology: develop a national strategy to promote sectors/areas of science to develop different skills (nanotechnology, longevity, smart tourism, etc.).

**Idea 3.2.** Promote extended reality networks and strengthen a network and interconnected culture for AI: promote the use of technology and experimenting with alternative realities, such as virtual reality and augmented reality, with information that can be accessed on the
network.

Idea 3.3. Strengthen creative industries within the digital culture: support and promote the development of cultural and creative industries by developing appropriate strategies to encompass creative potential and innovation and meet the challenges of digital culture.

Idea 3.4. Back cyber-security: promote applied research and the development of security-based industries and activities, and support measures intended to strengthen cyber-security in companies, public services, etc.

Idea 3.5. Strengthen the Internet of Beings (human beings): develop strategies to promote passing from an IoT to an IoB, a network focused on human beings as the centre of all technology based on collective intelligence with many applications (education, business, smart homes, etc.).

Idea 3.6. Implement Venture Capital funds: back talent settlements and the creation of intermediary institutions (such as foundations) that implement real Venture Capital funds.

Idea 3.7. Back renewable energy: develop a national strategy to promote the production and consumption of renewable energy by boosting its strategic lines, public support and financing.

Idea 3.8. Promote centres of excellence: strengthen scientific excellence by generating, financing and setting up centres of excellence for research and innovation (university-business collaborations, etc.).

Idea 3.9. Promote an economic model that uses resources efficiently: when faced with the foreseeable situation of limited access to resources, it is necessary to promote a production model based on the circular economy, efficiency and the virtualisation of the economy, directing the model towards an economy of the intangible and applying demand management policies in different fields.

Idea 3.10. Participate actively in exploration programmes in the Solar System: given the challenges facing Planet Earth, support programmes to move forward in exploring the Solar System and carrying out missions to other planets in it, such as Mars.

4. COMPANY/WORK

Idea 4.1. Extend systems to support self-employment and entrepreneurship whilst encouraging connected ecosystems: promote more autonomous, project-based employment. The State should guarantee the possibility of entrepreneurship by not penalising self-employment.

Idea 4.2. Adopt a new approach to social protection models in “flexi-security” schemes: guarantee social cohesion within the context of technological change through proactive protection mechanisms and flexibility criteria.
**Idea 4.3.** Develop general digital competences and key analytical competences (Big Data, etc.): extend and develop general digital competences in all groups of society and boost related analytical competences.

**Idea 4.4.** Boost knowledge management through open innovation in companies: it is fundamental that companies make their knowledge accessible internally and externally.

**Idea 4.5.** Rethink social responsibility and the impact of what companies generate for society (social contribution) and their employees: companies should rethink their social responsibility. The taxation focus has to be changed for social contributions.

**Idea 4.6.** Promote a dual training model throughout the entire further education system: businesses have a role in contributing to the model change and breaking with the duality in the job market through dual training.

**Idea 4.7.** Strengthen lifelong learning mechanisms to tackle continual recycling and job-seeking: redesign continuous training strategies and redirect them towards lifelong learning strategies that can tackle technological change.

**Idea 4.8.** Boost new means and models for companies and economic activity (P2P): the new economic system will be increasingly focused on developing personal capacities and interconnected individual entrepreneurship, leading to business models and economic activity based on “peer to peer” (P2P) platforms and “alter” systems.

**5. SOCIETY/CULTURE**

**Idea 5.1.** Strengthen the ethical values of organisations and people in the future: new “businessability”, rethink the business models and the role of people within them.

**Idea 5.2.** Promote citizen training in humanistic culture: change the rhetoric of blaming people. Education should respond to citizenship training.

**Idea 5.3.** Back a “humanistic technology” concept as a major motor of the Fourth Industrial Revolution: human beings should be differentiated from technology through education.

**Idea 5.4.** Boost technological contents based on individuality and cultural diversity: given that the technological contents are standardised and globalisation tends to break up diversity, it is necessary to develop content based on individuality and cultural diversity.

**Idea 5.5.** Improve the link between virtual reality and real systems: connect human intelligence to artificial intelligence through culture. Extended reality will become common in the 2020s and 2030s.

**Idea 5.6.** Develop altered states of the consciousness in art: promote a culture of augmented consciousness and augmented intelligence that will help us navigate through other people’s visions and, eventually, lead to a fusion of human beings and technology.
References


2. DIFFERENT AVENUES TO SKILLS AND COMPETENCES IMPLEMENTED IN REGIONAL AND LOCAL LABOUR MARKET OBSERVATORIES

2.1. Demand for Skills und Competences in Sectors, Occupations and Enterprises

Occupational Barometer as a Tool for Identifying Shortage and Surplus Occupations on Local Labour Markets: Evidence from Poland

Piotr Maleszyk

Introduction

The recognition of skills and occupations, which are in shortage and in surplus is one of the most important issues for developing and implementing an effective local economic policy. The justification of the problem’s significance can be manifold. Firstly, information about the demand for occupations and skills can influence the decisions of a wide range of stakeholders: from students choosing their path of education, through principals of vocational schools, university candidates and authorities, to local governments financing schools and designing local development policies, as well as officers of public employment services deciding on the training schemes for the unemployed.

Secondly, the coexistence of significant skill shortages with skill surpluses, which indicates a skill mismatch, has multiple negative implications for individual workers, firms and the national economy. As a result of the skill mismatch, job-seekers are more likely to face longer unemployment spells, lower wages and precarious working conditions. A negative impact on job satisfaction is also well documented. Employers facing skill shortages bear higher recruitment and training costs accompanied by lower productivity of realised matches. A short-
age of skilled workers might also hamper firms’ adaptation to structural change and technological progress, thus negatively affecting their competitiveness. Finally, at the macroeconomic level, mismatch restricts productivity and hampers GDP growth, increases equilibrium unemployment and questions the rationality of public expenditure on education. These effects have been extensively discussed in specialist literature, e.g. in Allen and van der Velden (2001), Leuven and Oosterbeek (2011) and Sattinger (2012).

Furthermore, the identification of occupations experiencing shortages and in surpluses can also be helpful in constructing selection criteria for discretionary labour migration policy. Many developed countries prepare a list of occupations for which there might be incentives if migrants are employed, e.g. exemption from labour market tests or additional points in the admission procedure (Charloff 2014). Finally, the system which might accurately identify and forecast skill shortages seems to be particularly informative for countries undergoing rapid structural change, i.e. for transformation and post-transformation economies. In the case of Poland, high structural unemployment persisted throughout the whole period of economic transformation, whereas an educational and occupational mismatch has persisted in recent years, in spite of the rapidly growing demand for labour (Kiersztyn 2013, Kaczmarczyk 2015, Gradziewicz et al. 2016).

The occupational and skill mismatch has attracted increased policy attention in recent years. To mention a few examples, the problem of mismatch is at the centre of “An agenda for new skills and jobs” launched by the European Commission in 2010. Since then, the Commission has developed a range of labour market and skills tools, such as the EU Skills Panorama, the European Skills and Competences for Occupations tool (ESCO) and European Skills Forecasting Model. The Commission has also initiated the exchange of experience and good practices in tackling mismatch among the Member States. The European Centre for the Development of Vocational Training (Cedefop) conducted a cross-country survey on skill mismatch among the EU countries and published a series of reports on the extent of skill mismatch, its consequences and policies that address it (Cedefop 2015a, 2015b, 2015c). The OECD has recently introduced the OECD Skills for Jobs Database, which aims to assist policy-makers with a comprehensive set of skill needs and mismatch indicators.
Most tools for recognising and forecasting skills shortages are at the national or regional level and are thus missing the needs of many local stakeholders. The main barrier to the development of applicable quantitative tools for the analysis of local labour shortages is the lack of sufficiently detailed data. This limitation has induced some countries to develop qualitative measures, which rely mostly on the knowledge and assessment of local labour market experts. The Occupational Barometer is an example of such a tool used by public employment services to identify occupations and skills in surplus and in shortage within local labour markets. It has already earned international recognition, as it was first applied in Sweden, and then developed in Finland, from where it was then adopted by Poland and the Baltic States.

This paper aims to evaluate the Occupational Barometer implemented by the local employment services in Poland, in particular by confronting the Barometer’s results in the City of Lublin with the data from a comprehensive job offer survey, i.e. one including offers from employers outside the labour offices, and with the data on the unemployed registered with the Labour Office in Lublin. This analysis, which is among the first assessments of the Occupational Barometer realised in Poland, allows for the evaluation of the Barometer’s reliability as a tool for regional and local planning, contributing to the discussion of the prerequisites necessary for the successful adaptation of the Occupational Barometer to the conditions of countries with different labour market situations. The article also contributes to the empirical literature on the qualitative approach to the identification of present and future skill shortages.

The article has the following structure: the first section contains a literature overview on approaches to the skill mismatch with a special focus on the identification of occupations and skills in shortage and in surplus. The empirical section first presents the methodology of the Occupational Barometer realised in Poland and then describes the sources of data and research procedure of an alternative approach that is based on data detailing job offers and the unemployed. The next section compares the results of both methods and serves as the basis for the evaluation of the Occupational Barometer’s accuracy. The discussion section highlights advantages and disadvantages of the Occupational Barometer and indicates which conditions are necessary for the successful realisation of the Barometer, shedding light on the transferability of this tool to other countries.
Approaches to the Identification of Occupations and Skills in Shortage and in Surplus: Review of the Literature

The literature is not clear on either the concept of occupations in shortage or in surplus or on skill mismatch. The distinction between vertical mismatch and horizontal mismatch deserves particular attention. Vertical mismatch is grounded in the concept of skill level and refers to a situation in which the level of education or skill demonstrated by the worker differs from the employer’s requirements or the specificity of work. Given data availability, educational mismatch used to be the most common way of conceptualising a skill mismatch (e.g. Freeman 1976, Oosterbeek 2000). In such an approach, over-education occurs when the level of education of a worker is higher than the current job requires, whereas the opposite is true in the case of under-education. Education mismatch has received wide attention, probably because numerous studies have found high rates of over-education. Comprehensive literature reviews on this issue have been carried out, for instance, by Groot and Maasen van den Brink (2000), and Desjardins and Rubenson (2011), whereas Cedefop (2015c) provides a comparative empirical analysis of the EU countries. The conceptualisation and measurement of skill mismatch has recently shifted from education mismatch to skill mismatch, with more measurements of skills that are more direct than educational attainment or years of education. In particular, academic research has explored international surveys, such as The Survey of Adult Skills conducted as part of the Programme for the International Assessment of Adult Competencies – PIAAC (Flisi et al. 2017).

From the perspective of policy-making, the issue of “too little” or “too much” education is rather secondary, while the question of “the right” education and skills needs to be addressed first. The latter approach is employed in the concept of horizontal mismatch, which remains at the centre of the Occupational Barometer. Horizontal mismatches arise when a worker’s field of study, occupation, qualification level or skills specialisation does not correspond to the worker’s actual job. This type of skill mismatch is grounded in to the concept of skills specialisation and might also be labelled as field-of-study mismatch, occupational mismatch, or qualification mismatch (Cedefop 2010, Quintini 2011, Montt 2015). There is some evidence that horizontal mismatch is less common than vertical mismatch, at least in the US, though the negative consequences of the former are more profound, especially in terms of wage penalty (Robst...
2008). The issue of horizontal mismatch remains the centre of interest for the Occupational Barometer.

Despite the importance of measuring horizontal mismatch, there has still been little research focusing on this issue because the question is difficult to address empirically. At least a few difficulties deserve attention. Primarily, few datasets contain both variables on the field of education or qualification and the appropriate characteristics of the occupation held, and when they do, samples are typically small or limited to certain sectors of economy (Robst 2007, Desjardins and Rubenson 2011, OECD 2017). The situation is even more disappointing in the case of regional and local labour market datasets. Moreover, certain jobs cannot be matched with a specific field of education, and some types of education or qualifications are designed to foster generic skills that might be applicable across many jobs (Desjardins and Rubenson 2011). The level of transferability of those qualifications and skills affects the assessment of the degree of aggregation and hence the magnitude of the identified skill mismatch. The work of Montt (2015) is among the few attempts to capture skill transferability and its relation to field-of-study mismatch. Another measurement issue raised in the literature concerns dealing with the heterogeneity of qualifications and skills possessed by a single person (see e.g. McGuiness 2006). As a result, multi-skilled individuals cannot be easily assigned to a single occupational category. Finally, fields of education, and especially qualifications, differ in terms of the time and cost of acquiring them (Richardson 2009, Corvers et al. 2002). Mobility across the ISCO occupational groups therefore varies substantially. These differences influence the magnitude of skill shortage experienced by employers. The problem is particularly important for forecasting skills and occupations shortages, as the cost and time needed to acquire skills sought by employers determines the persistence of skill mismatch.

On the grounds of specialist literature, several approaches to the identification of occupations and skills in shortage deserve attention. The empirical work on measuring skill mismatch has relied on three main approaches: “self-assessment”, “job analysis” and “realised matches”. These approaches are discussed in detail in Leuven and Oosterbeek (2011), Verhaest and Omey (2006) and Flisi et al. (2017). It should be noted, though, that these methods have mostly been applied to measuring vertical mismatch and giving the answer to the question about the “right” level of schooling required for a particular job.
The first method, self-assessment, is of a subjective nature and draws on workers’ opinions about the level of education required for their job. Employee surveys are also found to be useful in measuring horizontal mismatch, mainly field-of-study mismatch (e.g. Robst 2007, Montt 2015), though most datasets from comparative international surveys only contain a question concerning vertical mismatch (Cedefop 2010). “Job analysis” and “realised matches” approaches are of an objective nature. Job analysis is a normative method in which the “required” education and skills for a certain job are established on the basis of professional job analysts’ evaluations contained in occupational classifications. Classifications matching job characteristics with education and skills requirements, like ISCO or ESCO, are also useful for the expert assessment of horizontal mismatch, such as the Occupational Barometer. The realised matches approach is a statistical method, which infers the required education level for a job from the distribution of education levels of workers holding the same position.

Insight into the occupations and skills in shortage, as well as skill mismatch, can also be derived from labour market data on employment, vacancies, unemployment, and wage developments, as well as from the results of employer surveys. The relevance of analysing this data has been discussed, among others, in the works of Veneri (1999), Shah and Burke (2005), Richardson (2009), Abraham (2015), as well as in the recently released OECD Skills for Jobs Database (OECD 2017). The rationale of analysing listed labour market indicators as potential signals of present and future mismatches and shortages was also stressed by Psacharopoulos (1991), Hopkins (2002) or Corvers et al. (2002), who recommended the approach labelled “labour market signalling” as an alternative to the heavily criticised traditional forms of forecasting labour demand – the so-called “manpower planning”.

Unfortunately, none of these indicators can act as a direct measure of occupations and skills by itself. Employment growth remains the most unclear symptom of shortages in labour markets. Growing employment in a given occupation reflects the growing demand for labour, but it does not provide any insight into the size of the labour supply with corresponding skills. Expansion of employment in a given occupation might coexist with an even greater increase in labour supply. On the other hand, stagnant employment growth could occur if
employers face serious recruitment problems, and a growing number of hours worked per worker could signal labour supply shortages instead.

Data on available vacancies is of higher informative value, though some problems are still relevant. Most of all, data on vacancies across all sectors of the economy is unavailable, and many vacancies are filled without publishing job advertisements. The most commonly used dataset on vacancies is still collected by the Public Employment Services. Such data cover only part of the vacancies for the whole market and, what is more important, often suffer from occupational distribution bias. Moreover, in occupations with a high employee turnover, the demand appears to be higher than it actually is. High vacancy rates might therefore persist for reasons other than skill shortages, such as poor working conditions.

Information about skill shortages can also be extracted from the analysis of unemployment at the occupational level, which is generally collected by public employment services. The occupational distribution of the unemployed should be related to the corresponding distribution of labour demand, either filled (employees) or preferably unfilled (vacancies). In the latter case, low unemployment may signal a shortage of people with relevant skills when the corresponding vacancy rate is high. In the absence of data on the occupational distribution of employees or vacancies, the number of unemployed might be related to the number of graduates broken down by field of education. Unemployment dynamics across occupations might also be informative. Nonetheless, in a general condition of low unemployment rates and solid economic growth, low unemployment may sometimes coexist with a large-scale skill mismatch in the realised matches. The more important problem is that high unemployment could also be caused by reasons other than a skill surplus, such as inadequate skill level, lack of experience, excessive wage expectations, low motivation, and health problems, to name a few, which, presumably, are unevenly distributed across occupational groups.

Data on wage growth across occupations could be the key signal of imbalances between labour demand and supply across occupations. In a competitive labour market, a skill deficit results in wage pressure exerted by those who possess scarce skills, whereas competition among job-seekers pursuing occupations with an excess of labour should restrain wage growth. However, in imperfect labour markets, wage changes are also driven by collective bargain-
ing, wage indexation, increases to the minimum wage and employment protection legislation, making the interpretation of wage dynamics rather vague. What’s more, skill shortages barely create wage pressure in a highly regulated public sector, e.g. health services or education.

Employer surveys might seem to be a valuable direct source of information on occupations in shortage or surplus, but they end up having many drawbacks. First, employers facing difficulties in recruiting skilled workers mostly blame skill shortage. However, Cedefop (2015b) reveals that between one half and two thirds of EU firms with recruiting difficulties face this problem for reasons other than the lack of skills, namely due to information friction, poor recruitment intensity in firms, unattractive job offers and the lack of employer commitment to talent management. What’s more, employer understanding of the concept of skill shortage is highly subjective and depends strongly on the formulation of questions in the survey. Another problem, discussed in detail by Capelli (2015), is that employer surveys raise concerns about sample representativeness and response rate. In particular, the identification of skill deficits and surpluses at a level that is sufficiently detailed for policy purposes requires large and representative samples, as well as a high response rate. The proof of how difficult it is to realise this postulate is the fact that different sources, the European Company Survey, the European BusinessIndicator and the Manpower Talent Shortage, report striking differences in the size of skill shortages across countries and completely different country rankings (OECD 2017). All in all, employer surveys might be, at most, an additional source of information on occupations and skills in shortage or in excess.

In light of the presented discussion, it might be assumed that utilising several labour market indicators seems the most desirable approach to identifying occupations and skills in shortage in local labour markets. Labour Force Surveys provide adequately comprehensive datasets whose samples are representative for national or, at best, regional territories, but not for local areas. As a result, employment data, especially statistics on wages and vacancies, are either aggregated to describe excessively large groups or completely unavailable. Similarly, applying methods for measuring skill mismatch (i.e. self-assessment, job analysis and realised matches) to local labour market analysis encounters the same obstacles. This is very unfavourable, as sub-regional and local skill gaps and shortages might occur when the skill demand and supply in the whole
country or even region is balanced. In fact, identifying occupations and skills in shortage and in excess is among the priorities of multiple local stakeholders, including schools, universities, investment firms, local public employment services, and local governments. Overcoming difficulties in identifying local skill shortages seems to be a pressing need, particularly for cities with large labour markets and specialised labour, as well as for countries encountering vast differences in local unemployment rates.

A similar problem also applies to forecasting skill shortages and mismatches. In a report reviewing recent policies and practices addressing skill mismatch in the EU Member States, Cedefop (2015a) stressed the need to improve the connection between forecasting instruments and local challenges arising from mismatch. Still, the quantitative forecasting models face the aforementioned problem of lacking relevant local data. The state-of-the-art quantitative models forecasting labour demand represent a top-down approach, and typically employ a multistep procedure. First, projections of the GDP and the major categories of demand and income are developed using a multi-sectoral macroeconomic model, whose key results include consistent projections of employment levels by sector. Secondly, results are translated from the multi-sectoral model into a representation of the replacement and expansionary demand for occupations and skills (Wilson and Lindley 2007). Several countries have developed a model that integrates labour demand and labour supply projections, thus making it possible to anticipate future skill shortages and mismatching (Cedefop 2012). Still, quantitative forecasting models are built for national or, ideally, regional economies. The UK is perhaps the only exception, as Cambridge Econometrics and The Warwick Institute for Employment Research have developed the Local Economy Forecasting Model (LEFM), which predicts local labour demand in 25 occupational categories on the basis of national and regional forecasts. Nonetheless, one of the LEFM’s authors still indicates that there are many difficulties in applying quantitative models to local labour market analysis (Wilson 2008). Apart from the limited local data, Wilson mentions issues such as complex interdependencies, problems with assessing sensitivity of the local economy to the changes on national level, incorporating local economic “surprises”, or increasing the openness of local economies. Kriechel et al. (2008) add to this list with the problems incorporating labour supply flows across local boundaries (e.g. daily commuting, graduates’ flows). They also consider the issue of data limitations, stressing the trade-off between regionalisa-
tion of quantitative models and the degree of detail on specific occupations. Being aware of many difficulties, Wilson (2008), Kriechel et al. (2008), and Knobel et al. (2008) admit that the potential need for corrections could be discussed with regional labour market experts.

In the absence of reliable quantitative methods, several countries developed qualitative measures for the analysis of local labour markets based on expert judgment. Expert involvement often takes the form of Delphi-style techniques and aims to build short-term forecasts for labour demand and labour shortages across occupations and skills. Austria has introduced the AMS-Skills Barometer, which combines quantitative and qualitative information on occupations for nine federal states in a four-year span (Humpl and Bacher 2012). What is worth noting is that qualitative aspect in AMS Barometer’s methodology, i.e. expert assessment, prevails over the results of quantitative measures. The Occupational Barometer is even more based on a qualitative approach. It was first launched in Sweden and subsequently became a part of a broader measure called the “Occupational Compass” (OECD 2016). Since 2007, the Occupational Barometer has been developed in Finland, where it started to be used nationwide in 2011 (Marttinen 2012, Marttinen and Vahtonen 2012).

The Finnish version of the Occupational Barometer is based on the expertise and views of the staff of the local Employment and Economic Development Offices (TE Offices) regarding labour market development over the preceding six months. Relying on data concerning the registered vacancies, as well as on regular employer surveys, each TE Office estimates the market situation for 200 occupations, assigning them to one of the following five categories: great shortage, shortage, balance, surplus and large surplus. It is worth mentioning that TE Office Staff create estimates based on analysis from the perspective of employers rather than job-seekers. Research for the Barometer is conducted in more than 300 local Finnish municipalities. The results obtained are supplemented with TE Office’s data on unemployment and vacancies across occupations and then compiled into a national database. The database is publicly available on the website and presented using user-friendly maps and posters.

The Occupational Barometer has received international recognition as a potentially useful and transferable tool for identifying and anticipating occupations in shortage and in excess. In 2009, the staff of the Regional Labour Office in Krakow (Poland) learned about the concept of the Barometer during a study visit
to Turku. The Barometer also attracted even more attention from the participants of the ILO project “Social Partnership for Anticipating Change and Restructuring”, which was based on the exchange of experience and mutual learning between Finland and the Baltic countries. Participants from Lithuania, Latvia and Estonia declared a willingness to adapt the Barometer according to the national circumstances and implement it in their countries. The Barometer also captured the attention of local authorities and university researchers from Slovakia and Russia (Broughton 2011, Marttinen 2011, 2012). In September 2014, Public Employment Services in Turku hosted a workshop on the Occupational Barometer that gathered participants from 14 European countries. The long-term aim of the Barometers’ Finnish experts is to promote the Occupational Barometer as an EU-wide tool for local labour market analysis. So far, it has been adapted as a nationwide tool in Poland (since 2015) and Estonia (since 2016).

Evaluation of the Polish Variant of the Occupational Barometer

Methodological Framework of the Occupational Barometer in Poland

The Polish version of the Occupational Barometer produces a short-term, one-year forecast of the situation in individual occupations. It is set up separately in each county according to recommendations made by local experts during annual discussions that analyse the current situation in each occupation. During the assessment, experts use data from labour offices detailing the total number of vacancies and the number of people registered as unemployed in particular occupations. Those responsible for the realisation of the Barometer assumed, however, that labour office data does not provide a complete picture of the situation on the labour market, so this data therefore only has an auxiliary function and is not the basis of the analysis. Panel participants primarily base their assessment on their own professional experience (Krzesiński 2015).

The Barometer is thus grounded in the concepts of occupation and skill specialization, which are organised in a hierarchical framework. The list of occupations was developed according to The Polish Classification of Occupations and Spe-
cialisations (COaS), which is a national adaptation of the ISCO Classification. In some cases, however, the names of the occupations were modified to better match the names used by employers and job-seekers. Some occupations were grouped according to content or professional field. The panel members analyse 177 occupations, assessing only those occupations that are present on the local labour market. Moreover, they should not assess those occupations of which they have no knowledge. Expert discussions allow each occupation to be classified into one of three categories:

- **Deficit occupations**: those in which it should not be difficult to find a job in the coming year since the demand from employers will be high and combined with a low supply of labour willing to take up employment and having the right qualifications;
- **Balanced occupations**: those in which the number of vacancies will be close to the number of people capable of and interested in taking up employment in that occupation (i.e. the supply and demand will be balanced);
- **Surplus occupations**: those in which it might be more difficult to find a job because of the low demand and numerous candidates who both meet employer requirements and are willing to take up employment in that area.

The scope of evaluation covers the Occupational Barometer implemented in the third quarter of 2015 in the City of Lublin, which has a population of almost 350,000 and is the capital of the Lubelskie Region. The panel included the representatives of the Labour Office in Lublin and four representatives of private employment agencies. Together, they prepared the 2016 Occupational Barometer for 160 occupations (Krzesiński 2015).

**Framework for the Analysis of Vacancies and Unemployment**

In order to evaluate the Barometer’s accuracy, we followed an approach based on labour market signalling and used data concerning the occupational structure of the unemployed and on the jobs offered in accordance with COaS. Data describes the full calendar year of 2014. Occupations were grouped in the same way as in the Occupational Barometer.

Data on job offers comes from the database created for the second edition of the research project “The monitoring of job offers in the Lubelskie Region”, which took place between November 2013 and April 2015 (Wojewódzki Urząd
Pracy w Lublinie [WUP] 2015a). The main advantage of the vacancies database is the inclusion of offers not submitted to labour offices, but instead announced using the Internet and social networking websites, employment agencies, public information bulletins, university career offices or the press. Only offers for positions located in Lublin were used\(^1\). Because about two thirds of the offers appeared several times in different sources, the analysis excludes offers that were identical in terms of content and appeared within two weeks of each other. Using these criteria, 15,693 advertisements were selected offering 21,424 jobs. Information about the unemployed population comes from the Labour Office in Lublin and includes the 15,514 total unemployed people that registered with the office at some point during 2014 and 14,771 unemployed people who remained registered at the end of 2014.

At this stage it is worth considering the time difference between these two studies, which might raise doubts as to the validity of comparing the results of both methods. The Barometer was completed at the turn of the fourth quarter of 2015 as a forecast for 2016, while the available data on job offers and the unemployed is from the year 2014. Although the time discrepancy could indeed limit the comparability of the two methods, a number of arguments support the comparison’s validity. First of all, the years 2014, 2015 and 2016 are similar in terms of the growing employment and falling unemployment rate. Secondly, research carried out using Delphi-style methods is biased by recency and conservatism, especially in short-term forecasting (Makridakis et al. 2008, Kriechel et al. 2008). Considering the forecast’s barely year-long time span we assume that the experts mainly extrapolated to the current situation. The experience of 2014 and the first half of 2015 seems to have had the dominant influence on their convictions at the time of the research. The year 2014 was thus the last full calendar year of monitoring job offers before the Barometer panel. Last but not least, structural mismatches are a relatively persistent phenomenon, particularly in relatively large local labour markets.

We identify deficit and surplus occupations in Lublin by comparing the number of job offers to the number of the unemployed. Although the data on vacancies and the unemployed may be valuable for signalling, which occupations are in

\(^1\) It is worth adding that experts taking part in the Lublin panel only had access to the overall results for the entire region included in the report summarising the project.
deficit or in surplus, the interpretation of this data encounters some problems, some of which deserve special attention.

In general, one might assume that shortage occupations should have a considerably higher number of unemployed job-seekers, and deficit occupations should have a considerably higher number of job offers. Yet, such an approach might be criticised, as many vacancies are filled without publishing job advertisements. In the meantime, some job-seekers, particularly recent graduates, find jobs without registering with labour office. We might thus assume an optimistic view that the number of hidden vacancies is more or less equal to the number of unregistered job-seekers, and one phenomenon therefore balances the other. In many occupations such an assumption might be, in fact, far from reality. We tried to address this source of bias by considering other signals of labour market imbalances, like the working conditions and wages offered or employers’ requirements.

Secondly, the decision whether to analyse unemployment using flow data of all people registered with the office in the full calendar year of 2014 or stock data that only describes the unemployment situation as of 31 December 2014 might be worth debating. Choosing flow data seems more natural due to the analogous nature of the data on job offers. On the other hand, the number of the unemployed at the end of the year could, in turn, reflect the persistence of mismatch (even though unemployment is not always caused by skill mismatch), as the average time all unemployed people registered at the end of the year remain out of work is longer than that of the newly unemployed people registered throughout 2014. Among the long-term unemployed, however, the level of job-seeking activity is lower, and refraining from taking a job is more often the result of not being ready to commence work for reasons such as health or family care, in addition to seasonal work abroad (Czapinski and Panek 2015). We therefore gave higher priority to data on unemployment inflow.

Thirdly, the division of occupations into those in deficit, surplus or balance requires establishing borderline values of vacancies and the unemployed. The assumed bounding values are in fact the result of an arbitrary decision. It must be also noted that the lower the number of job offers and unemployed in a given occupation, the greater the uncertainty in forecasting a job-seekers deficit or surplus. Finally, we consider the risk of a trade-off between the complexity
of an adopted method and its application value for a wide range of stakeholders.

While seeking the criterion for the assessment of the situation in each occupation, we gave preference to the approach with a potentially high application value that is interpretable by a wide range of stakeholders. Hence, we use a graph with the number of the unemployed registered throughout the year 2014 (x) and the number of job offers (y). In the first stage of the procedure, we divide the graph plane by means of linear functions symmetrical about the line y=x (i.e. an equal number of job offers and unemployed job-seekers) into 3 parts of equal area, corresponding to a job-seekers deficit, surplus and balance (see Figure 1a).

Such a solution, however, would not be adequate for occupations in which the number of job offers and the number of the unemployed are relatively low. The process of assigning these professions into categories is encumbered by greater uncertainty, as dividing the graph into three equal parts would mean that even a slight change in the vacancies-unemployed relationship around the origin of the coordinate system could change the professions’ category. We have addressed this problem in two ways. First, we added (or subtracted) a fixed parameter to (or from) the functions constituting the bounding values so as to increase the area on the graph of occupations in balance, especially for those occupations with relatively low numbers of job offers and unemployed people (see Figure 1b). Secondly, we excluded from the analysis occupations for which the sum of offered vacancies and the unemployed was below 25. In Figure 1b, this area has been marked in black. It is worth noting that assessing the excluded professions with a low number of offers and the unemployed is at least equally troublesome for the Barometer experts who could have, at most, incidental experience of the recruitment processes in these occupations. Eventually, our comparative analysis included 130 occupations out of the 160 diagnosed in the Barometer.

\[ \text{Note:}\] The number may seem small. However, further analysis shows that for the vast majority of occupations with the most discrepant deficit and surplus assessments between the two methods, the total number of job offers and the unemployed exceeded 100.
Figure 1a: The procedure of identifying occupations displaying a deficit and a surplus

![Graph showing deficit, balance, and surplus areas]


Figure 1b: The procedure of identifying occupations displaying a deficit and a surplus

![Graph showing deficit, balance, and surplus areas]


The presented approach has several advantages. The graphic representation of the relationship between job offers and the unemployed for individual occupa-
tions can be easily interpreted by many stakeholders, including non-specialists. It also allows for assessing the scale of occupational mismatch and for indicating professions requiring priority intervention. Finally, the criteria for assigning occupations to individual groups are insensitive to the changes in the position of the occupations on the graph caused by structural or cyclical changes in the labour market.

Deficit and Surplus Occupations in Light of Both Research Methods

Figure 2 shows the number of occupations in surplus, in deficit and in balance as determined by the two methods. It turns out that, contrary to the Barometer experts’ opinion, the approach based on the data concerning job offers and the unemployed reveals the prevalence of surplus occupations. Out of 130 occupations assessed, 68 (52.3%) had the same forecast regardless of the method used. 40 occupations (30.8%) had assessments varying by one category, and 22 occupations (16.9%) – by two categories.

**Figure 2: The number of deficit, surplus and balance occupations according to the Occupational Barometer and the method based on job offers and the unemployed**

![Graph showing the number of deficit, surplus, and balanced occupations](https://doi.org/10.978.395710/3154)

With regard to the occupations that received the same assessment by means of both methods (see Figure 3), we assumed that assessment should reflect the genuine situation in the labour market. However, the overlaying of the results obtained using both methods at a level close to 50% must be considered a fairly low result. The question arises whether the accuracy of experts’ assessments is low or the approach based on quantitative data is burdened by such a large margin of error. Bearing in mind the limitations of the method based on job offers and the unemployed, we consider the demonstrated level of compliance as only the lower bound of the Barometer’s accuracy. Subsequently, we carefully analyse the remaining inconsistencies.
Figure 3a: Occupations with the same assessment obtained by means of the two methods (scale 0-100)

Notes: (1) Numbers of data markers correspond to numbers of occupations in Table 1.
(2) Triangle markers are assigned to occupations in surplus according to Occupational Barometer, square markers – as occupations in deficit, and horizontal lines – as occupations in balance.

Figure 3b: Occupations with the same assessment obtained by means of the two methods (scale 0-400)

Notes: (1) Numbers of data markers correspond to numbers of occupations in Table 1.
(2) Triangle markers are assigned to occupations in surplus according to Occupational Barometer, square markers – as occupations in deficit, and horizontal lines – as occupations in balance.
(3) When the location of the occupation is outside the graph area, its coordinates are given in brackets.

Figure 4 presents information on occupations that had the greatest discrepancy between the assessments of each method. It is worth noting that the location of the majority of the occupations on the chart differs significantly from the designated border lines, which means that occupation categorisation is quite invulnerable to the changes in the criteria of deficit (or surplus) assessment. Even in the case of occupations that require mostly general and transferable skills, and are thus available to a wide range of job-seekers (sales representatives, marketing and sales specialists, insurance agents), the presence of such a large number of vacancies combined with a small number of the unemployed raises doubts as to the experts’ assessment. The only exception is the profession of doctor, which seems to be more accurately evaluated by the Barometer experts, as the transition from university to medical units is strictly regulated, and vacancies are often filled without publishing job advertisements. On this basis, we assume that about 84% should be the maximum cap on the accuracy of the experts’ assessment. The answer to the question of whether the Barometer’s accuracy is closer to 52% or 84% should be determined after analysing the group of the remaining 40 occupations for which the assessments differed by one category. Figure 5 shows the number of job offers and unemployment inflow for these occupations along with the Barometer experts’ assessment.
Figure 4: Occupations with the assessments varying by two categories

Notes: (1) Numbers of data markers correspond to numbers of occupations in Table 1.
(2) Triangle markers are assigned to occupations in surplus according to Occupational Barometer, square markers – as occupations in deficit.
(3) When the location of the occupation is outside the graph area, its coordinates are given in brackets.

Figure 5: Occupations with the assessments varying by one category

Notes: (1) Numbers of data markers correspond to numbers of occupations in Table 1.
(2) Triangle markers are assigned to occupations in surplus according to Occupational Barometer, square markers – as occupations in deficit, and horizontal lines – as occupations in balance.
(3) When the location of the occupation is outside the graph area, its coordinates are given in brackets.


In order to resolve which results of the compared methods better reflect the actual situation of the remaining 40 occupational groups, we supplemented data on job offers and the unemployed with an analysis of the job offers’ content, which included the following elements:
• **The number of ads**: recruitment of a large number of employees in a single advertisement might indicate only a temporary increase in labour demand;

• **Job quality as evidenced by, for example, the type of contract or wages offered**: The prevalence of low-quality jobs might testify not to a deficit in candidates, but to a high rate of worker turnover and the employers’ strong negotiating position;

• **Requirements for candidates in terms of education and work experience**: Demanding requirements might mean that the employer’s difficulty in filling a vacancy in a given occupation is smaller than would be expected if judged only by the number of jobs offered;

• **An occupation’s availability to people without profiled education and experience**: Occupations that are easy to fill with people with an unrelated background or no profession at all will have a lower deficit than they would have if judged by only the number of offers and the unemployed.

In addition, we also considered other signals from the labour market: the inflow of new large investors to Lublin in 2015, information on collective redundancies announced for 2015 and the unemployment ratio among university graduates living in the Lubelskie Region within nine months of graduation (WUP 2015b). Table 2 in the Annex presents the most important conclusions from the analysis. We undermined the Barometer experts’ assessment only when the qualitative analysis unambiguously confirmed the result obtained using the data on job offers and the unemployed. This was found to be the case for 18 occupations.

Summing up, in the case of 39 out of 130 occupations assessed, our analysis of labour market signals provided strong evidence undermining the accuracy of the Barometer experts’ assessment for the City of Lublin. This means that the Barometer’s estimated accuracy was 70%.

### Advantages and Disadvantages of the Occupational Barometer in the Context of the Polish Labour Market: Discussion of the Results

The Occupational Barometer has a number of advantages and reflects significant progress in the identification of deficit and surplus occupations in local...
labour markets in Poland. The Barometer has supplemented the monitoring of surplus and deficit occupations done so far by labour offices. The classification of occupations for the purpose of monitoring was based on the quotient of the average monthly number of job offers submitted to labour offices and the average monthly number of the registered unemployed. The major weaknesses of this type of monitoring are the fact that only offers submitted to labour offices were included and the ambiguous interpretation of the quotient of offers and the unemployed, especially when there is a very low number of offers and unemployed in a given occupation.

Another argument in favour of the Barometer’s implementation is that experts may take into account not only the profession of the unemployed, but also other characteristics that determine their employment opportunities and are often difficult to measure. These include professional experience, additional qualifications and certificates, pay expectations, motivation, communication skills, health or age. As argued by the labour office authorities, “experts involved in the study also know which offers are submitted repeatedly, where there is a high turnover and what its causes are. They are also aware of seasonality in employment and its influence on the labour market statistics” (Krześciński 2015: 18f.). It is worth noting that in contrast to past statistical data analysis, the Barometer allows us to consider experts’ short-term labour market predictions formulated on the basis of the announced collective dismissals or new investment projects. The Barometer’s experts can also take into consideration labour supply flows across the local boundaries, like daily commuting or labour market entry of graduates.

A further advantage of the Barometer is the low cost of the study, as most of the experts are recruited from the staff of the labour offices. The clear presentation of the results, in turn, increases the application value of this method. Probably the most crucial argument in favour of the Barometer is that there are no statistics on occupational labour demand (both realised matches and vacancies) in local labour markets in Poland. Hence, it is impossible to use any alternative quantitative approach to the identification of deficit and surplus occupations. This argument is also relevant for the overwhelming majority of EU countries, as has been indicated in the literature review.

The Barometer implemented in its current form does, have some drawbacks, however. The qualitative approach based on experts’ assessments and Delphi-
style methods suffers from many biases and limitations, e.g. conservatism, anchoring, group-think or inconsistency, which have been widely discussed in the literature (see e.g. Makridakis et al. 2008, Rowe and Wright 1999). However, this is not a country-specific problem and does not affect the Barometer’s international transferability.

We assume that the key factor that negatively affects the Barometer’s accuracy in Lublin concerns the experts’ knowledge of supply and demand in the labour market. Labour office employees in Poland do have relevant information about the registered unemployed, which is not the case for labour market demand. Job offers submitted to the public employment services still constitute only a small part of all available offers. Research carried out by the National Bank of Poland (Gradziewicz et al. 2016) shows that between 2010 and 2015 labour offices received information about an average of 10-20% of vacancies (with a tendency to increase in subsequent years), while the percentage of firms not submitting offers to labour offices amounted to 60-70%. This research also revealed that the structure of the vacancies reported to the labour offices significantly differs from the structure of offers in the labour market. Labour offices receive more offers from employers seeking candidates without higher education for production positions relative to other types of offers. In addition, labour offices in Poland generally do not carry out any systematic surveys among local firms. In the case of the Labour Office in Lublin, regular contact with employers, apart from receiving job offers, is limited to co-operation with the 53 employers associated with the Employers’ Club. In conclusion, sufficient knowledge among Barometer experts seems to be a critical condition for the successful application of the Finnish Barometer to other countries.

Information shortages within labour offices were to be compensated by inviting employees of private employment agencies to the Barometer’s expert panel. In the Polish reality, however, such a solution has its limitations. The percentage of job offers sent to private agencies is even lower than the percentage of offers sent to labour offices. The most popular way of recruiting in Poland is through the media (about 50% of recruitment) and so-called “recommendations” (about 30% of recruitment). The structure of offers sent to private employment agencies also differs from the market structure; white collar workers with higher levels of education, predominantly managers and specialists, are overrepresented (Gradziewicz et al. 2016). Under these circumstances, we rec-
ommend collecting information about job offers not submitted to labour offic-
es (e.g. by using Internet data-mining tools), and subsequently presenting the
data on job offers to both the Barometer experts and the unemployed.

In comparison to Poland, Finland and Sweden have a well-developed system of
public employment services offering high-quality job-search assistance, coun-
selling and guidance. Government spending on active labour market services
might indicate the cross-country differences in this area. The allocation of
funds for labour market services (measured in % of GDP) in Poland is almost
30% less than in Finland and 65% less than in Sweden, despite a higher unem-
ployment rate in Poland (see Figure 6). TE Offices in Finland stand out as the
main actor concerned with identifying occupations and skills in shortage, as 60-
70% of open vacancies go through the local public employment services (Larsen
et al. 2012). Apart from the information obtained from job offers, Finnish and
Swedish local employment authorities regularly conduct comprehensive com-
pany surveys, gathering information on local employment prospects and edu-
cational needs. For example, local employment authorities in each of 21 Swe-
dish Counties interview about 400 employers twice a year (Lindskog 2004,
Marttinen 2012). With such reliable information about the demand for labour,
public employment services in Sweden and Finland are able to accurately indi-
cate the deficit and surplus occupations within the Occupational Barometer
framework.
Figure 6: Expenditure on labour market services (% of GDP) and unemployment rate (2010-2015 average) in Finland, Sweden and Poland

Source: Maleszyk (2018) based on Eurostat Database.

Another shortcoming of the Polish version of the Occupational Barometer is the division of the occupations into 3 categories: in deficit, in surplus and in balance, whereas in Sweden, Finland or Estonia there are five categories: there is a distinction among both deficit and surplus occupations for which the difference between supply and demand is particularly large. The consequences of the lack of a similar procedure in Poland can be illustrated by the example of Lublin, where 76 out of 160 occupations were considered to be in deficit. As a result, the Barometer did not allow for the selection of a “shortlist” of the most in-demand occupations, for which the local government intended to implement projects financed with European funds (Maleszyk 2017).
Conclusions

In this study, we have evaluated the Occupational Barometer as a measure for identifying shortage and surplus occupations in local labour markets. The Barometer is a qualitative tool based on the judgment of experts. It was first launched in Sweden and then developed in Finland, from where it was transferred to Poland and to Estonia.

The literature review revealed that one encounters a number of difficulties identifying occupations and skills in shortage and in surplus and measuring horizontal mismatch. The lack of sufficiently detailed datasets seems to be the most noteworthy of these difficulties. A sufficiently adequate dataset, which makes it possible to use reliable quantitative measures, often exists at the national or, at best, the regional level, but not at the sub-regional or local level. Qualitative tools based on experts’ judgment, like the Occupational Barometer, might have the potential to fill this gap and meet the needs of many local stakeholders. Nonetheless, its application value depends on its accuracy, which is difficult to verify.

To evaluate the Occupational Barometer we compared the results of the expert panel meeting held in Lublin (Poland) to the occasionally collected data on job offers (including those not submitted to labour offices) and the unemployed registered at the Labour Office in Lublin. We assessed occupations first in terms of their position on the Cartesian plane, in which the coordinate axes were the numbers of vacancies and the unemployed, and subsequently in terms of job offer contents and other information concerning the situation in the local labour market. According to this research procedure, which can be linked to the labour market signalling approach, the Barometer’s accuracy was estimated to be 70%.

Despite the somewhat disappointing level of accuracy, the Barometer has many advantages, especially compared to the methods used thus far by labour offices in Poland. Given the aforementioned limitations of poor local labour market data, we consider developing the Occupational Barometer to be the most feasible direction for improving the process of identifying deficit and surplus occupations. We attributed the unsatisfactory accuracy of the Barometer mainly to the limited amount of data on labour market demand at the disposal of the public employment services in Poland, especially in comparison to the amount of data gathered by public employment services in Finland or Sweden.
We argued that the involvement of private employment agencies did not resolve the problem, as the number of offers in these agencies is even lower than in labour offices.

Our leading recommendation is to collect information about job offers not submitted to labour offices (e.g. by using Internet data-mining tools), and to then make the data on job offers accessible to the Barometer experts, as well as to the unemployed. Information on labour demand can also be extended by conducting regular employer surveys and through more frequent, client-oriented relations between labour office staff and local employers, though following this recommendation might require increased spending on labour market services. We therefore consider the amount of data on the demand side of the labour market at the disposal of the local public employment services to be the key condition for a successful transfer of the Finnish Occupational Barometer to other countries. We also suggest distinguishing those occupations in which the difference between supply and demand is particularly large.

References


Humpl, Stefan/Bacher, Daniel (2012): The AMS-skills barometer: A web-based labour-market tool: Making use of forecast results by stakeholders, in: Cedefop: Building on skills forecasts:


Marttinen, Jouni/Vahtonen, Timo (2012): Activities and Measures for Anticipating Skills and Occupations in Finland, in: Larsen, Christa/Hasberg, Ruth/Schmid, Alfons/Atin,


Appendix

Table 1: The list of occupations in assessment and their categorisation

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<thead>
<tr>
<th>No.</th>
<th>Occupation</th>
<th>Occupational Barometer&lt;sup&gt;(2)&lt;/sup&gt;</th>
<th>Job offers and unemployment&lt;sup&gt;(2)&lt;/sup&gt;</th>
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<td>Beauticians</td>
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<td>Bricklayers and Related Workers</td>
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<td>Buyers</td>
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<tr>
<td>128</td>
<td>Weaving and Knitting Machine Operators</td>
<td>D</td>
<td>S</td>
</tr>
<tr>
<td>129</td>
<td>Wood and Metal Varnishers</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>130</td>
<td>Wood Treaters, Cabinet-makers and Related Trades Workers</td>
<td>B</td>
<td>B</td>
</tr>
</tbody>
</table>

Notes: (1) Numbers of occupations correspond to numbers in Figures 3-5.
(2) D: deficit occupations, S: surplus occupations, B: balanced occupations.

Source: Krzesiński (2015), labour office data, own calculations.
Table 2: Qualitative assessment of job offers and other labour market signals for occupations in assessment

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Barometer&lt;sup&gt;(1)&lt;/sup&gt;</th>
<th>JO&amp;U&lt;sup&gt;(1)(2)&lt;/sup&gt;</th>
<th>U(s)&lt;sup&gt;(2)&lt;/sup&gt;</th>
<th>U(i)&lt;sup&gt;(2)&lt;/sup&gt;</th>
<th>JO&lt;sup&gt;(2)&lt;/sup&gt;</th>
<th>Qualitative assessment of job offers and other labour market signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beauticians</td>
<td>B</td>
<td>S</td>
<td>80</td>
<td>97</td>
<td>33</td>
<td>1/3 offered jobs under civil law contracts, average wage offered ranges from 100 to 110% of the minimum wage</td>
</tr>
<tr>
<td>Building Architects and Town Planners</td>
<td>B</td>
<td>S</td>
<td>11</td>
<td>33</td>
<td>6</td>
<td>Experience and higher education required, share of unemployed among graduates: 150% of the average</td>
</tr>
<tr>
<td>Buyers</td>
<td>B</td>
<td>D</td>
<td>43</td>
<td>23</td>
<td>61</td>
<td>Secondary and higher education required, experience required in 50% jobs, full employment contracts prevails, transferrable skills</td>
</tr>
<tr>
<td>Car and Taxi Drivers</td>
<td>B</td>
<td>S</td>
<td>92</td>
<td>44</td>
<td>11</td>
<td>40% jobs under civil law contracts</td>
</tr>
<tr>
<td>Chemical Engineers</td>
<td>B</td>
<td>S</td>
<td>91</td>
<td>94</td>
<td>23</td>
<td>Higher education required, experience and higher education required in 60% jobs, share of unemployed among graduates: 120% of the average</td>
</tr>
<tr>
<td>Civil Engineering Technicians</td>
<td>B</td>
<td>S</td>
<td>143</td>
<td>160</td>
<td>27</td>
<td>Many job offers for House Builders and Related Trades Workers</td>
</tr>
<tr>
<td>Contact Centre Salespersons</td>
<td>B</td>
<td>D</td>
<td>49</td>
<td>41</td>
<td>1573</td>
<td>Little requirements for education and experience, 60% jobs under civil law contracts</td>
</tr>
<tr>
<td>Cooks</td>
<td>B</td>
<td>S</td>
<td>207</td>
<td>239</td>
<td>111</td>
<td>Vocational education required, experience required in 50% jobs, 90% jobs under employment contracts, average wage offered: 120% of the minimum wage</td>
</tr>
<tr>
<td>Financial and</td>
<td>B</td>
<td>D</td>
<td>20</td>
<td>19</td>
<td>349</td>
<td>Requirements for education not</td>
</tr>
<tr>
<td>Occupation</td>
<td>Barometer(^{(1)})</td>
<td>JO&amp;U(^{(1)}(2))</td>
<td>U(s)(^{(2)})</td>
<td>U(i)(^{(2)})</td>
<td>JO(^{(2)})</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------------</td>
<td>------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Investment Advisers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphic and Multimedia Designers</td>
<td>B</td>
<td>D</td>
<td>13</td>
<td>20</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>IT Application Specialists</td>
<td>B</td>
<td>S</td>
<td>35</td>
<td>56</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Landscape Architects</td>
<td>B</td>
<td>S</td>
<td>26</td>
<td>50</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Launderers and Pressers</td>
<td>B</td>
<td>S</td>
<td>26</td>
<td>23</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Lawyers</td>
<td>B</td>
<td>S</td>
<td>202</td>
<td>337</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Machinery Assemblers</td>
<td>B</td>
<td>D</td>
<td>39</td>
<td>24</td>
<td>107</td>
<td></td>
</tr>
</tbody>
</table>

Qualitative assessment of job offers and other labour market signals

Investment Advisers: mentioned, experience required in 40% jobs, 70% offered jobs under civil law contracts or self-employment, share of unemployed among Finance and Accounting graduates: 140% of the average

Graphic and Multimedia Designers: Employment contract (self-employment optional), professional education required, experience required in 40% jobs

IT Application Specialists: Share of unemployed among graduates among the lowest, skills transferrable with other IT professions

Landscape Architects: Offers for specialists with many years’ experience, employment contract (self-employment optional)

Launderers and Pressers: Jobs under employment contracts with minimum wage

Lawyers: Higher education in law required, jobs under employment contracts, average wage offered: 140% of the minimum wage (revealed in 1/3 offers), 25% offered jobs under civil law contracts, experience required in 50% jobs, unemployed among graduates: 120% of the average

Machinery Assemblers: Vocational or secondary education required, usually no experience requirements, jobs under employment contract, wage offers range 100-120% of the min-
<table>
<thead>
<tr>
<th>Occupation</th>
<th>Barometer(^{(1)})</th>
<th>JO&amp;U (^{(1)(2)})</th>
<th>U(s)(^{(2)})</th>
<th>U(i) (^{(2)})</th>
<th>JO(^{(2)})</th>
<th>Qualitative assessment of job offers and other labour market signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mail Carriers and Sorting Clerks</td>
<td>B</td>
<td>D</td>
<td>11</td>
<td>6</td>
<td>80</td>
<td>No education requirements, 70 jobs in two advertisements offering job under civil contract with minimum wage</td>
</tr>
<tr>
<td>Managers</td>
<td>B</td>
<td>D</td>
<td>97</td>
<td>35</td>
<td>1603</td>
<td>Employment or management contract, industrial and management experience often required</td>
</tr>
<tr>
<td>Medical Assistants and Paramedical Practitioners</td>
<td>B</td>
<td>S</td>
<td>14</td>
<td>27</td>
<td>2</td>
<td>Medical professions are generally characterised by a hidden recruitment</td>
</tr>
<tr>
<td>Motor Vehicle Mechanics and Repairers</td>
<td>B</td>
<td>S</td>
<td>252</td>
<td>232</td>
<td>77</td>
<td>Vocational or secondary education required, experience requirements in 50% jobs, jobs under employment contract, wage offers range 100-150% of the minimum wage</td>
</tr>
<tr>
<td>Porters, caretakers and carers</td>
<td>B</td>
<td>D</td>
<td>199</td>
<td>108</td>
<td>367</td>
<td>No educational and experience requirements, 3/4 offered jobs are part-time or under civil law contracts</td>
</tr>
<tr>
<td>Safety and Quality Professionals</td>
<td>B</td>
<td>D</td>
<td>45</td>
<td>66</td>
<td>128</td>
<td>Experience requirements in 50% offers, 60% jobs under employment contract</td>
</tr>
<tr>
<td>Security Workers and Uniformed Services</td>
<td>B</td>
<td>D</td>
<td>95</td>
<td>51</td>
<td>130</td>
<td>Usually no experience or educational requirements, 2/3 jobs under civil law contract, average wage offered: 80% of the minimum wage</td>
</tr>
<tr>
<td>Shop Sales Assistants and Cashiers</td>
<td>B</td>
<td>D</td>
<td>1066</td>
<td>651</td>
<td>1723</td>
<td>Usually no educational and experience requirements, 2/3 jobs under employment contract,</td>
</tr>
<tr>
<td>Occupation</td>
<td>Barometer&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>JO&amp;U&lt;sup&gt;(1)&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>U(s)&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>U(i)&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>JO&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>Qualitative assessment of job offers and other labour market signals</td>
</tr>
<tr>
<td>----------------------------------------</td>
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<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Translators, Interpreters and Other Linguists</td>
<td>B</td>
<td>S</td>
<td>88</td>
<td>166</td>
<td>56</td>
<td>wages close to minimum wage</td>
</tr>
<tr>
<td>Veterinarians</td>
<td>B</td>
<td>S</td>
<td>15</td>
<td>49</td>
<td>8</td>
<td>40% jobs under civil law contracts</td>
</tr>
<tr>
<td>Visual Artists, Interior Designers and Decorators</td>
<td>B</td>
<td>S</td>
<td>91</td>
<td>105</td>
<td>24</td>
<td>Secondary or higher education required, experience required in 2/3 jobs, jobs under employment contract, jobs coffers predominantly for Interior Designers and Decorators, unemployed among Art graduates: 200% of the average</td>
</tr>
<tr>
<td>Bricklayers and Related Workers</td>
<td>D</td>
<td>B</td>
<td>134</td>
<td>72</td>
<td>59</td>
<td>Experience required in 3/4 jobs, 40% jobs under civil law contracts, average wage offer: 120% of the minimum wage</td>
</tr>
<tr>
<td>Car Varnishers</td>
<td>D</td>
<td>B</td>
<td>19</td>
<td>16</td>
<td>15</td>
<td>Experience required in 60% jobs, 90% jobs under employment contract, wage ranges from 100 to 400% of the minimum wage</td>
</tr>
<tr>
<td>Electrical Mechanics and Fitters</td>
<td>D</td>
<td>B</td>
<td>196</td>
<td>170</td>
<td>222</td>
<td>Vocational education required, experience required in 2/3 jobs, jobs under employment contract, average wage offer: 200% of the minimum wage</td>
</tr>
<tr>
<td>Electronics and Telecommunications Installers and Repairers</td>
<td>D</td>
<td>B</td>
<td>48</td>
<td>47</td>
<td>27</td>
<td>Vocational education required in ¾ offers, experience required in 50% jobs, jobs under employment contract, average wage offer: 200% of the minimum wage, job description similar to Electrical Mechanics and Fitters</td>
</tr>
<tr>
<td>Occupation</td>
<td>Barometer(1)</td>
<td>JO&amp;U (1)(2)</td>
<td>U(s)(2)</td>
<td>U(i)(2)</td>
<td>JO(2)</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------------</td>
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<td>---------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Glaziers</td>
<td>D</td>
<td>B</td>
<td>24</td>
<td>17</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Occupational or elementary education required, experience required in 1/3 jobs, jobs under employment contract, average wage close to the minimum wage, job description similar to Roofers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House Builders, Building Frame and Related Trades Workers Not Elsewhere Classified</td>
<td>D</td>
<td>B</td>
<td>286</td>
<td>174</td>
<td>216</td>
<td></td>
</tr>
<tr>
<td>Vocational or elementary education required, experience required in 1/3 jobs, 3/4 jobs under employment contract, average wage offered: 120% to the minimum wage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Engineers</td>
<td>D</td>
<td>B</td>
<td>69</td>
<td>95</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>Higher education required, experience required in 60% jobs, jobs under employment contract, new investors’ inflow in 2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmacists</td>
<td>D</td>
<td>B</td>
<td>22</td>
<td>33</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Higher education required, experience required in 10% jobs, jobs under employment contract, share of unemployed among graduates close to 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printing Trades Workers</td>
<td>D</td>
<td>B</td>
<td>40</td>
<td>26</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Vocational education required, experience required in 50% jobs, jobs under employment contract, average wage offered: 120% of the minimum wage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Metal Preparers and Erectors</td>
<td>D</td>
<td>B</td>
<td>12</td>
<td>12</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Vocational education required, experience required in 1/3 jobs, jobs under employment contract, average wage offered: 120% of the minimum wage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toolmakers and Related Workers</td>
<td>D</td>
<td>B</td>
<td>186</td>
<td>142</td>
<td>177</td>
<td></td>
</tr>
<tr>
<td>Vocational education required, experience required in 40% jobs, jobs under employment contract</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td>Barometer(^{(1)})</td>
<td>JO&amp;U(^{(1,2)})</td>
<td>U(s)(^{(2)})</td>
<td>U(i)(^{(2)})</td>
<td>JO(^{(2)})</td>
<td>Qualitative assessment of job offers and other labour market signals</td>
</tr>
<tr>
<td>------------------------------------------------</td>
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<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Administrative and Specialised Secretaries</td>
<td>S</td>
<td>B</td>
<td>287</td>
<td>185</td>
<td>250</td>
<td>Higher education required in 60% offers, experience required in 40% jobs, 80% jobs under employment contract, average wage offered: 110% of the minimum wage, transferrable skills</td>
</tr>
<tr>
<td>Language Teachers</td>
<td>S</td>
<td>B</td>
<td>74</td>
<td>57</td>
<td>93</td>
<td>Higher education required, experience required in 1/3 jobs, 90% jobs under civil law contract, average wage offered: 160% of the minimum wage, teachers are recruited from linguists who are in surplus</td>
</tr>
<tr>
<td>Secretaries (general)</td>
<td>S</td>
<td>B</td>
<td>25</td>
<td>19</td>
<td>21</td>
<td>Higher education required, experience required in 20% jobs, jobs under employment contract, average wage offered: 140% of the minimum wage, job description similar to Administrative Secretaries</td>
</tr>
</tbody>
</table>

Notes: Grey background refers to the occupations for which the Barometer experts’ assessment has been undermined.

(1) D: deficit occupations, S: surplus occupations, B: balanced occupations.
(2) JO&U: the analysis of job offers and unemployment; U(s): registered unemployed in 31 December, 2014; U(i): unemployed registered through the year 2014; JO: the number of vacancies according to job offers.

Monitoring Changing Needs in skills, competences and qualifications in Austria

Claudia Plaimauer

Introduction
In Austria – like in so many other countries – short-term quarterly macroeconomic projections are well established and appreciated by economic policy-makers. This type of forecasting touches changing needs for skills, competences and qualifications only at a very general level. But education and training planners, labour market administrators and vocational counsellors as well as individuals facing career choices depend on more specific labour market intelligence and, ideally, a longer-term perspective. Is this kind of information available in Austria?

Until a few years ago, Austria could not claim to be innovative with respect to monitoring changing needs in skills, competences and qualifications. Yet with the new millennium Austria’s Public Employment Service (AMS)\(^1\) established an innovative tool, which since its launch in 2002 has already received a lot of attention at not just the national but also the European level: the AMS Skills Barometer\(^2\), a comprehensive information system analysing the current labour market situation in Austria as well as the trends for the following four years.

The Skills Barometer systematically covers current as well as future labour market demand from the national, regional\(^3\), occupational and even skills perspective at several levels of detail, leading from the general (occupational “sectors”) to the increasingly specific (occupational fields, individual occupations, skills and competences, certificates). Gender issues and green skills and occupations receive particular attention as well. Information is presented as text, graphics and tables according to the categorisations generally used by the Aus-

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\(^1\) In German: “Arbeitsmarktservice Österreich”. In the following we shall refer to Austria’s Public Employment Service by “Austrian PES” or “AMS”. \(^2\) In German: “AMS Qualifikations-Barometer”. \(^3\) At the level of federal states, in German: “Bundesland”.
trian PES for occupations and skills/competences: their competences classification\textsuperscript{4} and their occupational taxonomy\textsuperscript{5}.

To stay current, the Skills Barometer mostly depends on already available data and information on labour market needs across regions, sectors and areas of work. This paper describes and analyses these sources with respect to the following features:

- Utilised method;
- Analysed variables;
- Coverage;
- Representativeness;
- Timeframe of resulting statements on demand;
- Transferability of results.

All periodically undertaken investigations as well as samples of selected ad hoc studies on skills demand are covered. The objective is to assess the advantages as well as the disadvantages of Austria’s skills monitoring system in relation to respective data sources.

Overview of Available Sources for Assessing Needs in Skills, Competences and Qualifications\textsuperscript{6} in Austria

The AMS Skills Barometer’s assessment of skills, competences and qualification needs arises from an editorial evaluation of a broad mix of diverse information sources. To be included, content has to be relevant (focused on labour market and skills trends within Austria as a whole or its regions), methodologically valid and up-to-date (or at least contain some information that is still valid). Content is mainly national, but international statistics, reports, studies and articles are also evaluated as background information, including scientific as well as journalistic sources. These investigations have mostly been compiled in other

\footnotesize
\textsuperscript{4} In German: “AMS-Kompetenzenklassifikation”.
\textsuperscript{5} In German: “AMS-Berufssystematik”.
\textsuperscript{6} Since professions, especially regulated ones, often serve as applicants’ proof of qualification, we also include investigations analysing demand for certain occupations or occupational fields in this analysis.
contexts, and only some studies are commissioned by the Austrian PES itself, sometimes specifically for the AMS Skills Barometer.

For the annual updates of the AMS Skills Barometer, available information is compiled, analysed and evaluated. Since the Austrian PES’ taxonomies for occupations and skills/competences function as the backbone of the Skills Barometer’s information architecture, all information on labour market demand has to be related to the concepts and groupings of these classifications. Usually only studies commissioned by the Austrian PES itself report findings in line with these taxonomies, therefore results from all other sources, e.g. articles from newspapers and magazines or reports and studies from independent labour market research firms, have to be interpreted and subsequently related to the categories of reporting as much as possible. Remaining gaps are filled by interviews with sector experts.

**Regular Surveys**

There are a couple of surveys undertaken in Austria at more or less regular intervals, most notably a prognosis of apprentices and skilled workers (Alteneder 2018) and a micro-prognosis (Alteneder 2017), both commissioned by the Austrian PES on an annual basis. Unfortunately, neither of these surveys is satisfactory for forecasting future labour market demand.

The prognosis of apprentices and skilled workers mainly aims at foreseeing supply, meaning it forecasts the probable availability of apprentices based on existing numbers, demographic trends and anticipated educational attainment. Nothing is being said about demand for apprentices, let alone their expected skills and competences.

The commissioned micro-prognosis is a short-term forecast of labour demand, which only roughly differentiates between occupational fields (represented by combined ISCO groups). It provides no information on technical skills or personal competences in demand. Statements on individual occupations are limited to assessing whether or not these are threatened by unemployment.

At least between 2001 and 2013, more detailed information in line with the Skills Barometer’s categories of reporting was provided by the AMS’ bi-annual
enterprise survey (Ziegler et al. 2012), which contacted Austrian enterprises with more than 20 employees (approximately 20,000 enterprises) inquiring – amongst many other topics – about the development of their labour force and qualification demands. The questions aimed to identify occupations and skills/competences highly demanded within the last two years, as well as occupational trends and anticipated need for further education and training within the next twelve months. Answers – provided in free text – were manually coded onto the Austrian PES' occupations and skills taxonomies and were thus fully compatible with the categorisations used in the AMS Skills Barometer. Unfortunately, carrying out this bi-annual survey was very time-consuming and expensive. Although the response rate was usually quite high (around 35%), the quality of answers was far from ideal. Results were usually available only with a considerable time lag, rendering any conclusions already out-dated at the time of publication.

Since 2009 Austria’s National Statistics Bureau publishes a national report on vacant positions annually. A representative sample of Austrian employers is contacted via telephone survey and asked which new currently unfilled or soon to be open jobs they intend to fill now or within the foreseeable future, either via mass media, intermediaries, the web, personal contacts, or internal recruiting, etc. Since it can also be determined whether these job openings are being reported to the AMS, this allows for a comparison of vacancies mediated with or without the involvement of the Austrian PES. Unfortunately, results are reported at a very high level of aggregation only: ISCO major groups and qualification levels.

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7 The AMS enterprise survey was also a tool for customer relationship management, inquiring about e.g. the companies’ most important trade goods and services, technologies used, the size and composition of the current work force, the name and contact details of the HR administrator, etc. It is quite likely that contacted enterprises tended to see mainly this customer care intention of the survey and thus left answering the questionnaire altogether up to those HR administrators who generally interacted with the AMS when in need of manpower or training offers. In that case, reported shortages in occupations, skills and qualifications are quite likely to have been shaped by the expectation of what the AMS is able to offer in this respect.

8 For example, the response “up-to-date technical skills”, which was a frequent answer to questions regarding anticipated training needs, was too abstract to be useful for assessing training demand.

9 In German: “Statistik Austria”.

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Another regular survey commissioned by the AMS between 1996 and 2015 was the annual analysis of vacancies published in print newspapers and journals (Lavrencic 2016). This investigation aimed to generate information on the size and structure of the Austrian vacancy market on top of the AMS’ mediation efforts (for which regular statistics are issued as well). At the beginning, this survey was based on a quota sample taken of all print media containing a relevant amount of job vacancies; to save on costs. After a few years it was reduced to a random sample of daily and weekly newspapers and journals – still more than 600 editions/copies per year. Variables like occupation, qualification level, region (at the federal state level), type of employment offered (e.g. full-time, part-time, open-ended or temporary contract) and extent of employment (weekly working hours) were manually coded, quantitatively evaluated and then extrapolated to arrive at representative results.10 Reported results were fully compatible with the Austrian PES’ occupational taxonomy, differentiated between Austria’s nine federal states and concentrated on vacancies published in addition to those of the AMS. Up to survey year 201511, results were displayed in the Skills Barometer’s tables characterising non-AMS labour market demand of the current and preceding year.

Print media only dominated the Austrian vacancy market until the 1990s. Around the turn of the millennium, more and more job ads migrated into the web, but monitoring this increasingly larger online vacancy market required completely different methods impossible to provide using the existing suppliers of print vacancy analyses. Therefore, the Austrian PES decided to discontinue this investigation and to turn instead towards automatically collected and processed online job vacancies collected from the Big Data platform Jobfeed.

10 Between 2003 and 2015, the Austrian PES also commissioned annual analyses of skills demand, as demonstrated in online vacancies. These were based on small samples of manually collected and coded job ads, covering selected occupational fields only. Although results were largely reported with reference to the Austrian PES’ skills and occupations taxonomies, they could only be used as “qualitative” background information due to their lack of representativeness.

11 From survey year 2016 onwards, data generated by an online vacancy analysis based on Jobfeed is published in the Skills Barometer.
Jobfeed aims at an exhaustive coverage of the Austrian online vacancy market. According to Textkernel, inventor and operator of Jobfeed, the estimated coverage of the national online job market is currently around 90-95%. From 2016 onwards, the AMS’ annual vacancy analysis relies on this Big Data platform, regarding it as an “approximate full survey”. Vacancies are automatically normalised using Jobfeed’s proprietary occupations taxonomy, which is mapped onto the AMS’ taxonomy, thus facilitating an almost full translation of results into the categories structuring the Skills Barometer. Jobfeed also automatically processes work places mentioned in the vacancy text and relates these to the respective federal state. Also available, but presently not yet utilised in the analysis, are the type of work contract offered, the demanded qualification level, as well as skills and competences expected from applicants.

The online vacancy analysis currently characterises labour market demand with reference to occupations and federal states, differentiating between vacancies posted (also) to the AMS’ eJob-Room and those published exclusively outside of this context. Although Jobfeed also processes job requirements (skills, competences, certificates, physical requirements, etc.) in a manner that allows for systematic queries, the Austrian PES is still reluctant to use this information scientifically due to scepticism regarding the comprehensiveness and accuracy of this feature.

Ad Hoc Studies on Skill Needs

Several ad hoc studies on skills needs are undertaken in Austria per year; most of them are publicly available. The AMS commissions most of these studies, but some are also performed on behalf of the Federal Ministry of Education, Science and Research, the Federal Ministry for Digital and Economic Affairs, the Austrian Federal Economic Chamber, the Chamber of Labour, or individual federal provinces and communes. The focus and frequency of these investigations vary according to political demands, for example a couple of studies were published recently on the influence of online shopping on employment in Aus-

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12 See Plaimauer (2016) and (2018) on Jobfeed and online vacancy analysis.
These investigations usually focus on individual sectors or regions, encompass a prognostic time-frame that is mostly short-term (one year) or medium-term (five years) and have results that vary significantly with respect to the applied reference taxonomy, level of detail and representativeness.

Also worth mentioning in this context are the 2017 and 2018 interview surveys amongst experts, such as human resource managers of leading enterprises, personnel advisors, managers of vocational education and training institutions and representatives of professional associations. Commissioned by the Austrian PES with the purpose of serving the Skills Barometer’s need for current and detailed information on labour market demand, around 100 interviews were conducted to assess: present and future developments on the employer-side, demand for occupations and areas of activities as well as important qualifications, knowledge, skills and competences. Results – reported in categories identical or at least compatible with the ones used by the AMS – are meant to either fill information gaps or validate statements retrieved from other investigations. The level of detail is high, characterising labour demand at the level of occupational fields, occasionally even at the level of occupations, and individual skills/competences. In this way, the interview survey has already proved its utility for the Skills Barometer, and, even though it has only been performed twice so far, there is a chance it will be repeated next year or maybe even transformed into a regular survey in the future.

Another information source also relying on expert knowledge in a different setting are the “AMS Standing Committees on New Skills”. Established in 2009 by the Austrian PES and Social Partners, they aim to support a quick adjustment to changing labour market demands on the side of enterprises, employees and job-seekers. Every year, specialist working groups are installed to identify short- to medium-term labour market demand in different occupational sectors. Findings summarised in reports influence not only the AMS’ decisions regarding targeted training planning, but also the Skills Barometer’s trend assessments.

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13 E.g. Eichmann et al. (2016), KMU Forschung Austria (2017) or Gittenberger et al. (2016).
14 Bliem et al. (2017) documents the previous year’s survey; the report summarising this year’s survey will be published in autumn 2018.
Major Challenges with Respect to Data Sources on Skills, Competences and Qualifications Demand in Austria

The AMS Skills Barometer aims to make well-informed statements regarding current and medium-term future labour market demand in a systematic, comprehensive and detailed manner. Information is gathered from a broad range of sources, ranging from forecasts of labour demand and projections for labour force development to sector- or region-specific investigations of skills demand or comprehensive vacancy analyses. The challenges encountered with respect to sources can be understood as characterising the national data situation in general:

- **Different availability of sources for sectors**: for some sectors there are many, for others barely any. The character of available sources also differs between sectors: for some you find comprehensive national studies, for others only journalistic texts in newspapers or magazines.

- **Varying point of view/perspective**: many sources primarily describe the current or past situation of the economy or the labour market in a particular sector, but the AMS Skills Barometer aims to describe the present situation in addition to looking ahead and describing developments and trends for occupations and skills.

- **Level of detail**: in general, the availability of information tends to increase with the level of abstraction; it is easier to find sources for specific sectors than for specific occupations, or even for specific skills. The level of detail also seems to be negatively correlated with comprehensiveness: sources providing detailed information for occupations frequently cover only certain sectors, regions or qualification levels, whereas sources providing comprehensive coverage of sectors, regions and qualification levels tend to make only very general statements.

- **Timeliness and reliability of information**: since it usually takes time to produce scientifically validated results, the timeliness of information and its reliability tend to be inversely proportional. Journalistic texts from newspapers and magazines often have to be used to access up-to-date information.

- **Different categorisations**: Only very few sources report results employing same categorisations as those used in the Skills Barometer; the effort needed to translate information into the concepts and groupings of AMS taxonomies differs considerably. It is rarely easy (e.g. in the case of integrating AMS vacancy statistics), usually quite time consuming (e.g. in the case of the bi-annual enterprise survey) and sometimes barely possible.
• **Lack of quantitative data for skills:** The largest challenge is the lack of reliable quantitative data on skills – concerning their availability as well as their demand – specifically at a low level of aggregation. This information was meant to be delivered by the AMS’ bi-annual enterprise survey until 2013, and by the annual vacancy analysis of skills demand until 2015. Expert interviews tried to fill the void in the last update in 2018, but unfortunately none of these investigations were representative of the whole national labour market.

Although monitoring and forecasting labour market demand mostly happens “outside”, it is the AMS Skills Barometer’s special merit to identify, analyse, validate, integrate and summarise the results of national labour market research, thus making it available to a broader audience. In the face of irresolvable conflicts between research statements it is a particular challenge to form a unified picture of a probable future.

It is the privilege but also the burden of the Skills Barometer’s editors to decide who to believe, who to doubt, and which research results are to be taken into account and which are not. The audience of this online system expects validated and condensed information presented in an easy to understand manner. When the Skills Barometer’s annual update goes online once again, it can only be hoped that editors are perceived as simplifying a complicated matter without being recklessly simplistic.

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Offene-Stellen-Erhebung:
http://www.statistik.at/web_de/statistiken/menschen_und_gesellschaft/arbeitsmarkt/offene_stellen/index.html

AMS Standing Committees on New Skills: https://www.ams.or.at/newskills
Current and Future Demand for Professions, Competences and Qualifications in the Context of the Sectoral Development of the Regional Economy: The Case of Podlaskie Voivodeship, Poland

Marta Marzena Sosnowska

Preliminary Issues Concerning the Subject and Proposed Research Concepts

Examining the demand for labour from the angle of sought-after qualifications and competences constitutes a separate and subjective attempt at analysis. The methodology for obtaining information is often dictated by organisational factors, often omitting full information requirements. Therefore, a holistic approach to the study of desirable qualifications and competences requires the diversification of sources and research methods. Often, it demands an extrapolation of global phenomena to the national and regional level (such as the global trend of high demand for IT professions).

This article presents the skill and competence needs in different sectors in the Podlaskie Voivodeship currently and in the future. It also shows the most preferred ways to study the demand for labour in terms of the desired qualifications and competences.

To identify which occupations, qualifications and competences are in shortage and sought-after in the regional labour market, taking the key sectors of the regional economy into particular consideration and determining the possible ways of supporting employers in lifelong learning in areas of identified structural mismatches, the following methods may be used (Widelska 2017):

- Desk research to capture the background;
- Quantitative surveys (in the form of questionnaires) among employers in the voivodeship, representing key sectors of the region’s economy;
- Quantitative surveys (in the form of questionnaires) among representatives of educational institutions, training companies and vocational schools that train for occupations that are in shortage in key economic
sectors in the voivodeship (i.e. analysing the current vocational training offer in- and out-of-school in the shortage/sought-after occupations in the Podlaskie Voivodeship and assessing its suitability for the needs of employers);  
• Qualitative research (in the form of focus group interview (FGI)) of employers and representatives of employer associations and/or clusters, whose specialisation concerns key regional sectors, recruitment intermediaries and business environment institutions;  
• Qualitative surveys (in the form of FGI) of representatives of vocational schools training students for occupations that are in shortage in the key sectors of the Podlaskie Voivodeship and representatives of educational institutions and training companies;  
• Foresight surveys in the form of STEEPVL analysis, the scenario method, visualisation and network analysis and the Delphi method.

Adequate research techniques can be:  
• A matrix of adequacy;  
• A multivariate statistical analysis:  
  – Cluster analysis;  
  – K-means method;  
  – Correspondence analysis;  
  – Correlation analysis;  
  – Classifications trees.

The above methods were used in the Podlaskie Voivodeship in 2017 as part of a one-time study (but based on the results of a continuous analysis of job offers, among others) entitled: “Employers needs in the Podlaskie Voivodeship in the field of support for lifelong learning in the shortage occupations”. For the purposes of this article, selected conclusions from the study are included below.

The Demand for Qualifications and Competences in Selected Sectors

The most important sectors in Podlaskie, Poland, which generate the highest demand for work, are:  
• Construction;  
• Machine Production;
• Metalwork Production;
• Woodwork Production;
• Production of Rubber and Plastic Products;
• Transportation;
• Food Processing;
• Gastronomy and Tourism;
• Health Care and Social Care;
• Trade.

In the next five years, the occupations for which there will be the greatest demand throughout the economy of the Podlaskie Voivodeship in the analysed sectors are: web page administrators, analysts, testers and operators of teleinformatics systems, car diagnosticians, digital graphic designers, internet salespersons, database designers and administrators, programmers, construction site managers, building supervision inspectors, construction engineers, mechanical engineers, bus drivers, production managers, excavation equipment operators and mechanics, doctors, nurses, midwives, paramedics, independent accountants, specialists in the organisation of production, freight forwarders and logisticians.

The deficit professions in particular sectors include (at the moment and in the future):

• In Construction: construction workers, bricklayers and plasterers, carpenters, cement workers and civil engineers;
• In Machine Production: welders, specialists in electronics, automation and robotics, machine tool operators, locksmiths, forwarders and logisticians, machinery and equipment mechanics, electromechanics and electromangers;
• In Metalwork Production: machine tool operators and welders;
• In Woodwork Production: machine tool operators, production managers, carpenters, quality staff and welders (see Figure 1);
• In the Production of Rubber and Plastic Products: machinery and equipment mechanics, storekeepers, welders and machine tool operators;
• In Transportation: truck and tractor drivers, forwarders and logisticians;
• In Food Processing: quality staff, specialists in production organisation, storekeepers and production managers;
• In Gastronomy and Tourism: cooks, waiters, bartenders, quality staff, chefs, receptionists, registrars and kitchen help;
• In Health Care and Social Care: nurses, midwives, specialist nurses, doctors, accounting and bookkeeping staff, psychologists and psychotherapists and administrative and office staff;

• In Trade: PR, advertising, marketing and sales specialist, cashiers and sales representatives.

The identified shortage and sought-after occupations, competences and qualifications are very diverse. Shortage occupations that are typical for a given sector can be distinguished, but there are a number of universal shortage occupations in various sectors (for an example, see Woodwork Production in Figure 1 below).

Figure 1: Deficit profession rankings in woodwork production in Podlaskie, Poland


It needs to be emphasised that the qualifications and competences that are significant with regard to innovation and competitiveness are similar among businesses in the key areas of the Podlaskie economy and especially concern the social and personal competences of candidates. Among social competenc-
es, employers most often seek the following: self-communication, communicativeness, customer service and teamwork (Figure 2).

**Figure 2: Current demand for social competences (N=5293)**

<table>
<thead>
<tr>
<th>Competence</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>openness</td>
<td>98</td>
</tr>
<tr>
<td>sharing knowledge and experience</td>
<td>172</td>
</tr>
<tr>
<td>assertiveness</td>
<td>194</td>
</tr>
<tr>
<td>negotiating</td>
<td>202</td>
</tr>
<tr>
<td>team building</td>
<td>293</td>
</tr>
<tr>
<td>teamwork</td>
<td>1890</td>
</tr>
<tr>
<td>customer service</td>
<td>1995</td>
</tr>
<tr>
<td>communicativeness</td>
<td>2137</td>
</tr>
<tr>
<td>self-communication</td>
<td>2488</td>
</tr>
</tbody>
</table>

Source: The Virtual Map of Professions and Qualifications (2018).

Among personal characteristics, employers most often seek the following: willingness to work, responsibility, conscientiousness, honesty, availability, goals, self-confidence, physical fitness, creativity and analytical thinking (Figure 3).

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1 According to a quantitative survey of job offers on the Internet carried out by the Voivodship Labour Office in Bialystok (VLO). The Virtual Map of the Occupations and Qualifications (an IT system dedicated to and designed by employees of VLO) examines over 123 variables that appear in job offers, including: data on the the name of the company, branches, sectors, territorial units, names and six-digit profession codes from the Classification of Occupations and Specialties, qualifications and competences whose terminology was taken from the Competence Research Tool used by vocational counselors in Poland, and working conditions, including wages.
Employers and experts confirm that nowadays, the willingness to learn is the most needed competence of all professional competences. The next is knowledge and experience in administration and documentation. Computer and Internet skills are also important (Figure 4).
Figure 4: The most needed professional competences of work candidates (N=9556)

Employers’ preferences regarding characteristics of candidates depend on the sector in which they operate. For example, technical competences and communication skills are the most important for woodwork production. Professional knowledge, independence, sharing knowledge and experiences as well as teamwork are also necessary. Technical skills and independence were found to be the two competences with the strongest relationship to one another. Professional skills go hand in hand with other professional skills, and independence is also combined with the ability to work in a team (see Figure 5).
**Figure 5: A network of connected competences: Woodwork Production**

![Network of Competences](image)


Over the next five years (2018-2022) the most in-demand qualifications in Podlaskie could be: technical skills, professional knowledge, foreign languages, strategic thinking, reliability and customer orientation. On the other hand, the following skills will have the smallest impact: co-operation within the company, managing each other, delegation and influence (Table 1).

**Table 1: Ranking competences and qualifications by demand in the next five years (2018-2022)**

<table>
<thead>
<tr>
<th>Competences</th>
<th>Average demand in the future</th>
<th>Demand in the future*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical skills</td>
<td>4.43</td>
<td>Very high</td>
</tr>
<tr>
<td>Professional knowledge</td>
<td>4.36</td>
<td>Very high</td>
</tr>
<tr>
<td>Knowledge of foreign languages</td>
<td>4.30</td>
<td>Very high</td>
</tr>
<tr>
<td>Strategic thinking</td>
<td>4.28</td>
<td>Very high</td>
</tr>
<tr>
<td>Thoroughness/reliability</td>
<td>4.26</td>
<td>Very high</td>
</tr>
<tr>
<td>Skill</td>
<td>Score</td>
<td>Rating</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-------</td>
<td>--------------</td>
</tr>
<tr>
<td>Customer orientation</td>
<td>4.26</td>
<td>Very high</td>
</tr>
<tr>
<td>Analytical thinking</td>
<td>4.25</td>
<td>Above average</td>
</tr>
<tr>
<td>Procedures: knowledge and application</td>
<td>4.23</td>
<td>Above average</td>
</tr>
<tr>
<td>Planning</td>
<td>4.17</td>
<td>Above average</td>
</tr>
<tr>
<td>Professional development/readiness to learn</td>
<td>4.15</td>
<td>Above average</td>
</tr>
<tr>
<td>Self-reliance</td>
<td>4.13</td>
<td>Above average</td>
</tr>
<tr>
<td>Team-building</td>
<td>4.12</td>
<td>Above average</td>
</tr>
<tr>
<td>Pursuit of results (entrepreneurship)</td>
<td>4.12</td>
<td>Above average</td>
</tr>
<tr>
<td>IT skills</td>
<td>4.11</td>
<td>Above average</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>4.10</td>
<td>Above average</td>
</tr>
<tr>
<td>Orientation in business</td>
<td>4.10</td>
<td>Above average</td>
</tr>
<tr>
<td>Teamwork/team collaboration</td>
<td>4.10</td>
<td>Above average</td>
</tr>
<tr>
<td>Communication</td>
<td>4.07</td>
<td>Above average</td>
</tr>
<tr>
<td>Innovation and flexibility</td>
<td>4.06</td>
<td>Above average</td>
</tr>
<tr>
<td>Negotiating</td>
<td>4.03</td>
<td>Below average</td>
</tr>
<tr>
<td>Administering/maintaining documentation</td>
<td>4.03</td>
<td>Below average</td>
</tr>
<tr>
<td>Building an effective organisation</td>
<td>4.02</td>
<td>Below average</td>
</tr>
<tr>
<td>Solving conflicts</td>
<td>4.01</td>
<td>Below average</td>
</tr>
<tr>
<td>Motivating</td>
<td>4.00</td>
<td>Below average</td>
</tr>
<tr>
<td>Process management</td>
<td>4.00</td>
<td>Below average</td>
</tr>
<tr>
<td>Decision-making</td>
<td>3.98</td>
<td>Below average</td>
</tr>
<tr>
<td>Team management</td>
<td>3.98</td>
<td>Below average</td>
</tr>
<tr>
<td>Sharing knowledge and experience</td>
<td>3.96</td>
<td>Below average</td>
</tr>
<tr>
<td>Building a relationship</td>
<td>3.93</td>
<td>Below average</td>
</tr>
<tr>
<td>Project management</td>
<td>3.91</td>
<td>Below average</td>
</tr>
<tr>
<td>Leadership</td>
<td>3.91</td>
<td>Below average</td>
</tr>
<tr>
<td>Identification with the company</td>
<td>3.88</td>
<td>Below average</td>
</tr>
<tr>
<td>Co-operation within the company</td>
<td>3.73</td>
<td>Very low</td>
</tr>
<tr>
<td>Managing others</td>
<td>3.72</td>
<td>Very low</td>
</tr>
<tr>
<td>Delegation</td>
<td>3.56</td>
<td>Very low</td>
</tr>
<tr>
<td>Influence</td>
<td>3.40</td>
<td>Very low</td>
</tr>
</tbody>
</table>

*According to the scale: very high, above average, below average, very low.


As a result of the improvement in the state of the Polish and regional labour market and the rise of the so-called “employee market”, the number of deficit professions is increasing. In effect, employers are unsuccessfully looking for suitable candidates for work. The permanent barriers that make it difficult to attract and retain employees are: low salaries in the Podlaskie Voivodeship
(the average gross salary in the enterprise sector in Podlaskie is about 4,083 PLN, or 954 EUR per month\textsuperscript{2}, while the Polish national average is 4,887 PLN or 1,141 EUR per month\textsuperscript{3}), the limited financial resources of the company, an unsatisfactory system of non-wage motivation, mental barriers (like a “loose approach to work”), “buying” employees, having no possibility of employee development, low levels of employee identification with the company, etc. as in the Figure 6.

**Figure 6: Barriers making it difficult to attract and retain employees (N=446)**

![Bar chart showing the percentage of each barrier]


\textsuperscript{2} According to the Statistical Office in Białystok, Poland: https://bialystok.stat.gov.pl/.

The main factor influencing shortages in the labour force in the Podlaskie Voivodeship (both currently and in the future) is the movement of qualified personnel out of the region, also known as brain drain. This is a result of factors such as the low attractiveness of the region for specialists and mismatches between the competences and qualifications of the labour force and those needed by firms (Figure 7).

**Figure 7: Current and future factors affecting the occupational deficit in the Podlaskie Voivodeship, Poland (N=446)**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Current Influence</th>
<th>Future Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industries characterised by low productivity</td>
<td>3.81%</td>
<td>7.62%</td>
</tr>
<tr>
<td>Low efficiency of technology transfer centres</td>
<td>5.38%</td>
<td>6.05%</td>
</tr>
<tr>
<td>Low funding for R &amp; D</td>
<td>5.83%</td>
<td>5.38%</td>
</tr>
<tr>
<td>Insufficient research and development potential</td>
<td>7.17%</td>
<td>8.52%</td>
</tr>
<tr>
<td>Low level of internationalisation of activities</td>
<td>8.97%</td>
<td>6.95%</td>
</tr>
<tr>
<td>Worsening condition of public finances</td>
<td>10.99%</td>
<td>10.09%</td>
</tr>
<tr>
<td>Divergent policy at the central and regional level</td>
<td>12.11%</td>
<td>11.43%</td>
</tr>
<tr>
<td>The relatively low levels of entrepreneurship</td>
<td>12.33%</td>
<td>14.13%</td>
</tr>
<tr>
<td>Underdeveloped cross-sector cooperation</td>
<td>13.00%</td>
<td>13.45%</td>
</tr>
<tr>
<td>Limited access to technology</td>
<td>13.68%</td>
<td>15.02%</td>
</tr>
<tr>
<td>Persistent low GDP per capita, low income level</td>
<td>14.13%</td>
<td>13.23%</td>
</tr>
<tr>
<td>Professional burnout syndrome</td>
<td>14.80%</td>
<td>31.61%</td>
</tr>
<tr>
<td>Negative demographic developments</td>
<td>15.02%</td>
<td>14.80%</td>
</tr>
<tr>
<td>Problems with enterprises implementing</td>
<td>15.25%</td>
<td>15.25%</td>
</tr>
<tr>
<td>Low investment attractiveness</td>
<td>16.59%</td>
<td>13.45%</td>
</tr>
<tr>
<td>Insufficient economic potential of the region</td>
<td>18.61%</td>
<td>16.82%</td>
</tr>
<tr>
<td>Lack of willingness to retraining</td>
<td>24.89%</td>
<td>29.60%</td>
</tr>
<tr>
<td>Mismatch betw. education and the lab. market</td>
<td>25.34%</td>
<td>19.06%</td>
</tr>
<tr>
<td>Lack of schools for deficit professions/directions</td>
<td>27.58%</td>
<td>26.46%</td>
</tr>
<tr>
<td>An aging labour force</td>
<td>36.77%</td>
<td>34.53%</td>
</tr>
<tr>
<td>Inadequate competences and qualifications</td>
<td>40.81%</td>
<td>34.98%</td>
</tr>
<tr>
<td>Low attractiveness of the region for specialists</td>
<td>48.88%</td>
<td>48.21%</td>
</tr>
<tr>
<td>The outflow of skilled employees from the region</td>
<td>57.17%</td>
<td>55.61%</td>
</tr>
</tbody>
</table>

Results of Other Surveys

Taking into consideration the Occupational Barometer⁴, which is a one-year forecast of the state of occupations in Poland, the deficits in occupational training (in specific professional skills, e.g. welding) and highly specialised personnel (specialists in the health and ICT industries) are getting deeper from year to year.

The Barometer is the next “good practice” in the field of practical competence and qualifications. It is a qualitative research method developed for each country individually. The Barometer is formed by experts who deliberate the state of each occupation. In their assessment, the experts use data on the number of vacancies and the people registered as unemployed in that particular occupation. They also take into account a number of internships in the vacancies in a discussed occupation. The experts, made up of local labour office staff and representatives of private employment agencies and other institutions that have knowledge about the local labour market provide answers to the following questions for each occupation:

- How is the demand for employees in this occupation going to change in the coming year? Is it going to grow or decrease? Or maybe it will remain unchanged?
- What is the relationship going to be between the labour force and the demand for employees in this occupation? Will there be a deficit or a surplus of job-seekers? Or will the supply and demand reach a balance?

What are the results of this forecast in 2018? Experts have identified twenty groups of deficit occupations in Podlaskie: automotive diagnosis technicians, bakers, chefs, confectioners, construction installation assemblers, construction joiners and carpenters, cooks, earthmoving plant operators and mechanics, electrical mechanics and electrical assemblers, hairdressers, handicraft workers in wood and joiners, independent accountants, metal working machine tool setters and operators, nurses and midwives, database designers and administrators and programmers, stock clerks, tailors and clothing manufacturers, toolmakers, truck drivers and welders (see Map 1).

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⁴ The Occupational Barometer divides jobs into three groups on the national, regional and local levels: deficit, balance and surplus.
Map 1: An example of the estimated balance between labour supply and demand for truck drivers in the transportation sector in Poland, 2018

Forecast for year: 2018, Poland
Estimated balance between labour supply and demand - truck drivers

A negative symptom within the regional labour market is the presence of surplus professions, including those arising from educational surpluses in previous years (due to the inefficiency of the education system). There are nine groups of surplus professions in 2018: economists, educational counsellors, farmers and animal producers, food and nutrition technology professionals, mechanical engineering technicians, public administration professionals, general subject teachers and textile machine operators (see Map 2).
Map 2: An example of the estimated balance between labour supply and demand for economists in finance and related sectors in Poland, 2018

Forecast for year: 2018, Poland
Estimated balance between labour supply and demand - economists

Interestingly, experts are very cautious about the demand for IT professions in the Podlaskie Voivodeship and not willing to make definite statements. Meanwhile, desk research analysis and individual interviews conducted with the representatives of this sector point to large staff shortages. Moreover, this deficit will deepen in the future, which is why a diagnosis of the lack of information is
especially important at this time. Currently, the most sought-after qualifications are:

- Digital security;
- Business networks;
- Large database analytics;
- Internet applications;
- Mobile technologies;
- Cloud computing;
- Change management in the organisation;
- Memory databases (e.g. InMemory);
- Integrated product-service strategies;
- Smart network technologies or modern interfaces (Novel Interfaces).

The authors of another report, The Harvey Nash/KPMG CIO Survey (2017), also argue that the most desirable ICT skills are: analytics of large data sets, business analysis and creating a business structure by making BPM (Business Process Management).

**Conclusions**

The methods presented here do not exhaust the possibilities for analysing the demand for work in the present or future. They instead present “good practices” that can be treated as a benchmark in the development of their own methods of analysing the state of the labour market. Undoubtedly, it is necessary to combine both quantitative and qualitative methods. The role of experts is important in the research process, as expert knowledge provides the context for the interpretation of metadata. From my point of view, broadened industry analyses in the area of desirable qualifications and competences are essential for creating informed labour market policy.

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Professional Qualification Mismatches in Preceding Occupations: Comparison of Persons Entering Unemployment in East and West Germany

Pierre-André Gericke and Alfons Schmid

Introduction

Qualification mismatches, i.e. discrepancies between the formal qualifications of an employed person and the qualifications required for the occupation they actually perform, have been at the forefront of international and domestic discussions for several years (cf. Quintini 2011, OECD 2011: 207ff., Cedefop 2010, Reichelt and Vicari 2014, a selective overview in Baden et al. 2013 as well as McGuinness et al. 2017). So far, qualification mismatches in the profession of origin, that is the most recently held occupation, have rarely been examined in relation to the beginning of unemployment. These can be different from the qualification mismatches experienced by employed people, for whom the discrepancies between the qualification and requirement levels impact the risk of becoming unemployed. Empirical research (Quintini 2011) as well as theoretical considerations (Gericke et al. 2016: 136ff.) suggest such a connection. In our initial approach we explored the qualification mismatches for selected occupations of origin (cf. Baden et al. 2013, Gericke et al. 2016: 136ff.). The results indicated that often considerable differences in over-qualification and under-qualification existed between the occupations of origin of newly unemployed people in Germany.

In this contribution, we study the differences in these occupational qualification mismatches by comparing East and West Germany. This research question arises from the insight that the labour markets for certain occupations have specific structures and ways of functioning that influence the nature and scope of qualification mismatches considerably. For example, when considering to what extent their qualification level determined an unemployed person’s ability to find work in their last phase of employment, we can see that both the nature and extent of qualification-appropriate employment depend on the last
occupation (Gericke et al. 2016: 136ff.). If this proposition is true, then the comparison of regions should display only small differences in inadequate employment in regard to the qualification level, since the structure and functioning of the respective occupational labour market determines over- and under-qualified employment to a large extent.

In the first comparison of four Federal States in West Germany, this proposition was largely confirmed (cf. Baden et al. 2013). However, there were some initial indications that this proposition was not true when comparing East and West Germany. Due to the differences in the partial labour markets arising from the differences in professional qualification and training (path dependency) and unique professional employment and labour market conditions in East and West, discrepancies in occupational qualification mismatches also existed for the same occupations.

Here, this initial proposition will be tested using several different occupations as examples. We study to what extent there are differences between East and West Germany in respect to over- and under-qualification in the original occupations of newly unemployed people. Answering this question is of scientific interest as it contributes to closing an existing research gap, but it also has practical implications, since the provision of (further) VET should at least to some extent take regional differences into account.

**Methodology**

The research into qualification mismatches experienced by newly unemployed persons focused on the ten occupations displaying the highest number of newly unemployed people in the period of study. To start with, we will shortly outline these qualification mismatches in Germany based on the statistics collected by the Federal Employment Agency¹. The official labour market statistics contain information on the qualification level of unemployed people as well as the required qualification level of their last occupation. For people who had been employed in the primary labour market before becoming unemployed, these data help to establish if their last occupation was of an adequate qualification level or if there was a qualification imbalance.

¹ In German: “Bundesagentur für Arbeit”.
The level of education required for the previous occupation is described according to the Classification of Occupations 2010 (KldB 2010). The required qualification level of an occupation is related to its complexity and takes on different forms: unskilled and semi-skilled occupations, specialist occupations, complex specialist occupations and highly complex occupations. Hence, the requirement level – referring to the level of qualifications required for an occupation – is related to the type of occupation. Table 1 describes the four requirement levels of the KldB 2010 in detail.

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2 In German: “Klassifikation der Brufe 2010” (KldB 2010). It was developed by the Federal Employment Agency and the Federal Statistical Office and maps the landscape of occupations in Germany. The KldB 2010 structures occupations principally by qualification level and requirement level (cf. Paulus et al. 2010). The KldB 2010 was included in the labour market statistics in 2011.
Table 1: Qualification and requirement levels of a profession according to KldB 2010

<table>
<thead>
<tr>
<th>Qualification level</th>
<th>Requirement level</th>
<th>Requirement level of an occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Helpers</strong>: helpers, civil servants in elementary service, year-long professional trainings</td>
<td>1</td>
<td><strong>Unskilled or semi-skilled activities</strong>: due to the limited complexity of activities, ordinarily no formal professional educational attainment is required. Only one year of regulated professional training is required.</td>
</tr>
<tr>
<td><strong>Specialists</strong>: specialists, middle-level civil servants</td>
<td>2</td>
<td><strong>Specialist activities</strong>: the requirement level is normally reached with a two- to three-year vocational training. Comparable to this is, for example, a professional qualification at a vocational school. Relevant professional experience and/or informal professional education and training are considered equivalent to formal education and training.</td>
</tr>
<tr>
<td><strong>Higher-level specialists</strong>: masters, technicians and others, commercial further trainings and others, upper-level civil servants, Bachelor courses</td>
<td>3</td>
<td><strong>Complex specialist activities</strong>: professions requiring professional education and training as master/technician or at a higher education institution are subsumed in this requirement level. This, for example, concerns qualifications from a professional or vocational academy, a degree from a technical college of the former German Democratic Republic as well as a Bachelor’s degree at a higher education institution. Often, relevant professional experience or informal professional training can be considered sufficient for performing an occupation.</td>
</tr>
<tr>
<td><strong>Experts</strong>: academic professions (minimum of four years), upper-level civil servants</td>
<td>4</td>
<td><strong>Highly complex activities</strong>: the typical professional educational requirement is a degree from a higher education institution (Master, Diploma, state examination or similar). In the case of some professions or occupations, a doctorate or habilitation could also be required.</td>
</tr>
</tbody>
</table>

Source: Classification of Occupations 2010 (KldB 2010).
The term “qualification level” refers to formal qualifications possessed by an individual. Qualification level is divided into three categories based on whether a person has a completed vocational education or training (either school-based or firm-based), acquired a degree from a university for applied sciences or a four-year university or has not received any professional training at all. In the following, professional qualification mismatches are identified by juxtaposing information on the formal requirement level for an occupation to the formal qualifications of employees. A qualification imbalance or qualification mismatch exists if an individual’s qualification level differs from the qualification level required for an occupation. If the qualification level of a person is higher than the occupation they perform, it is referred to as “over-qualification”; the opposite case is termed “under-qualification” (Cedefop 2010). The results of juxtaposing the qualification level and requirement level of an occupation can be summarised in three categories: the adequately employed, the over-qualified and the under-qualified (cf. Rohrbach-Schmidt 2010, Tiemann 2009, detailed account in Gericke et al. 2016).³

Results

We examined the data of all people who registered as unemployed between July 2010 and January 2012 in Germany and had been employed in the primary labour market before (excluding data concerning persons with a disability according to SGB III of the German legal code)⁴. The data used stem from a full census of a population of 172,248 people who were employed in jobs eligible for social security benefits and became unemployed within a given time frame. The data originate from the Federal Employment Agency, which supplies statistics based on administrative data collected by the labour administration.

³ Horizontal qualification mismatches, i.e. the missing content-subject related fit between qualifications and the requirement level of an occupation, are not considered here.

⁴ Social Security Code, in German: “Sozialgesetzbuch” (SGB). The SGB III includes benefits and measures for employment promotion. It is thus the basis for the work of the Federal Employment Agency and the employment agencies. The Social Code III also contains regulations on unemployment insurance.
In the following section, we first present the research results for the total mismatches before differentiating these insights based on age and sex. The focus is on the East-West comparison of mismatches for select occupations of origin.

Qualification Mismatches of Newly Unemployed People: Comparison of East and West Germany

Based on the definition of “fit” used here, 73.1% of newly unemployed people in Germany were adequately qualified for their occupation of origin in the observed time span. 14.4% were under-qualified for their last occupation (over-valued) and 12.5% were over-qualified (undervalued). The total qualification mismatch in previous employment was therefore 26.9% (Figure 2).

Figure 1: Qualification mismatches for newly unemployed people according to place of residence in Germany (differentiated between East and West Germany), 2010-2012

![Qualification mismatches chart]


Differences between East and West Germany are especially prevalent in the case of those who were previously under-qualified for their occupation: in West Germany, under-qualified employment was proportionately higher for newly unemployed people than it was in East Germany. Consequently, over-qualified employment was more frequent in the new federal states than in the old ones. This results from the labour market situation in East Germany, where
unemployment in the considered time period was almost double the unemployment rate in West Germany. Furthermore, the differences in the professional education and training systems in the former German Democratic Republic (GDR) and West Germany are likely to serve as explanatory factors.

Figure 2: Over- and under-qualification in East and West Germany according to the age and sex of newly unemployed people, 2010-2012

There are differences in the mismatches in East and West Germany based on age:

- In terms of under-qualification, there are scarcely any differences between age groups compared to West Germany, where those over 30 were considerably more likely to be under-qualified for employment in the occupation of origin. In contrast, in East Germany both age groups were proportionately less likely to be under-qualified for employment than in West Germany;

- In the case of over-qualification the exact opposite applies: in East Germany in particular, the over-30-year-olds were over-qualified for employment before becoming unemployed while there was no difference between these two age groups in West Germany.

There are also substantial differences in terms of sex:

- In East Germany, men as well as women were considerably less likely to be under-qualified for employment in the original profession than in West Germany; this applied to men in particular.

- Overall, in East Germany both sexes were proportionally more over-qualified before their entry into unemployment than in West Germany. Women especially displayed high rates of being over-qualified.

The research results so far confirm the initial proposition that there are differences in the qualification mismatches for newly unemployed people in the occupation of origin between East and West Germany. How these differences manifest themselves in occupations will be addressed in the next sub-section.

Professional Qualification Mismatches in West and East Germany

Somewhat significant differences in the amount of under-qualified employment in the occupation of origin can be observed when comparing East and West Germany. Except for wholesale and retail merchants, the share of under-qualified employment was significantly higher in all professions studied in West Germany. The differences in the mismatches at the level of occupations vary – at different levels – in both regional structures (i.e. in East and West Germany) in some cases considerably. In West Germany, over 42% of the motor vehicle drivers, but only 6.4% of the painters and varnishers were employed below their qualification level in the occupation of origin. In East Ger-

\(^5\) Unlike the other occupations, this occupation does not require professional training and will therefore not be considered in this interpretation.
many, the differences range from 29% in the case of entrepreneurs to 2.5% in the case of masons. In the case of over-qualified employment, fewer differences in the professional qualification mismatches in the profession of origin exist in both regional structures. In East Germany the mismatch in all considered occupations of origin is higher. However, with the exception of the painter/varnisher occupational group, the differences are small.

**Figure 3: Under- and over-qualification according to the occupation of origin of newly unemployed persons, 2010-2012**

Differences between occupations of origin persist, particularly in regard to un-
der-qualified employment, which can be attributed to the specific labour mar-
ket and employment conditions for certain professions in East Germany. The
reason for the limited share of people who were under-qualified for their last
employment relationship could be rooted in the state of the East German la-
bour market, which is characterised by a lower number of available jobs. Fur-
thermore, the East German qualification structure is quite specific as there are
relatively few people who have not completed professional or vocational train-
ing (cf. Lott 2010, for example). Moreover, during the transformation process,
professional qualifications from the former GDR could be adjusted to the new
labour market conditions to a varying extent. Given the high level of occupa-
tional specificity in the former GDR, access to the labour market should be less
affected by limited occupational mobility than by limited specificity (cf. Diwald
et al. 2002, for example).

Discussion
As a preliminary approximation, the research results confirm that there are
considerable differences in the qualification mismatches in the occupations of
origin between East and West Germany in the case of newly unemployed peo-
ple – particularly in regard to under-qualified employment. At first glance, this
seems to be the result of the different labour market conditions in East and
West Germany, as well as a result of the post-unification era (cf. Reichelt and
Vicari 2014). Less than a fifth of the respondents experienced professional ad-
vancement, while about a third of the workforce went through a professional
decline: “The differences cannot really be ascribed to formal qualification dif-
fferences, since the qualification level of employees was quite a bit higher in
the former German Democratic Republic than in West Germany” (Diewald et
al. 2002).

However, there are also differences in the occupational qualification mis-
matches among newly unemployed people within these two territorial units.
These differences also indicate that markets for occupations function different-
ly and vary in structure. At this point, we cannot answer how the initially listed
reasons – differences in professional qualifications, professional training (path
dependency), the different labour market and employment conditions for occupations in East and West Germany – explain these differences or if there are other factors that have an influence. This would require further research into the relationship between geographical dimensions and the structure and functioning of labour markets for professions.

References


Different Skills, Different Gaps: Measuring and Closing the Skills Gap

Dan Restuccia and Bledi Taska

Introduction

The term “skills gap” conjures up the image of one giant chasm, a sort of Grand Canyon between what employers need and what workers can provide. But that suggests that the skills gap is a single problem with a single cause and a single solution. In fact, the gaps around specific skills vary in their characteristics and, as a result, affect different corners of the job market in very different ways. Rather than one canyon, the gap is much more akin to a series of potholes, damaging some industries and avoided by others.

We approached the problem using an innovative new model to map both supply (using federal workforce statistics) and demand (based on job postings). With this approach, we are able to assess the worker shortfall at an occupational level, role by role. This provides a picture of which roles, industry by industry, have robust talent supply chains and which face gaps.

A role-based approach to understanding the skills gap is important as it allows training providers and policy-makers to direct resources into developing the specific skills industries need in order to build a successful workforce.

We find a lack of alignment between the skills employers need and the available talent in the workforce. In twelve of the 17 career areas we studied, demand for workers exceeded available supply, revealing a shortage of 4.4 million workers. Those job categories with associated shortages include health care (1,153,617), business and financial operations (985,214), office and administrative support (461,263), sales (388,857) and computers and mathematics (356,527).

In our research, we found that these different sectors are suffering from skills gaps for different reasons: some occupational fields, such as health care practitioners, computer and information scientists, and information security analysts
suffer from a shortage of trained workers. In other areas of the job market, hiring and training systems seem to be misaligned as employers raise the bar for hiring.

Another area of interest was a comparison of trends during and after the Great Recession. In 2016, there were 5% more openings than available workers, compared to 2012, in the midst of the recession, when there were 5% more available workers than openings. When looking at more detailed trends over the course of recovery from the recession, we find that many skilled occupations such as computer roles, engineers, and health care professionals had skill gaps consistently throughout this period. Middle-skill occupations such as administrative roles and maintenance/repair roles had a surplus of workers during the period of high unemployment, but now face shortages in the number of available workers relative to openings.

The findings in this paper reinforce a number of conclusions:

• A need for improved alignment between education and workforce systems and a rapidly changing labour market;
• A need for an expanded employer leadership role in those systems;
• A need for improved employer signalling, particularly around the changing competency and credentialing requirements for the fastest growing jobs that provide a living wage.

This paper concludes with recommendations for how to improve education and workforce system alignment, employer leadership, and employer signalling.

A New View of the Skills Gap

There are many who still challenge the existence of a skills gap. Surveys of employers routinely find that companies have difficulty finding skilled workers.¹ However, some economists argue that, if that were true, wages would be rising and employers would be investing more in training (Burtless 2014).

¹ See for example ManpowerGroup (2016) and U.S. Chamber of Commerce Foundation (2014).
In our research, we developed a supply/demand model that compares the number of open positions to the number of available workers in the field for each occupation. In this way, we can see which roles have skill gaps (demand exceeds supply), which are in equilibrium (demand matches supply) and which have a surplus of available talent (supply exceeds demand).

To measure demand, we use an econometric model, which starts with the total postings collected by Burning Glass Technologies for each occupation, and normalises them to equal the total number of national openings reported by the Bureau of Labor Statistics’ Job Openings and Labor Turnover Survey (JOLTS). Supply is measured based on the total number of workers separating from their job in JOLTS. We then estimate a turnover rate for each occupation based on data from the Census’s Current Population Survey (CPS). We determine the available number of workers by multiplying the churn rate by the total employment in each industry and occupation. Demand and supply are then compared to determine the ratio used as a summary statistic for each occupation.

With this approach, we can identify whether the supply of currently employed workers is greater, less, or roughly equal to the number of job openings posted, which sheds light on whether there is a skills gap for a particular occupation, and what the nature of the gap might be.

Of course, having more openings than workers is not always a negative and can yield certain advantages. Workers are able to change jobs and advance in their careers, unemployed workers can be rehired relatively quickly, and it is an indication that the economy is growing. Too many openings in relation to the available labour supply, however, is a sign that employers are having trouble filling positions, and that the pipeline for workers is falling behind demand.
Figure 1: Demand/supply ratio by occupation family


Our research shows that roles requiring highly skilled workers, such as health care practitioners, business and financial operations, computer and mathematics professionals and architecture and engineering roles, are the most undersupplied roles. In each case, there are at least 15% more openings than available workers in the market. For health care practitioners, the gap is even more severe, with 44% more openings than available workers. At the other end of the spectrum, the occupation groups with the largest supply of workers include construction and extraction, arts and design and food preparation. Each of these have at least 13% fewer openings than available workers.

From an education and training perspective, high-skill occupations, defined as those where at least 80% of online job postings for that position request a Bachelor’s degree or higher, have 25% more openings than available workers. Middle-skill occupations, such as welders, administrative assistants, and com-
puter support specialists, have 13% more openings than workers.² Low-skill occupations have the opposite problem: 7% fewer openings than available workers.

**Figure 2: Demand/supply ratio for high-, middle-, and low-skilled occupations**

![Demand/supply ratio chart]


**Evolution of the Skills Gap**

The skills gap is neither new nor static. In some cases, gaps exist but are closing, which is good news for employers. In others, the gap is widening. To measure these gaps, we constructed a skills gap model by occupation family, a group of related roles, for each of the last five years, 2012 through 2016.

Not surprisingly, the number of openings per worker has increased as the economy has improved. In fact, the ratio of supply and demand has flipped. In 2012, there were 5% fewer openings than available workers, whereas our model finds that in 2016 there were 5% more openings than workers. In nearly every occupational family, we have seen the market tightening, with an increase in the ratio between demand and supply.

The two occupation families where the demand/supply ratio has decreased are computers and mathematics and architecture and engineering, which each had

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² We define middle-skill roles here as those positions where the median wage is greater than $15.00, a living wage based on MIT’s living wage calculator, and at least 20% of positions are available to job-seekers with a sub-baccalaureate credential. Low-skill occupations are defined as those which pay less that $15.00 per hour and high-skill occupations are defined as those where at least 80% of job postings specifically request a Bachelor’s degree qualification.
sizeable gaps both during and following the recession, declining slightly over the course of the recovery. This is largely a function of supply starting to catch up with demand. Supply in computer and mathematics roles has risen 33% over the period, while demand has increased by 25%. For architecture and engineering roles, supply has risen by 22% compared to a 17% increase in demand.

How individual firms and industries have fared depends significantly on what kinds of occupations comprise their hiring. To better understand differences in the impact of supply and demand dynamics, we will examine the trends in the supply/demand ratios for groups of similar occupation families:

- A cross-cutting set of business occupations hired by nearly every type of firm;
- Engineering and manufacturing roles;
- Health care roles.

Cross-cutting Business Occupations

Four occupation families represent business-critical functions in nearly all companies: Business and Financial Operations, Sales and Related, Office and Administrative Support, and Computer and Mathematics. In these families, we find that the supply/demand dynamics form two clusters:

- Specialised roles with large gaps that were gapped during the recession and remain so today;
- More general roles, which have seen markets tighten during the recovery.

The specialised role cluster includes Business and Financial Operations and Computer and Mathematics (i.e. Information Technology). These two occupation families have the second- and third-largest gaps between available supply and demand on a percentage basis. In addition, their demand/supply ratio has not shifted during the recovery. The ratio for computer and mathematics roles was down slightly during the recovery, and the others have been flat.

This is likely in part because these, and other highly skilled roles, were less affected by the downturn and so the dynamics of employers looking for additional skilled labour have remained fairly steady. While demand has increased, available supply has increased as well.
Employers have seen the market for office and administrative support workers and sales workers tighten as the economy has improved. In 2012, each of these occupation groups was oversupplied, with roughly 5% fewer openings than workers. In 2016, each group had 5% more openings than workers. These roles show a tightening market for employers seeking middle-skill workers.

**Figure 4: Demand and supply of business occupations over time**

![Graph showing demand and supply trends for business occupations](https://doi.org/10.978.395710/3154)


**Engineering and Manufacturing Occupations**

In engineering, manufacturing and other skilled trade occupations, we see that occupations requiring more advanced training have gaps that have endured the recession, while markets for middle-skill jobs have tightened. Engineers show 15% more openings than available workers. As with information technology workers, that gap has slightly declined since 2012 (by 4%).

Installation and repair workers, a middle-skill occupation group, have seen a notable shift. In 2012, there was a 14% surplus of workers in this field, which has been absorbed and has become a 2% opening shortage.

Though our data suggests otherwise, manufacturing employers consistently cite a deep shortage of production workers with the skills and qualifications...
they need (Accenture 2014). A likely explanation for the discrepancy between our model, which shows a modest shortage, and the experience of employers is that the skills requirements in the industry are changing, making many available workers under-qualified for currently available jobs. This indicates a genuine skills gap, a misalignment between the skills possessed by workers and the skills needed by employers.

Figure 5: Demand and supply of engineering, manufacturing over time

Health Care Occupations

Health care occupations show large and growing gaps between employer needs and available workers. The Bureau of Labor Statistics divides the health care category into practitioner roles (such as doctors, nurses, and technicians) and support professionals (such as medical assistants and home health aides). In both cases, we see skills gaps where employers do not have enough available workers to address their needs. This is particularly true among higher-skill practitioner roles where openings exceed available workers by more than 40%. This is by far the most dramatically expanding skills gap in our research.
The Causes of the Skills Gap

There are several possible causes of the skills gaps that we see across different occupations:

- **Supply shortage**: there are not enough workers with the appropriate background to fill positions in a given field or occupation;
- **Misalignment of hiring and training systems**: employers may not have configured their hiring and training systems in a way that acquires and develops the talent they need.

Supply Shortages

A skills gap usually presumes a lack of higher-order skills. Shortages of workers, however, can strike high-, middle-, or low-skill occupations. The reasons for those shortages may be quite different. In high-skill occupations, a skills gap can be caused by training programmes that do not produce enough qualified workers. Essentially, this is a problem with the supply pipeline and would need to be addressed by training programmes.
In low- and middle-skill occupations, by contrast, a worker shortage may be caused by a lack of workers willing to choose these roles. Workers commonly cite reasons such as relatively low pay and benefits.

Occupations facing supply shortages include:

- **Health Care Practitioners**: this is the most severe shortage we identified, with nearly 1.5 openings for every available worker across this occupational family. Importantly, the shortages are particularly high among rapidly growing, advanced practice clinical care roles, such as nurse practitioners, physician’s assistants, physical therapists and occupational therapists. Each of these roles has more than 1.7 openings for every potential worker.

Put another way, the 1.5 ratio means there are 1.04 million health care jobs going unfilled because of a lack of qualified workers. In the fields with the highest ratios of openings to workers, that means the field is short by more than 52,000 physical therapists, more than 43,000 nurse practitioners, 24,000 occupational therapists and 23,000 physician’s assistants.

Also troubling is the fact that clinical health care roles require long training periods – often graduate study – and that demand is projected to increase. The Bureau of Labor Statistics projects that need for nurse practitioners, physician’s assistants, and physical therapists is projected to grow by at least 25% over the next ten years (U.S. Bureau of Labor Statistics 2018). Growth in these fields is projected to rise three to five times faster than the job market overall, placing these occupations in the top 3% of all jobs in terms of projected growth.

Licensure requirements for workers, accreditation rules, and new programme approval processes for training providers impact the rate at which universities are able to expand programmes for advanced health care roles.
Chart 6: Rapidly growing health care roles, ten-year projections


- **Computer and Information Scientists**: as recently as 2012, computer scientists showed no gap at all as an occupation, but now we see a gap of 1.2 openings for every worker. That is the largest change of any technology occupation over time.

  The reason for the shift is the explosion in Big Data analytics and the growing demand for data scientists (which the Bureau of Labor Statistics includes under the occupation computer scientist).

  In 2012, there were just 1,061 online postings for data scientists. By 2016, that number grew 14-fold to 14,653. The supply of data scientists has not been able to keep up. In other research, we identified data analytics as a “disruptive skill” that shakes up job markets because of its crucial nature to business success, sourcing challenges, and the lack of an established training system (Burning Glass Technologies 2017).

- **Hybrid occupations, including Information Security Analysts**: security breaches have left business sectors from retail to finance scrambling for cybersecurity talent over the last few years (Burning Glass Technologies 2015a). The ratio between openings and workers is 1.5, comparable to the health care industry gap. Also like health care, more specialised roles within the industry have larger gaps.

  Interestingly, the skills gap for an information security analyst is much more severe than for a network administrator (1.1 openings/worker), even though the latter requires many similar skills. Employers who are able to train network administrators with cybersecurity skills can take advantage of the overlap between the two roles and address talent shortages more easily.
One additional factor in the information security field is the growth of “hybrid jobs”, roles that blend skills from different domains (Burning Glass Technologies 2015b). Information security roles often blend skills from a range of disciplines including information technology, risk management, business and business analysis. Training designed for a hybrid job may be hard to come by because, by their very nature, hybrid jobs do not tend to align with existing training programmes – computer science programmes do not teach business skills, and vice versa.

For example, operations research analysts need both information technology skills and business analysis skills. Because of this overlap requiring multiple training paths, the skills gap for this role is larger (1.5 workers per job) than for the similar roles which blend to create the position: computer systems analysts have a ratio of 1.2 workers per job, and management analysts a ratio of 1.3 workers per job.

- **Low- and middle-skill occupations**: a supply shortage also exists for many important and growing low- and middle-skill occupations. Truck drivers, personal care aides, and customer service representatives all have high ratios of openings to available workers.

There are certainly opportunities in these fields. Demand for both personal care aides and customer service representatives is projected to grow rapidly over the next ten years (24% and 10%, respectively). The problem is that these jobs are not that attractive, with relatively low pay and often challenging working conditions.

**Misaligned Hiring and Training**

Hiring is still more art than science, and as a result many employers miss the mark in terms of finding the employees and skills they need. Often, employers have difficulty articulating their needs to training providers, with the consequent risk that the programme will not properly prepare workers. Occupations in this category include:

- **Office and administrative support**: office and administrative support roles have gone from having too many workers per opening to too few over the last five years. The ratio has swung from 0.95 openings per worker in 2012 to 1.05 in 2016. Or, put another way, in 2012 there were 375,933 more Office and Administrative Support workers than there were posted openings, compared to 427,736 more openings than workers in 2016.

This is partly because of the Great Recession and its impact on hiring. Another factor, however, is that employers have been raising the bar for
these roles. Formerly middle-skill positions, these roles now commonly require a Bachelor’s degree. In some cases, this is driven by increasing skills requirements for a role, whereas in others it may be that hiring managers are raising standards to bring on more credentialed candidates during a slack labour market.

In addition, employers may also be using the Bachelor’s degree as a proxy for soft skills. These skills – communication, collaboration, time management, and so on – are crucial in administrative roles, and employers often complain about how difficult they are to find among high school graduates.

By requiring a Bachelor’s degree, the available talent pool for these roles is decreased. For example, 37% of job postings for book-keepers ask for a Bachelor’s degree, compared to 19% of current book-keepers who have one. In our analysis, there are 1.05 openings per worker, or 29,748 unfilled openings for that role. For human resources assistants, there is an 8% gap (37%/29%) and an imbalance of 1.12 workers per opening, or 6,629 unfilled openings. Research also suggests that increasing credential requirements for hiring is a “sticky” decision: once raised, the bar tends to stay raised (Deming and Kahn 2018).

**Management**: overall, management roles have larger skills gaps than those of the people they manage. Management and supervisory roles have 1.3 openings per worker versus 1.02 for all roles. This is true across nearly all occupation families, with the exceptions of Information Technology and Transportation. Information technology workers, for example, are often highly specialised, so technical skills gaps are more likely to be a problem than skills gaps for cross-cutting management experience. By contrast, as noted above, there are supply shortages for truck drivers because of the nature of the work.

In making this calculation, we assume that employers want to hire managers with prior experience in the field. While there are particular skills unique to management, managers are not infinitely transferrable. You cannot turn an information technology manager into a nursing supervisor.

**Recommendations**

This analysis highlights skills shortages facing employers amidst a tightening labour market. These gaps are especially pronounced in many business-critical and high-skill roles.
But addressing skills gaps at a national scale is neither a small nor simple problem. Resolving skills gaps requires systemic effort from three primary actors in the workforce system: training providers, employers and policy-makers.

**Improved Access to and Outcomes from Post-Secondary Education and Training Providers**

The data included in this paper help to reinforce the case that there is a need for improved access to post-secondary education, training, and credentialing opportunities. We do not suggest that everyone needs a four-year degree, but it is clear that the most in-demand jobs require some form of post-secondary education or training. In occupations that typically require a Bachelor’s degree, there are 25% more openings than available workers. In our new economy, fewer jobs providing family-sustaining wages will be going to those with a high school diploma or less, and employers are expressing the need for more highly skilled workers today.

We need better alignment between the changing workforce needs of the economy and our education and workforce systems. There are opportunities to build and reinforce alignment in the higher education and K-12 systems with the reauthorisation of the Higher Education Act and the Carl D. Perkins Career and Technical Education Act. Alignment should include a focus on supporting those programmes that are closely linked to labour market demand as well as programmes that deliver good outcomes in terms of jobs and wages.

**Increased Connection Between Employers and Higher Education**

Employers too will need to play an expanded leadership role in education and workforce training systems to ensure alignment between what people learn and the career opportunities available in the new economy. This means that employers must not serve merely as advisors, but must play a more significant role as customers of the education and training systems to ensure their demand for a skilled and competitive workforce is met.

For example, we find that employers struggle to hire workers with the requisite management skills. This problem will get worse in the coming years as the baby boomer generation retires. Management skills are often best developed through a combination of on-the-job training, which employers can best pro-
vide, along with more structured training through formal providers in higher education. Indeed, employers are in the best position to identify potential managers who can benefit from formal training. Deepening the connection between employers and higher education will allow both employers and higher education to play to their strengths in building a talent supply chain for managers.

The U.S. Chamber of Commerce Foundation’s (USCCF) Talent Pipeline Management (TPM) initiative is an example of how employers are changing the way they partner with education and training providers to close the skills gap for their most critical positions.3 As part of the TPM strategy, employers play an expanded leadership role as “end-customers” of flexible and responsive talent supply chain partnerships with preferred education and training providers.

Through the newly launched TPM Academy, USCCF is training business associations and employers on how to implement performance-based, talent supply chain solutions in communities across America.

Improved Signalling by Employers about Labour Market Needs

If supply is going to keep up with demand in a rapidly changing labour market, employers need to more effectively signal the competencies, skills and credentialing requirements for their most critical positions. In this economy, job descriptions will continue to undergo change, and the change will be more frequent, requiring clearer and more granular signals about employer hiring requirements that connect to their talent acquisition and hiring process.

As the job market changes and skill requirements evolve, employers can play a proactive role in signalling their needs to workers and the training providers who support them. For example, we find skill gaps in hybrid jobs, roles which combine disparate skills and for which few degree programmes exist. Employers are likely to see hybrid trends emerging before other stakeholders and are best positioned to flag these needs. Data scientists and cybersecurity analysts are two examples of hybrid roles highlighted in our analysis. As the workforce continues to evolve and specialise, the need for strong signalling about emerging jobs and skills becomes ever more critical.

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3 To learn more about the TPM movement visit www.TheTalentSupplyChain.org.
More than an employer engagement challenge, better employer signalling around changing job needs will require a technology solution. USCCF is organis- ing a pilot demonstration of a new job registry service that will help employers send faster, clearer, more dynamic signals about their changing job require- ments. This will be done through leveraging advances made in linked data and open human resource data standards for describing competencies, skills, and credentialing requirements. With employers providing structured, linked data around their hiring needs, education and training systems will have more granular, real-time, and actionable data to align their curriculum and credentials to improve workforce transitions.

Conclusion

In this paper, we have studied the extent of the skills gap using five years’ worth of data on 17 career areas. Using Burning Glass Technologies, JOLTS and CPS data to estimate demand and supply, we have examined the trajectories of the occupational-level gaps during and after the Great Recession. Labour market outcomes, we have found, differ greatly across the education and training dimension of workers: high-skill occupations, which typically require a Bachelor’s degree or higher, have 25% more openings than available workers, middle-skill occupations have on average 13% more openings than workers, and low-skilled occupations, on the contrary, have 7% fewer openings than available workers. After outlining the possible causes of the skills gaps, we have presented the main challenges faced by training providers, employers, and policy-makers and made a series of recommendations to deal with skills shortages amidst a tightening labour market.

With 4.4 million jobs unfilled because of unavailable talent, even as workforce participation remains stubbornly low, the skills gap is increasingly costly for employers and workers alike. Yet a crucial lesson of this research is that the skills gap is not singular; it is cumulative – the result of different gaps across different kinds of occupations. That is part of why addressing the skills gap has proven so elusive: it defies easy categorisation. As we have shown, these mis-

4 To learn more about the Clearer Signals project visit https://www.uschamberfoundation.org/blog/post/reinventing-employer-signaling-rapidly-changing-talent-marketplace.
matches affect different corners of the market in different ways based on a range of root causes. By charting the landscape of supply/demand imbalances more comprehensively, we hope that this paper will contribute to efforts to build a more effective labour market, highlighting both where and how solutions can be deployed.

References


## Appendix

### Table 1: Demand and Supply Ratio and Surplus Job Openings by Occupation Family

<table>
<thead>
<tr>
<th>Occupation family</th>
<th>Demand/supply ratio</th>
<th>Surplus Job Openings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Care Practitioners</td>
<td>1.44</td>
<td>1,153,617</td>
</tr>
<tr>
<td>Business and Financial Operations</td>
<td>1.21</td>
<td>985,214</td>
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<tr>
<td>Computer and Mathematics</td>
<td>1.17</td>
<td>356,527</td>
</tr>
<tr>
<td>Architecture and Engineering</td>
<td>1.15</td>
<td>151,976</td>
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<tr>
<td>Transportation and Material Moving</td>
<td>1.13</td>
<td>558,339</td>
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<tr>
<td>Health Care Support</td>
<td>1.09</td>
<td>133,217</td>
</tr>
<tr>
<td>Building and Grounds Cleaning and Maintenance</td>
<td>1.09</td>
<td>176,978</td>
</tr>
<tr>
<td>Sales</td>
<td>1.05</td>
<td>388,857</td>
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<tr>
<td>Farming, Fishing, and Forestry</td>
<td>1.05</td>
<td>3,541</td>
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<tr>
<td>Office and Administrative Support</td>
<td>1.05</td>
<td>461,263</td>
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<tr>
<td>Life, Physical, and Social Science</td>
<td>1.05</td>
<td>22,229</td>
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<tr>
<td>Installation, Maintenance, and Repair</td>
<td>1.02</td>
<td>34,063</td>
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<tr>
<td>Personal Care</td>
<td>1.00</td>
<td>-1,249</td>
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<tr>
<td>Production</td>
<td>0.97</td>
<td>-108,282</td>
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<tr>
<td>Food Preparation and Service</td>
<td>0.87</td>
<td>-1,238,927</td>
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<tr>
<td>Arts, Design, Entertainment, Sports, and Media</td>
<td>0.83</td>
<td>-181,036</td>
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<tr>
<td>Construction and Extraction</td>
<td>0.80</td>
<td>-630,576</td>
</tr>
<tr>
<td>Overall Job-market</td>
<td>1.05</td>
<td>--</td>
</tr>
</tbody>
</table>

## Table 2: Demand/supply ratio by occupation family and year

<table>
<thead>
<tr>
<th>Occupation Family</th>
<th>Demand/supply ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Care Practitioners</td>
<td>1.23</td>
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<tr>
<td>Business and Financial Operations</td>
<td>1.19</td>
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<tr>
<td>Computer and Mathematics</td>
<td>1.25</td>
</tr>
<tr>
<td>Architecture and Engineering</td>
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<tr>
<td>Transportation and Material Moving</td>
<td>0.98</td>
</tr>
<tr>
<td>Health Care Support</td>
<td>1.04</td>
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<tr>
<td>Building and Grounds Cleaning and Maintenance</td>
<td>0.97</td>
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<tr>
<td>Sales</td>
<td>0.95</td>
</tr>
<tr>
<td>Farming, Fishing, and Forestry</td>
<td>1.07</td>
</tr>
<tr>
<td>Office and Administrative Support</td>
<td>0.96</td>
</tr>
<tr>
<td>Life, Physical, and Social Science</td>
<td>0.98</td>
</tr>
<tr>
<td>Installation, Maintenance, and Repair</td>
<td>0.86</td>
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<td>Personal Care</td>
<td>0.93</td>
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<tr>
<td>Production</td>
<td>0.93</td>
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<td>Food Preparation and Service</td>
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<tr>
<td>Arts, Design, Entertainment, Sports, and Media</td>
<td>0.79</td>
</tr>
<tr>
<td>Construction and Extraction</td>
<td>0.54</td>
</tr>
<tr>
<td>Overall Job-market</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Analysing Demand-oriented Skills in the Commercial Sector: The Swiss Case

Moreno Baruffini

Introduction

The commercial sector in Switzerland deserves particular attention as it employs many professional profiles that continuously struggle to find space in the labour market. There are many possible causes for this, such as the excessive number of students enrolled in commercial schools, the changing needs of companies, and the disappearance of specific tasks, to name a few. How can we forecast the future needs of organisations? Which professions will change? Which will disappear? It is difficult to predict the future, but it is crucial to try to ride this change without remaining passive. Technology evolves faster than training does (or reasonably could), which, much like other areas of preparation and activities, requires continuous updating. For this reason, student preparation aimed at continued development is one possible method of managing contingent phenomena and, even more, structural change. It is therefore necessary to invest in not only disciplinary, but also relational, attitudinal, and personal skills.

This paper presents a case study on the analysis of demand-oriented skills using a recent experience held in Ticino. It aimed to examine skills shortages and propose solutions for facing the incoming “digital transformation” in the commercial sector. To start with, preliminary challenges identified by federal and cantonal stakeholders are outlined. In the next step, the activities of the Working Group looking for the best implementable solutions at the regional level are systematically described. Finally, some preliminary results of the Working Group are presented, which urged for a progressive, but effective change in the combined system composed of the “education” and “production” sectors. We also provide some preliminary results for a skills measurement activity currently under development, using an automatic tool and a web-scraper.
The Starting Point: A Changing Labour Market and a Working Table

To further the broader discussion on “Digitalisation” and “Skills Development” at the Swiss level\(^1\), a Working Group was created in Ticino\(^2\) to analyse challenges and look for solutions. A first meeting was held in June 2017 to discuss the needs of educational institutions. The Working Group promoters were presented and approved, the contributions and expectations of the participants were explained and, finally, the methodology was defined and the activities were planned. Different workshops and meetings were set up to find concrete solutions. The meeting featured active participation, ensuring an open structure, and promoted various seminars and activities in order to create a broad vision of the problem.

Some initial comments were related to awareness of the fact that in order to understand the needs of companies, it will be important to have a dialogue with them. Technology evolves faster than training does or reasonably could, which, much like other areas of training and activities, requires continuous updating. The group agreed to not focus too much on the current (contingent) needs of companies that will change again in a short time. Student preparation for continuous change is a possible method for managing contingent phenomena and, even more, structural changes. It is therefore necessary to invest in not only disciplinary, but also relational, attitudinal and personal skills. This tendency is also highlighted by those working in the field of human resources who emphasise that flexibility increasingly becomes a central element for the selection and choice of personnel, for example.

Preliminary challenges were also previously identified and discussed and are summarised below.

\(^\text{1}\) As an example, the Swiss Academies of Arts and Sciences have launched the initiative #digitale21 to promote an equitable dialogue between public and private stakeholders from areas such as science, education and economy and to work together to find solutions to ease the transition towards digitalisation for the Swiss people.

\(^\text{2}\) The Table was promoted by SIC Ticino, its Director Nicola Giambonini, and the Cantonal School of Commerce. The project involves public institutions (DFE and DECS), the corporate and entrepreneurial world (CC-Ti, SBT, HR Ticino), as well as the academic sector (USI and SUPSI).
New Needs and Challenges

The training system requires continuous updating to adapt to changes in the society and economy. For this purpose, identifying some concrete paths is fundamental. One of these consists of anticipating technological evolution and then intervening in training, not only in terms of contents, but also in terms of teaching methods. Training plans are usually given by the confederation authorities, but to be optimally implemented and adapted, it is essential that the school has an active connection to the world of work. This Working Group was intended as part of this track, integrating with and asking for support from all stakeholders in the commercial sector. Some preliminary results were provided by the Hochschule für Wirtschaft Zürich (HWZ), which carried out an exploratory study on the consequences of digitisation for the professional profiles of the commercial professions. The authors of the study, Professor Sybille Sachs, Director of the Institute for Strategic Management of the HWZ, and Professor Peter Pertin, Rector of the HWZ, highlight that a “strategic approach” is a key skill for the future. New specialists, such as digital managers, are emerging, but there is still a large amount of uncertainty for future developments.³

A Complex Training System in Switzerland

The Swiss training system is very complex because students have access to many different types of schools (Figure 1). New training paths are being created, such as training for hotel client communication. For these new routes, the entry criteria are high. This increase in the skills required is observed throughout the formation of the commercial sector. From this starting point, other questions arise concerning possible difficulties that students might have. Some programmes have federal recognition and are therefore more rigid, making difficult to change paths.

³ An interview with the authors is accessible here: https://youtu.be/CJS5y_CIMgl (German language, last accessed April 2018).
Figure 1: The Swiss education system

The Swiss Vocational and Professional Education and Training (VPET) system enables young people to enter the labour market. It has a high labour market relevance and is an integral part of the education system. The VPET system is divided into two sectors: upper-secondary level vocational education and training (VET) and tertiary-level professional education.

The Structural Difficulties of the Commercial Employee

This sector deserves particular attention, as it is the only one involving qualified professionals who continually struggle to find space in the world of work. There are many possible causes such as the excessive number of young people who follow this professional path, competition with cross-border commuters, the new needs of companies that are arising, and the disappearance of specific tasks, to name a few. It is therefore vital to have different stakeholders in order to have a broad vision of the problem and look for the best implementable solutions.
What About the Future?

How can we forecast the future needs of companies? Which professions will change? Which will disappear? It is difficult to predict the future, but it is crucial to try to ride this change without remaining passive. The Working Group was created according to this conviction.

The Initial Workshop

The initial workshop aimed to work with participants to bring out the strengths and weaknesses of the current “ecosystem” of the professions in commerce. The members of the Working Group were divided into two groups, and one worked at the “Table of Strengths” while the other worked at the “Table of Weaknesses”. Using coloured post-its and panels for the posting to make the activity interactive, each group used its table to express what had been identified and discussed. The groups then switched, and continued to work further on what had already been done by their colleagues. This exchange allowed them to add other strengths or weaknesses that had not yet been identified. They then moved to a voting phase with the aim of selecting the strengths and weaknesses considered the most important, or the “priorities”, using “sticking dots”.

The workshop ended with a plenary discussion to deepen and share some aspects that emerged.
### Table 1: Expectations identified by the Working Group promoted by SIC Ticino in 2017 (by main themes)

<table>
<thead>
<tr>
<th>Current ecosystem</th>
<th>Skills</th>
<th>Mega-trends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concreteness/to respond to a need in the society as a whole/consistency between different needs setting concrete priorities/concrete measures to be proposed to the actors involved</td>
<td>Social cohesion and computer literacy</td>
<td>Opening to trends and internationalisation/understanding the changes, professional profiles and skills of the future (including soft skills)</td>
</tr>
<tr>
<td>Simplification – comparisons</td>
<td>To identify the needs of companies</td>
<td>Reflections on continued education</td>
</tr>
<tr>
<td>Understanding to act</td>
<td>To review the training offer</td>
<td>Possible upgrades/improvements</td>
</tr>
<tr>
<td>To optimise what already exists</td>
<td>Attract resources from the territory in the field of training</td>
<td>To know opportunities for companies</td>
</tr>
<tr>
<td>Understanding the increase in youth discomfort</td>
<td>Sharing of practical cases of digitisation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To clarify the link “school-work”</td>
<td></td>
</tr>
</tbody>
</table>


Results show that the integration of training into the world of work is the most recognised strength of the current ecosystem of the commercial profession in Switzerland. Nevertheless, the participants also emphasised how communication between the world of education and the world of work is not always optimal for different reasons, not least the fact that not all teachers are, or even could be, in regular contact with companies. There are also some technical and competence differences due to the very specialised training of certain teachers. A level of communication that is not always optimal also prevents the precise identification of training needs. It is still not easy to derive them from the professional needs that are expressed, but not always well-defined by employers. The business structure has developed in recent years along with techno-
logical developments and the consequent change in the importance of certain skills (especially considering “soft skills”). This development, combined with the complex system of commercial professions and the 21 branches of activities it involves, means that the uncertainty about future needs is likely to increase. Considering this, the a-synchronism between the development of the economic world and the development of training is likely to increase, which will not help the adjustment between labour supply and demand.

The survey also reveals how the proximity between training paths and the world of work is a determining factor for functional integration in the working environment. This proximity is already promoted on several levels and through individual educational models, such as experiential learning through classroom simulations, but also by focusing on some “soft” cross-referring skills. Another point in favour of the current ecosystem of commercial professions is the potential for innovation and experimentation, allowing the system to adapt continuously. This is made possible, among other things, by the presence of functional and modern infrastructures. Continuous adaptation is also supported by constant training, which is increasingly developed both for specialist skills and for more personal, interpersonal and transversal skills. Among the criticalities mentioned above, there is one that deserves particular attention, that is especially related to language skills, primarily German. According to the workshop participants, these skills must be improved and linked to the motivation behind the choice of commercial training. It has to be taken into account that often this choice is a makeshift choice, since learning another language requires an adjunctive effort, which goes beyond a basic training.

The group discussion also touched on the worrying decrease in apprenticeships available in companies. The schools compensate for the lacking opportunities for practical training through the greater use of educational models, such as learning by simulation. By its nature, this model has limitations that do not allow students to obtain the same benefits or effects as they would in a real practice activity. A strategic preference for companies to invest in internal training was also identified during the discussion as a way to bridge the gap in knowledge between the required skills and the skills profiles leaving schools. For efficiency reasons, companies prefer targeted and specific training to their needs. These trends further widen the gap between schools and companies. In this regard, the group also discussed the differences between professional
teachers and part-time teachers, who are in constant contact with the market. The discussion then moved to the degree of autonomy of teachers in the choice of content and training programmes. However, the Working Group wanted to underline that the commercial training in question is a “basic” exercise that trains children up to the age of 18 who will eventually enter very different sectors. Against this background, we need to be aware of the risks involved in excessive sectoralisation and specialisation of training.

Last but not least, the plenary discussion also touched on the theme of the general power that new technologies, particularly digital ones, can have not only in training, but also in production processes that are especially helpful for people with motor deficits or another difficulty.

At this first meeting, the Working Group was given an overview and some useful data and information concerning the current ecosystem of trade and sales. Thanks to the workshop activity, various forces and criticalities of the current system emerged. This first phase of analysis of the current situation serves as the crucial basis needed for proceeding with the exploration and analysis of future scenarios and, finally, for defining a concrete, targeted action plan.

**A Discussion and Analysis Activity**

In the first part of the Working Group activity, the participants expressed their satisfaction with what had emerged so far. The results underlined some important aspects and issues that the members of the workshop would like to see established through concrete actions and measures. The problem concerning the distance between schools and companies was discussed in particular. The high amount of rapid changes taking place make it essential to update training and greater dialogue with companies. In response to this problem, the group discussed the possibility of reintroducing so-called “company contamination” programmes that allow teachers to update trainers on company news. There was also discussion of the importance of keeping professional teachers in contact with the company and their integration into the qualification programmes, without forgetting the most important goal of teaching, which is to optimise the transmission of knowledge to students.
The Working Group also considered the current flexibility of the training programmes and the currently available margins of manoeuvrability. This first part of the workshop ended with an exciting discussion about the transmission of so-called “soft skills”. The participants believe that teaching these increasingly important competencies should not be left to the initiative of the most enterprising teachers, but must instead be inserted into the curriculum in a more structured way, guaranteeing all children the possibility of developing these skills.

The activity ended with a discussion on some critical issues that emerged during the analysis. Among these was the role of the teacher, which, in the future, could also change in important ways. On the Web, there are many educational offerings and even many basics in every field and discipline and at every level of training. The quality of this information, also very much linked to the quality and veracity of the sources, is already a theme that will become increasingly relevant. From this point of view, the role of the teacher could eventually have more to do with coaching or the selection of notions and information and less to do with being a dispenser of this information.

Considering the significant changes taking place, reading these trends and capturing the signals in order to address them will be crucial as a way of reducing the impact of critical issues and seizing the opportunities at the best possible moment. To better face these changes, it is not enough to only observe them; it is also important to act, experience change and experiment. This will allow students entering in the labour market to be attentive and critical protagonists of change rather than passive actors being affected by it.

The First Empirical Application: The Web-scraper Cecilie

Web scraping is becoming more and more popular for analysing the labour market. “A web scraper accesses web pages, finds specified data elements on the page, extracts them, transforms them if necessary, and finally saves these data as a structured data set. This process essentially mimics how a web browser operates by accessing web pages and saving them to a computer’s hard drive cache” (Boeing and Waddell 2016). Nowadays, many public offices in the Ticino region are interested in the topic, but there are only a few active
projects at this point. As an example, the City of Lugano is using data on traffic along with data concerning heart diseases to decide where to place public defibrillators.

Starting from this premise, The Observatory for Economic Dynamics [O-De]⁴ started a pilot project concerning the monitoring of the labour market and the skills offered. One of the first activities was related to analysing job offers for commercial employees that were posted on some local internet sites. The methodology used was quantitative and based on the use of a web-scraper⁵. As previously defined, this type of software is an Internet bot that systematically browses the World Wide Web and retrieves information from selected Internet sites. The toll, called Cecilie, can monitor the content of a web page containing job offers.

As a part of the initial pilot activity, 357 data offers corresponding to a period of approximately three months were collected and saved to a web database, using JSON as a transport storage mechanism. The results were analysed in terms of quality and functions related the commercial sector. Some detailed results are presented in Figures 2 and 3, which report the percentage and absolute numbers of:

• Total job offers;
• Offers in the commercial sector;
• Offers in the commercial professions;
• Offers relating to “clerks”.

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⁴ The “Osservatorio delle Dinamiche Economiche” (O-De) is a research and learning observatory inside the Institute for Economic Research (IRE) and the Università della Svizzera italiana (USI). O-De is committed to the analysis and disclosure of structure and trends of the Canton of Ticino’s economy, with particular attention on the labour market.

⁵ The web-scraper was programmed by Laura Merlo and Marco Bedulli.
The results of the pilot activity show that the professions in the commercial sector, especially the clerk profession, are only a marginal part of the total job offer in the current Ticinese labour market. All commercial professions, such as accountant, assistant sales manager, and assistant HR manager, comprised on-
ly 29 out of a total 357 offers (7%). Only 29 general job offers in the commercial professions were registered, and, restricting the analysis further, just 13 offers (3%) were posted for the clerk profession.

The analysis confirmed the structural difficulties of the commercial sector already identified by the Working Group (Table 1). It also provides some useful information on the skill gap that will be useful for future research. Further developments intend to not only precisely identify the job skills currently requested by the labour market, but also to define the skills that will be increasingly requested in the future by analysing the descriptions included in job offers.

Conclusions

Many studies analyse the impact that the combined effect of digitalisation and delocalisation will have on the commercial professions in Switzerland. They show how the work will become exciting, creative, and less repetitive, but also much more demanding. Furthermore, employees will increasingly be recruited as portfolio workers and will work on a mandate to the detriment of fixed employment. This paper presented, as a case study, the activity of a Working Group aimed at analysing and discussing the associated challenges for the commercial sector in Ticino, Switzerland. This experience sought to identify the best implementable solutions for addressing the current trends in the regional labour market.

Private associations and the academic sector promoted different workshops and meetings, where the stakeholders first studied and analysed technical documents concerning the digital transformation and its expected effect on the labour market. They were particularly interested in the commercial sector at the local level, considering new challenges that have arisen in the last few years. The group discussed problems related to the distance between schools and companies, the flexibility of the training programmes and the role of teachers in a world of changing competencies. The Working Group has already found some preliminary solutions that will be discussed until the end of the year. As a pilot activity, a web-scraping initiative collected data and linked demand expressed by companies to policies promoted by the group.
The SIC Ticino has developed a new strategy that will guide efforts in the coming years. The plan aims to bring all routine and future activities to an upper level that joins the interests of people, businesses and the territory. They want to ensure that essential training takes into account the evolution and needs of the labour market and that continued training must enable employees to remain up-to-date and competitive, including the new skills required for digitalisation.

References

Websites
SIC Ticino: http://www.sicticino.ch/
Utilising Skills Demand Opportunities to Overcome the Low Professional Status and Attractiveness of a Sector: The Early Learning and Childcare Sector in Scotland

Alesandra Webb and Ronald McQuaid

Introduction

This paper considers how a sector, which is perceived to have low attractiveness for potential employees, in terms of status, pay and conditions, can seek to attract a more diverse workforce through policies such as promoting skills development among existing employees and new recruits. This type of strategic organisational orientation is important particularly as the changing world of work imposes new demands for skills, attributes and competencies, some of which require quick and often radical adjustments in vocational education and training. Employment, skills and employability thus remain key preoccupations of national governments across Europe and its regions to prevent shortages of skilled labour as well as support more inclusive labour markets. While some of the projected skills shortages in many regions and localities are expected to be a consequence of the growing impact of technological change and digitalisation of production and consumption in a globalised world, others are driven by a range of new social policies and political interventions. An example of such a new policy intervention is the Scottish Government’s Early Learning and Childcare (ELC) sector’s expansion, which is designed to extend free childcare provision for three to four year-olds and eligible two-year-olds. One result of this is a rapid rise in the number of employees needed by the ELC sector. Preparations for the implementation of this expansion policy offer opportunities to reflect on the importance of workforce and skills development in the wider context of professional status and career choice.

This paper illustrates how strategic debates about skills demands and interventions focused on reducing skills and competency shortages can be linked with a thorough analysis of the barriers that prevent people from engaging with the
sector and considering it as a viable long-term career option. The insights presented in this paper are based on the data collected as part of the Erasmus-funded Replay-VET project.\(^1\) The paper firstly describes general employment projections in Scotland. Secondly, it gives an overview of the Scottish ELC sector with the projected employment opportunities as well as barriers and challenges currently faced by the sector. Lastly, it outlines strategic recommendations on how to overcome the challenge of the sector’s low-attractiveness.

**Employment Projections for Scotland**

The UK Commission for Employment and Skills (UKCES 2016) employment projections for 2014-2024 forecasted five occupational areas with the most opportunities for employment including: the care sector (classified together with “Leisure and other services”); as well as professional occupations; associate professionals and technical; elementary occupations; and managers, directors and senior officials. Similarly, the Regional Skills Assessments (RSA)\(^2\) carried out by Scotland’s Skills Development agency (SDS 2016), indicate that Scotland, like many other European countries, has undergone a substantial labour market transformation from a manufacturing to a service-based economy in recent decades (Thom and Mackay 2015, McQuaid 2008, Scottish Government 2016). It is expected that an increase in new employment opportunities in the near future will largely be for people with higher qualifications, although all sectors will see considerable replacement demand (Thom and Mackay 2015). Managers and professionals combined are forecast to be a source of half of all new job openings up to 2022 (Figure 1). The analysis suggests that the Scottish labour market will have hour-glass characteristics, with demand mainly for high-

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\(^{1}\) The two-year Replay-VET project (1 January 2017-30 December 2018) is funded by the Erasmus+ programme with an aim to improve the employability of low-skilled and disadvantaged people to acquire the necessary VET skills and take advantage of the opportunities created by the replacements demand in the labour market. For more information about the project see: http://regionallabourmarketmonitoring.net.

\(^{2}\) Regional Skills Assessments (RSA), commissioned by Skills Development Scotland, provide a coherent evidence base on which future investment in skills can be based. It aims to highlight economic and labour market data and offer trends and forecasts at both regional and local level. The data covered includes the demand for skills, supply of people, provision of skills and skills challenges.
er-level skills, but some job openings in lower-skilled jobs as well, indicating a polarisation of the labour market. However, people with no qualifications and SQF 1-4 (ISCED 0-2) will find themselves in a risky situation unless steps are taken to upskill them to at least SCQF 5 and 6 levels in order for them to benefit from new job openings up to 2022.

Figure 1: Forecast net change and replacement demand in Scotland (in thousands), by standard occupational classification (SOC) groups, 2012-2022


The Scottish and UK projections seem to be aligned with forecasts for Europe. Cedefop (2016) confirms a pan-European continuing trend towards services and knowledge-intensive sectors where the majority of future job openings will be located. When the forecast employment and population changes are taken together, the total number of Scottish jobs is expected to increase by 5% between 2012 and 2022, whilst the working age population is expected to contract by 1% over the same period. This could create a potential mismatch between future labour supply and demand and reflects important demographic changes across much of Europe. It is expected that Scotland will see nearly 1.2 million new job openings between 2014 and 2024 (Broadie 2011). Some
115,000 jobs (9%) are expected to arise from expansion demand and the remaining from replacement demand. Given the continuing ageing of the population, a wide range of commentators emphasise the importance of differentiating between the scale and nature of the “expansion demand” generated by growth in the Scottish economy and “replacement demand” generated by replacing those people who retire, change occupations or move away when considering and planning for workforce training, development and management. Expansion demand in Scotland is expected to result in 140,000 new job opportunities between 2012 and 2022; however, replacement demand is projected to result in over one million job openings over the same period, nearly ten times that resulting from net growth. The replacement demand will vary across sectors reflecting, in particular, differences in the demographic profile of the workforce. However, importantly, openings will occur across all types of occupations and jobs.

A threat of job losses due to an increasing use of technology and automation is a commonly listed factor in employment replacement forecasts. UK-wide research suggests that up to 30% of UK jobs could potentially be at high risk of automation by the early 2030s (Berriman 2017). Predictions estimate that in the next few decades over 46% of jobs (1.2 million) in Scotland are at high risk of potential automation (Thomas and Gunson 2017). Interestingly, the risks appear highest in sectors such as transportation and storage, manufacturing and wholesale and retail, other areas of work, such as health, care and other personal services are less likely to be automated, and some experts project that robots may not be able to totally replace human touch input in the foreseeable future (Berriman 2017, Frey 2015). This is partly because, according to Frey and Osborne (2013), jobs in person-focused services tend to require creativity and Social Intelligence (SI)\(^3\), which remains a substantive barrier to the full automation of jobs. Hence, care-focused roles seem to be an appropriate

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\(^3\) SI constitutes abilities such as “social perceptiveness” (being aware of others’ reactions and understanding why they react as they do), “negotiation” (bringing others together and trying to reconcile differences); “persuasion” (persuading others to change their minds or behaviours), and “assisting and caring for others” (providing personal assistance, medical attention, emotional support, or other personal care to people). These components are crucial in a range of jobs and are essential to work-tasks in many services.
context to acquire work with a relatively low risk of being fully substituted by technology.

**Early Learning and Childcare Sector: Employment Opportunities and Challenges**

**Overview of the Sector**

ELC is a Scotland-wide key strategic sector with particular social and economic importance at the national and regional level. The Occupational Projections of Skills Investment Plan (SDS 2016)\(^4\) for “Caring, leisure & other service occupations” from 2016-2024 in Scotland estimated a total labour requirement of 91,171, which makes the caring sector an attractive choice to match future demand with employment opportunities. A significant policy-driven expansion in the Scottish ELC sector is currently being implemented with a remit of increasing provision of free early learning and childcare provision. Through the Children and Young People’s Act 2014, the Scottish Government has pledged to increase the provision of free early learning and childcare provision for children who are three to four years old, as well eligible two-year-olds (i.e. whose parents/carers are on qualifying benefits), to 1,140 hours per year by 2020, which is a significant increase from the current 600 hours of free care per child in a relatively short period of time (Scottish Government 2015, SDS 2017, SDS 2018). Thus, the sector will require additional ELC workers and child-minders, as well as managers and other support workers and associated professions to meet the expansion demand (SDS 2017). The Scottish Government provisionally estimated up to 20,000 new posts for the expansion programme, which will substantially increase the size of the workforce in this sector. The use of inclusive language when talking about new employment opportunities matches the

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\(^4\) Specific Skills Investment Plans have been development by the Scottish national body Skills Development Scotland (SDS) responsible for skills development. SDS aims to bring skills demand and supply closer together, support individuals to develop the skills that the industry needs, and encourage sectors and regions to make best use of the people, skills and resources available. It identifies the skills challenges and opportunities across Scotland’s key sectors to give a picture of the economic and labour market situation, trends in skills and qualification supply and employers’ perspectives on the big skills issues affecting sector growth (https://www.ourskillsforce.co.uk/skills-investment-plans/).
declared ambitions in the public sector to ensure access to work for people from all backgrounds.

In terms of the size of the sector, in 2015 the ELC workforce was estimated at 39,030 and comprised two main areas: child-minding and day care (SDS 2016). There were 5,560 people working as child-minders in Scotland (83% of Scotland’s child-minders are members of the Scottish Childminding Association), 33,460 worked in day care of children: in caring roles (78%), admin and support roles (6%) and managerial roles (10%) (Table 1).

Table 1: Role profile of the Early Learning and Childcare workforce, 2015

<table>
<thead>
<tr>
<th>Role</th>
<th>No of Staff (Headcount)</th>
<th>Admin., Support and Ancillary Workers</th>
<th>Class 2/3 Care Workers</th>
<th>Class 4 Care Workers</th>
<th>Managers, Directors &amp; Chief Executives</th>
<th>Not Known</th>
</tr>
</thead>
<tbody>
<tr>
<td>Childminding</td>
<td>5,570</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5,570</td>
</tr>
<tr>
<td>Day Care of Children</td>
<td>33,460</td>
<td>1,910</td>
<td>26,080</td>
<td>1,690</td>
<td>3,330</td>
<td>220</td>
</tr>
<tr>
<td>Scotland</td>
<td>39,030</td>
<td>1,910</td>
<td>27,770</td>
<td>1,690</td>
<td>110</td>
<td>5,790</td>
</tr>
</tbody>
</table>

Source: SSSC Workforce Data, 2016; Figures may not sum due to rounding

It is difficult to provide a robust assessment of the overall skill levels of the ELC workforce using a method other than qualifications as a proxy. As Table 2 demonstrates, a range of different levels of qualification is displayed by those who enrol in ELC-related college courses – with almost half of them in 2014/2015 having no or low qualification levels. However, the uptake of childcare and childhood practice degree courses have also been gradually rising since 2012 (Table 3). This suggests that the sector as a whole has an hour-glass skills structure with two main groups of workers, i.e. those having high and low levels of qualification.
Table 2: College enrolments in Early Learning and Childcare-related courses, by level, 2014/15

<table>
<thead>
<tr>
<th></th>
<th>2012/13</th>
<th></th>
<th>2013/14</th>
<th></th>
<th>2014/15</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>%</td>
<td></td>
<td>%</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>No Qualifications</td>
<td>155</td>
<td>2%</td>
<td>147</td>
<td>2%</td>
<td>346</td>
<td>4%</td>
</tr>
<tr>
<td>Other Qualifications</td>
<td>1,760</td>
<td>26%</td>
<td>1,834</td>
<td>26%</td>
<td>2,141</td>
<td>26%</td>
</tr>
<tr>
<td>SCQF 1-4 (e.g. NCS and NPAs)</td>
<td>1,050</td>
<td>15%</td>
<td>837</td>
<td>12%</td>
<td>1,101</td>
<td>13%</td>
</tr>
<tr>
<td>SCQF 5 (e.g. National 5)</td>
<td>1,116</td>
<td>16%</td>
<td>1,433</td>
<td>20%</td>
<td>1,908</td>
<td>23%</td>
</tr>
<tr>
<td>SCQF 6 (e.g. Higher)</td>
<td>1,377</td>
<td>20%</td>
<td>1,480</td>
<td>21%</td>
<td>1,348</td>
<td>16%</td>
</tr>
<tr>
<td>SCQF 7-12 (e.g. HNC, SVQ 3 and above)</td>
<td>1,395</td>
<td>20%</td>
<td>1,410</td>
<td>20%</td>
<td>1,455</td>
<td>18%</td>
</tr>
<tr>
<td>Total</td>
<td>6,853</td>
<td>100%</td>
<td>7,141</td>
<td>100%</td>
<td>8,299</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: SDS (2016).

Table 3: Enrolments in courses at Scottish HEIs relating to Early Learning and Childcare, 2012/2013, 2013/2014 and 2014/2015

<table>
<thead>
<tr>
<th>Course by Degree Level</th>
<th>2012/13</th>
<th>2013/14</th>
<th>2014/15</th>
<th>% of total</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childhood Practice</td>
<td>286</td>
<td>443</td>
<td>501</td>
<td>51%</td>
<td>75%</td>
</tr>
<tr>
<td>Childcare</td>
<td>227</td>
<td>329</td>
<td>321</td>
<td>32%</td>
<td>41%</td>
</tr>
<tr>
<td>Training teachers – nursery</td>
<td>130</td>
<td>154</td>
<td>168</td>
<td>17%</td>
<td>29%</td>
</tr>
<tr>
<td>Other Undergraduate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childcare</td>
<td>363</td>
<td>136</td>
<td>84</td>
<td>67%</td>
<td>-77%</td>
</tr>
<tr>
<td>Childhood Practice</td>
<td>133</td>
<td>39</td>
<td>42</td>
<td>33%</td>
<td>-</td>
</tr>
<tr>
<td>Postgraduate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Childcare</td>
<td>105</td>
<td>142</td>
<td>217</td>
<td>83%</td>
<td>107%</td>
</tr>
<tr>
<td>Childhood Practice</td>
<td>-</td>
<td>7</td>
<td>14</td>
<td>5%</td>
<td>-</td>
</tr>
<tr>
<td>Training teachers – nursery</td>
<td>35</td>
<td>31</td>
<td>32</td>
<td>12%</td>
<td>-9%</td>
</tr>
</tbody>
</table>

Source: SDS, 2016

In Scotland, many routes to qualification gain in ELC are based on college-based courses, SVQ work-based qualifications, apprenticeship programmes
and placements as well as university-degree courses. There is a wide range of training courses provided by Further Education Colleges and Higher Education. The most common route in the past, which is becoming highly utilised during the workforce development planning in response to the ELC policy extension, is the one through vocational training and college settings. Thus, a variety of qualification levels and training channels exists as a route into the profession and for up-skilling low-qualified workers; the most common routes are through work-based learning and “on-the-job training” (SVQ qualification level and apprenticeships) and college and university degrees (HNQ/HND, Bachelor/Masters degrees). It seems, however, an apprenticeship model is currently underutilised in the ELC sector. As Table 4 shows, no apprenticeship in Early Years Care Education has been offered, while social service apprenticeships seemed popular. The current expansion plans focus on the uptake of apprenticeships.

Table 4: Provision of apprenticeships in Early Learning and Childcare, 2014/15 and 2015/16

<table>
<thead>
<tr>
<th>Framework</th>
<th>2014/15</th>
<th>2015/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Years Care Education</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Children’s Care, Learning and Development</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Social Services (Children and Young People)</td>
<td>1,254</td>
<td>1,288</td>
</tr>
<tr>
<td>Social Services (Children and Young People) Technical Apprenticeship</td>
<td>19</td>
<td>150</td>
</tr>
<tr>
<td>Total</td>
<td>1,273</td>
<td>1,439</td>
</tr>
</tbody>
</table>

Source: SDS, 2016

Many of the new job opportunities in ELC will exist within both the public and private sectors, some other employment opportunities will exist in a self-employment capacity after a successful accreditation process). For example, the Scottish Childminding Association informs that in Scotland child-minders belong to an occupational group that works mostly on a freelance basis. Interestingly, a large amount of care is provided by grandparents in an informal
context. Literature on childcare extensively covers a growing phenomenon of kinship care, whereby retired grandparents are increasingly undertaking care responsibilities for the children of their children due to rising cost and care provision inflexibility (Guzman 1999, Jappens and van Bavel 2012, SCOW 2015, STUC 2015, Wheelock and Jones 2002). It will be interesting to observe whether the ELC expansion will reduce the amount of free care delivered through kinship care.

In summary, the Early Learning and Childcare sector in Scotland is of strategic importance because it can offer employment opportunities to a wide range of groups, including those from poorer backgrounds or with no/lower level of qualifications as the sector requires a variety of quite diverse roles. The sector has positive labour market projections for the coming years, due to both expansion and replacement demands for the ELC. The extension of the care provision for early years appears to be planned on inclusive principles and aims to offer opportunities for disadvantaged and excluded groups of individuals. Most importantly, jobs in the ELC offer possibilities for higher work satisfaction, better work-life balance and longer-term job security, and this is an example of a work area more difficult to be easily replaced by digitalisation and automation.

Key Challenges in the ELC Sector

The policy-driven expansion in the Scottish ELC sector highlights important challenges for the sector. A range of problems have been identified by the Sector Skills Plan (SSP) (SDS 2018) for ELC and the Replay-VET Project. These include: skills and training shortages, recruitment and retention challenges, lack of information on skills development and career pathways and the perceived low value of the ELC sector and its workers.

Skills Shortages and Training

The ELC workforce requires a set of skills, attributes and attitudes. Evidence from the consultations gathered by Skills Development Scotland (SDS) indicates that people entering education and training do not have the required essential skill set such as literacy, numeracy, personal presentation and verbal and non-verbal communication (Ibid.). This evidence suggests that 63% of partner providers reported difficulty with the recruitment of suitable new employees. However, it seems the up-skilling of the entire sector’s workforce is
considered an important requirement to ensure high quality care for young children. The SDS’s report and the Replay-VET project findings disclose that employers highly value and seek an appropriate level of literacy, numeracy, digital skills and science-related knowledge among the ELC workforce. They also expect employees to have enhanced digital/ICT and communication skills reflecting the demands of a changing workplace and responsibilities of communicating effectively with children, parents, carers, work teams, and the wider community.

As indicated in the previous section, many routes to work in ELC exist. However, access to learning and training is often more difficult for child-minders and those working in the private sector as time for training often means a loss of work and income. Geographical barriers to accessing training, particularly in remote/rural areas also exist. The initial scoping report of the sector emphasised particular challenges in recruiting and training ELC staff in rural and remote areas where the pool of potential workers is generally smaller. While this is a substantial challenge, the sector can provide an employment opportunity for low-skilled and geographically remote people in public and private settings. However, financial support, flexible learning options and investment in training by employers is needed to close the skills and qualifications gaps and prevent the danger of a two-tier system (of highly and lowly paid staff based on qualifications rather than actual jobs carried out) leading to a substantial difference in quality of care received by children, on the one hand, and worse pay, terms and conditions and training opportunities for workers in the private provisions on the other.

Recruitment and Retention Challenges
The key problems identified in the ELC sector at the moment are recruitment and retention challenges. The sector’s inability to retain an adequate, high quality, diverse and committed workforce to meet current and projected needs is a point of concern, particularly during the expansion as these recruitment and retention challenges might prevent people from a diverse range of backgrounds (including low-skilled/low-qualified people) as well as other career changers, returners and older workers who have relevant attitudes, skills and aptitudes from pursuing a career in ELC.
Diversity is a key challenge of the recruitment in the ELC sector. For instance, currently the vast majority of employees are females; a significant expansion of training opportunities for new entrants to the sector is likely to require large numbers of people to move from other sectors into ELC, and the requirement for the on-going development of the skills of existing employees to match the growing appetite for the professionalisation of the sector. A clear strategic direction, with concrete actions, is required in order to attract a more diverse workforce into the ELC sector, both at the entry level from education/training and from those working in other sectors or returning to work after a break. A nation-wide recruitment campaign is being developed, and some local authorities have targeted school leavers and existing workforce in other lines of work. It is also necessary, however, to maintain and improve the current and future skills of the workforce, so they can continue to provide and improve the quality of services to children. This can also assist in the greater professionalisation of the workforce and improve the currently relatively low perception of the sector as a place to work and develop a career with clear progression opportunities.

There are clear concerns about the level of resources available for increasing and improving ELC provision and subsequent employment (Audit Scotland 2018, House of Commons 2018). A strategic overview of employment and infrastructure costs can raise awareness of the need to properly fund ELC, particularly during the period of its expansion. There may therefore be a need for maintaining, or increasing, if necessary, levels of public funding for an adequately resourced ELC sector.

*Lack of Information on Skills, Skills Development and Career Pathways in the ELC Sector*

Challenges identified by SSP (SDS 2018) include gathering relevant labour market information on the sector and using this to create labour market intelligence that could underpin the main actions aimed to improve skills, training, employment and employment opportunities, especially for the low-qualified or low-skilled. Specific issues include:

- Identifying the scale and characteristics of employment in the sector and the different parts of the sector;
- Profiling employment and how it varies between types of employer (public, private and third sector, the former often with better pay, condi-
tions and training and thus having a greater ability to attract scarce employees for other employers);

- Identifying the future and present skills requirements of the sector.

The Perceived Low Value of the ELC Sector and Its Workers

The low attractiveness of the ELC sector for work and career choices is the principal challenge that emerged during the fieldwork carried out within the focus of the Replay-VET project. The perceived low professional status of the ELC sector and its workers seem to be underpinning a variety of other challenges related to recruitment, training and workforce development, as already discussed. ELC work is commonly classified and referred to as a low-skilled and low-paid sector, unlike teaching professions, for example. The low pay and overrepresentation by low-qualified women may underpin a substantial gender imbalance in the sector. The caring roles encompassed in ELC have traditionally been performed by female workers, as they tend to carry out these roles in non-paid, informal environment at home and elsewhere. Such biases in who undertakes different roles means that caring roles, including ELC, have been dominated by young females, which over the years contributed to the sector’s gender imbalance. In consequence, many, including the trade unions, argue these female jobs became undervalued and under-paid and have a lower perceived socio-economic status. Most employees in the sector currently (especially at the lowest qualification levels) are young women or women returning to work after looking after their own children, and so most opportunities related to the sector’s growth are likely to target similarly low-qualified females unless major changes to recruitment are undertaken. There may be attempts to improve gender (and other) diversity, but currently the representation of males working in the sector is very low, which helps perpetuate the inequalities in the sector. It is therefore important to tackle those issues to enable the recruitment and workforce development needed to satisfy the demand and fulfil the objectives of the expansion policy over the next two years and at the same time improve the job opportunities and employability of low-qualified people at risk of labour market exclusion, as well as other target groups that could benefit from the influx of new jobs in the expanding sector.
Conclusions with Key Recommendations

Early Learning and Childcare in Scotland is a particular example of growth due to government policies to expand free childcare provision, with up to an estimated 20,000 additional staff required to meet the new demand by 2020. It is clear that the sector offers great opportunities for new employment for a diverse group, including lower-qualified people. The ELC sector has to grow and invest in workforce development, but many current challenges and barriers to work in the sector need to be addressed during this process, especially the gender imbalance and the perceived low socio-economic status of jobs in ELC. The expansion of the ELC sector offers the opportunity for systemic innovation and a cultural shift, whereby the currently and historically female-dominated ELC sector can be transformed into a more diverse and desirable context to work in. There are many strategies that can be implemented to improve the professional status and overall attractiveness of the ELC sector as a good work and career choice. These include:

- **Uplift the perceived status of the ELC sector**: improvements in the terms and conditions of work need to be considered. Decent and “fair work” pay and conditions will improve the attractiveness of ELC as a career choice. Making this line of work pay-attractive will, firstly help meet the recruitment challenge and secondly, potentially widen up and diversify the workforce by attracting under-represented groups such as males and people currently working in other sectors, etc. The undervaluing and often poor working conditions and pay need to be eliminated so unemployed women, particularly lone parents and women and men with low qualifications and of a variety of ages can enter a sector that recognises the value of ELC work and the level of employee engagement and responsibility needed. Actions focused on raising the ELC workers’ professional status may require positive promotion and publicity around the career benefits of ELC employment, e.g. clear career progression routes, high job satisfaction levels with the work itself and opportunities for good work-life balance. It may also involve recognising that although many workers in childcare jobs are actually highly skilled despite having

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5 Scottish Fair Work Convention (2016) defines “fair work” as “work that offers effective voice, opportunity, security, fulfilment and respect; that balances the rights and responsibilities of employers and workers and that can generate benefits for individuals, organisations and society”.

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low qualifications and perhaps considering using terms such as “early years educators” for some staff.

- **Offer multiple training opportunities throughout the career:** investment in skills training and an on-going focus on skills development throughout the span of people’s careers and through multiple flexible pathways is important to challenge the perceived low qualification level in the sector and rehabilitate the workers’ “educator” status. The on-going investment in training could improve the actual and perceived skills of the workforce and could substantially reduce the current high turnover of staff across the sector. In addition, considering the following actions could help improve the level of skills in the sector: raising standard expectations and practices for training; paid release from work to engage with learning activities; involving all social actors (employers, NGOs, public sector and trades unions) in supporting a strong training framework for staff in the sector; including a strong role for mentoring throughout all career transitions (e.g. high school-college, or college-labour market and in the workplace); and promoting a “fair work” ethos in the sector. In this context, the definition of “fair work” used by the Scottish Fair Work Convention (2016) is appropriate. Overall, strong support for lifelong learning opportunities for existing staff may be needed to help them to increase their skills, better adapt to changes, achieve career progression and help the sector to avoid staff retention problems.

To obtain the lifelong-learning objectives, however, there is a need for strengthening the provision of flexible training options (including FE placements) to enable people to take up learning opportunities that fit with their working and personal lives. Training must be available for public, private and third organisations and not just primarily focused on one area of the sector (often the public-side of the sector). It is important to meet the quality training expectation, address identified skills gaps and maintain availability and standards for all ELC staff.

The importance of maintaining or increasing levels of public funding for those seeking to work in the expanded sector needs consideration, as well as increasing employers’ support and financial contributions towards training. There should be a concerted effort to remove financial barriers for career changers especially those needing to retrain while looking after their own families or where the place of work or training is far from home and access might be an issue.

- **Design a successful national recruitment campaign:** actions are needed to recruit and retain an adequate, high quality, diversified and commit-
ted workforce to meet current and projected needs through reducing recruitment barriers, providing new routes into ELC employment and increasing the diversity (especially of gender) among the workforce. A broadened approach to recruitment to diversify the current profile of the workforce is suggested as a priority to continue to attract people from ethnic minority backgrounds, school leavers, career changers and returners to the sector and those with currently low qualifications. Communicating the benefits and opportunities that the ELC sector offers in terms of work and career for individuals considering such a vocational choice is important now and in the future. The campaign needs to address all the challenges related to the current misperceptions around the sector as an unattractive work context and tackle the perceived low-status of the profession. At present, the focus seems to be placed on emphasising the worth and satisfaction of ELC work and the work-life balance this line of work offers. It is worthwhile to also consider reframing strategies that use a positive language when referring to the sector.

• **Adopt a comprehensive approach to the development of the strategic ELC action plan:** when considering labour market information on the ELC sector the following should be included: an analysis of the characteristics of the sector and the employment associated with the sector now and in the future (this should involve key actors, such as employers, social partners, trainers, the public sector and users, especially parents from a wide range of socio-economic backgrounds); a review of the skills needs (this should involve active partnerships with multi-stakeholder groups associated with the sector skills); identification of demand priorities for skills to enable the growth and development of the sector and the skills of its workforce (this should involve sector leadership groups); testing the views with the industry stakeholders; assessing supply-side constraints (this should involve the skills agencies, trainers, trades unions etc.); ensuring buy-in from key stakeholders for the strategy and actions and wider open and transparent dissemination of the strategy.

The development of the strategic action plan may incorporate multi-level (national, regional and local public and other bodies), multi-stakeholder (discussed above) and multi-dimensional elements (the latter supporting the integration of skills, training/educational demand and supply, and high quality childcare). It should also incorporate a suitable form of system-wide governance, which would recognise the limitations of co-ordination among public bodies and differing stakeholders’ interests and focuses.
There is a need for clear direction and focus for stakeholders in developing the ELC sector’s skills and diversity. In order to get efficient and effective action to improve the key issues facing the current and future labour force, better working relations and strategic alignment may be needed between multiple actors (on both the labour and skills supply and demand sides). Specific issues include: helping to provide an appropriate forum, direction and focus to responses by stakeholders to the skills challenges for the sector; agreeing on a framework for targeting resources for development of suitable skills provision and helping to engage and bring together the key stakeholders (e.g. employers, skills providers, trade unions, the public sector, parents) on both the labour and skills supply and demand sides to support effective improvements in the sector.

Importantly, the ELC expansion plan needs to try to avoid unintended consequences, such as the danger of creating a two-tier system with differences in training opportunities and terms and conditions between groups of workers, such as public and private workers and among workers within an organisation (e.g. introducing qualified teachers who may be paid more and have a higher status, despite having little ELC training, and may also get preference for further training). Care must be taken through a systematic approach so as not to potentially undermine other parts of the childcare system, such as child-minders who might be affected by changes elsewhere, such as increased free childcare through kindergarten.

- **Increase familiarity with approaches, policies, strategies and practices adopted in other countries in Europe:** the identification and sharing of good practices should be considered as European countries, regions and nations can learn from each other. For example, lessons may be learnt from those regions successfully promoting an integrated model of delivering childcare through public provision, where carers and educators work together towards quality, responsive and inclusive service. Learning from the successes of other countries can be insightful and practical. Strengthening the relationships between stakeholders and building a resilient system in which all national, regional and local partners play an important complimentary role will benefit children and contribute to a happier and more satisfied workforce.

These recommendations can act as a starting point for action required from regional and local decision-makers, the sector’s leaders, employers, recruiters, experts in the workforce development programmes, and providers of initial
and further education and training. These considerations substantiate the strategic vision for overcoming the perceived low status of the ELC sector and uplifting its status, which is a prerequisite for attracting a diverse range of prospective workers to ELC careers and developing their skills in a fast-changing world of work.

References


Digitalisation and Automation: Insights from the Online Labour Market

Mario Mezzanzanica, Fabio Mercorio and Emilio Colombo

Introduction

There are three main structural phenomena (aka mega-trends) that have changed the relationship between employment and product:

- The ageing of population;
- The globalisation process;
- The technological progress.

These mega-trends, in conjunction with the economic crisis, led to a sharp contraction in employment and an increase in unemployment that is not being re-absorbed in the recovery due to the persisting mismatch between labour demand and supply. Indeed, several jobs are disappearing while new jobs are emerging; of these, some are simply a variant of existing jobs while others are genuinely new jobs that did not exist until few years ago. On the other hand, employers use job vacancies to specify the main characteristics (in terms of skills) that the ideal candidate should possess, along with all of the skills that someone with such a profile might have, like digital skills, for example, which play an enabling role in many professions.

In such a scenario, the analysis of online job vacancies becomes crucial for observing such online labour market dynamics and trends promptly and at very fine-grained level. In this paper we report some insights that can be obtained by analysing three million vacancies in Italy, by:

- Recognising professions in distinct business sectors and areas;
- Extracting skills;
- Measuring the impact of digital and soft skills within professions;
- Evaluating the probability of job automation through a data-driven approach.
The Context

The current macroeconomic scenario is characterised by a context of gradual economic recovery both at the global level and at the European and national levels. In recent years, the Italian economy has gradually recovered after losing eight GDP points between 2008 and 2013. This recovery, however, is not translating into a simultaneous improvement or return to pre-crisis labour market conditions.

Figure 1: Timeline of GDP per capita (1999-2016)

Despite the evident recovery, also evidenced by the trend of rising GDPs - not only in Europe - there are many studies that underline how the global economic growth that followed the financial crisis is characterised by a job creation rate below the average of the pre-crisis period (the so-called “jobless recovery”). These elements suggest the existence of structural phenomena that have altered the relationship between employment and product. These structural phenomena have existed for several years but have been sharpened by
the great financial crisis and are radically changing the labour market as well as the whole production and, more generally, social systems.

Changes and Impacts on the Labour Market

We can identify the structural phenomena that have altered the relationship between employment and product using three main factors, also called megatrends:

• The ageing of population;
• The globalisation process;
• The technological progress.

These three factors and their consequences will be described in the following paragraphs where we will focus exclusively on the Italian context to create a detailed picture of these changes in practice.

The Ageing Population

Figure 2: Italian population per age classes

Source: Italian Statistical Office.
The ageing of the population has direct effects (such as causing a sort of “bottleneck” at the entrance of the labour market for the youngest workers) and indirect effects (like skills obsolescence) on the labour market.

The Globalisation Process

The second change factor concerns the polarisation of the global labour market, which has led to an increase in the relative demand for low-skilled workers in developing countries and a complementary increase in the relative demand for high-skilled workers in advanced economies. The factors that mainly drive the phenomenon of polarisation are technological progress and globalisation (see Baghwati and Panagaryia 2004 and Feenstra 2001).

Technological progress has substantially changed the routine component of work, where machines have significantly replaced the need for human involvement. Globalisation also has an impact on the composition of labour demand itself. In particular, it is now possible to divide the production process into phases that can be carried out by units in different countries through processes like outsourcing and offshoring.

Figure 3 shows that Italy is not exempt from these dynamics. Considering the changes in employment that have taken place in the last 20 years, we notice that employment has grown in the high- and low-skilled professions while it has strongly decreased in the medium-skilled professions.
Figure 3: Polarisation of the labour market: percentage variation on total occupation 1995-2015, Italy vs. OECD countries

Technological Progress

The technological progress that is probably the most important factor has radically changed the competencies and skills required for workers (see Acemoglu 1998, Acemoglu 2002, Bessen 2018, Autor et al. 1998, Autor et al. 2003, Card and DiNardo 2002). New technologies allow for the automation of an increasing number of activities that were previously carried out by people. Initially, these automation mechanisms focused on routine activities, both manual (like assembly, logistics, etc.) and otherwise (such as administrative activities, paralegal activities, reporting activities, etc.). The advent of Big Data, the development of artificial intelligence and the Internet of Things (IoT) have made it increasingly possible to automate even the tasks that seemed too complex for a machine. A clear example of this is the development of autonomous driving.

The Mismatch as a Consequence

The combination of the mega-trends previously defined and the economic crisis has led to a sharp contraction in employment and an increase in unemployment that is not being reabsorbed by the recovery due to the persisting mismatch between labour supply and demand. In this sense, the problem is not only quantitative, but also qualitative regarding the difference between the new skills required by companies and those offered by workers.
Figures 4 and 5 show some simple mismatch indicators developed by the OECD. The “field of study” mismatch indicator refers to the percentage of workers who are employed in a field different from their field of specialisation. The qualification mismatch, on the other hand, measures the percentage of workers who have a qualification level (in this case an educational level) different from the one required for the work they are currently doing. This indicator is further detailed in Figure 4, which shows the rate of over-education, or the percentage of workers in possession of a higher level of education than is required for their profession.

Figure 4: Mismatch indicators, percentage of mismatched workers

Source: OECD.
The figures show that in most European countries, the rate of mismatch is extremely high and affects 30% of workers on average. Italy has one of the highest rates of mismatch of all countries studied and an especially large fraction of workers who are over-qualified. This kind of mismatch is often considered less important than the imbalances caused by high unemployment even though it is equally harmful. On the one hand, it generates an evident loss of productivity as workers are not in a position to make full use of the skills acquired, and, on the other hand, it generates a sense of frustration in the workers themselves that, as a consequence, damages the quality of work. Finally, the presence of a high over-qualification index devaluates training and discourages future students from investing further in education.

In this context, the weakest and most vulnerable categories of the labour market (especially young people) are particularly penalised, and the gap between the north and south of the country is exacerbated. The figure shows that the overall unemployment rate has more than doubled since the economic crisis, from 6.1% in 2007 to 11.6% in 2014. In this situation the regional gap, which...
was already dramatic in itself, has widened even more: in the north, unemployment rose from 3.5% to 7.5% in the same period, while in the south it went from 11% to 19.6%.

**Figure 6: Total unemployment rate**

![Graph showing total unemployment rate from 2004 to 2016 for Italy, North, Centre, and South and Islands.]

Source: ISTAT, data analysed by CRISP-UniMib.

**Figure 7: Youth unemployment rate, 25-34-year-olds**

![Graph showing youth unemployment rate from 2004 to 2016 for Italy, North, Centre, and South and Islands.]

Source: Data analysed by CRISP-UniMib.
The unemployment rate of young people in the age group of 25-34-year-olds (Figure 7), which should also include those who have completed tertiary education, demonstrates how young people have been particularly affected by the crisis: it caused the overall unemployment rate to go from 8.2% in 2007 to 17.6% in 2014. In this case the regional gap is even more pronounced: in the north, unemployment went from 4.2% to 10.5%, while in the south it went from 15.6 to 30%.

What Changes Are in Store for the Future of Labour?

What consequences will there be for the societies of advanced countries? Are robots and artificial intelligence destined to replace human labour progressively and inexorably? A study by Frey and Osborne (2017) estimates that almost half of all existing jobs have a high probability of “automation” over the next 25 years. A recent report by the World Economic Forum estimated that 65% of children currently attending primary school will do a job in their lifetime that does not exist today. This question is echoed in many scientific and non-scientific publications and is an increasingly frequent topic in scientific debates and conferences.

Given the changes outlined in the previous paragraphs and the effects that are detected in the labour market, it is legitimate to ask how far the changes will go, what consequences there will be for the societies of advanced countries and if human labour is progressively and inexorably destined to be replaced by robots and artificial intelligence. Actually, many believe that work will not completely disappear but will probably be redefined, and that, above all, a change in skills will be needed. Therefore many jobs will remain, but they will require different skills to be carried out. For example, digital skills are increasingly required for not only the more specifically ICT jobs but also for more traditional jobs. In this regard, a WEF report estimates that within 5 years, approximately 1/3 of the skills required in the labour market will include skills that are not considered to be central today.

All this poses a clear problem for our educational system. While the training systems took several years to develop the new skills required by the market during previous technological revolutions, the speed with which technological
change is currently affecting the productive dimension risks completely distorting the planning of the training system. In such a scenario, the key challenge is being able to catch these changes in the labour market promptly, with the goal of supporting decision-makers using the data (e.g. ranging from strategic decisions and policymaking to people who might use labour market data to identify their own training or career path). In this paper we show two distinct analysis paths, both using job vacancies posted by companies online: the former analyses skills, particularly digital, focusing on non-ICT professions; the latter provides an empirical evaluation of the impact that some skills have on the probability of robotisation for a given set of professions.

Digital, Non-digital and Soft Skill Rates

From a global perspective, the analysis of online job vacancies allows us to carry out a very fine-grained analysis of how the labour market is changing in near-real time in terms of occupations and skills. Indeed, on the one hand, several jobs are disappearing while new jobs are emerging; of these, some are simply a variant of existing jobs while others are genuinely new jobs that were non-existent until few years ago. On the other hand, employers use job vacancies to specify the main characteristics (in terms of skills) that the ideal candidate should possess, along with all of the skills someone with such a profile might have. As a consequence, a vacancy allows us to focus on only the skills that those who wrote the advertisements consider relevant for those jobs. This represents a competitive advantage for labour market analysts to use vacancies to extract and analyse skills that are relevant for the labour market at a given point in time.

This is what motivated us to exploit skills to further distinguish between:

- Soft skills;
- Hard skills:
  - Digital skills;
  - Non-digital skills.

In this way, for each skill category we can compute a “skill rate” that would provide a raw estimate of the pervasiveness of that skill category has within an ISCO profession, in terms of the frequency and relevance of the skills present within it. Then, for each ISCO profession we compute:
• The Soft Skill Rate (SSR);
• The Hard Skill Rate (HSR), composed of:
  – The Digital Skill Rate (DSR);
  – The Non-Digital Skill Rate (NSR).

Specifically, our analysis proceeds along the following path: Once an online job vacancy has been classified according to the standard classification system of occupation and skills (ISCO for professions and ESCO for skills), a second classification step is taken to identify the sector of the proposed job, which can be either Industry, Commerce or Service. For each sector, we also distinguish between jobs related to the Support and Management Processes and Core Business Processes by grouping jobs according to the corresponding business area using to the following coding.

Table 1: Macro business processes on business areas

<table>
<thead>
<tr>
<th>Macro business processes</th>
<th>Business area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support &amp; Management</td>
<td>• Secretariat, staff, general services;</td>
</tr>
<tr>
<td></td>
<td>• Personnel management, human resources organisation;</td>
</tr>
<tr>
<td></td>
<td>• General direction;</td>
</tr>
<tr>
<td></td>
<td>• Administration, purchases and legal;</td>
</tr>
<tr>
<td></td>
<td>• Accounting, management control, finance.</td>
</tr>
<tr>
<td>Core Business</td>
<td>• Production of goods, provision of the service;</td>
</tr>
<tr>
<td></td>
<td>• Design, research and development;</td>
</tr>
<tr>
<td></td>
<td>• Quality control;</td>
</tr>
<tr>
<td></td>
<td>• Sales;</td>
</tr>
<tr>
<td></td>
<td>• Marketing, communication and customer support;</td>
</tr>
<tr>
<td></td>
<td>• Logistics, transport and supply chain;</td>
</tr>
<tr>
<td></td>
<td>• Installation and maintenance;</td>
</tr>
<tr>
<td></td>
<td>• Quality, safety and environmental certification.</td>
</tr>
</tbody>
</table>


Then, for each process, we provide a set of information and KPIs computed on the vacancies belonging to this set, which are:
• The 2017 DSR and its dissimilarity with 2014;
• SSR and NSR;
• A categorisation of digital skills;
• A set of radar plots of some professions and the corresponding benchmarking with its own area;
• A selection of the most relevant skills for each profession.

As one might imagine, this kind of analysis easily results in a large number of cases to be analysed. For these reasons, we can only discuss one example here. The figure below shows the DSR, SSR and NSR for each sector as a whole. Furthermore, we also provide the DSR computed for the same vacancies in 2014. As one might note, the request for digital competences grew in all but one sector, Services and Industries, while it remained unchanged in the Commerce sector.

**Figure 8: Skill rates for the Commerce, Services and Industry Sectors**

<table>
<thead>
<tr>
<th>Sector</th>
<th>DSR 2017</th>
<th>NSR 2017</th>
<th>SSR 2017</th>
<th>NSR 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commerce</td>
<td>9%</td>
<td>56%</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>14%</td>
<td>54%</td>
<td>32%</td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>13%</td>
<td>59%</td>
<td>28%</td>
<td></td>
</tr>
</tbody>
</table>

DSR: Digital Skill Rate; SSR: Soft Skill Rate; NSR: Non-digital Skill Rate.

Source: WollyBI.

Focusing on the Industry sector, we can analyse vacancies in depth by looking at the different business areas for the Support and Management Processes, and Core Business Processes. The figure below reports the DSR for each business area (vertical axis) while the per cent variation in the number of vacancies for each business area is shown on the horizontal axis. In this way, one can observe the dynamic of each business area in terms of digital skills and demand as well.
We observe general growth in the demand for work in online ads linked to economic trends, a greater dynamism of the market as well as a greater use of the web as a tool for finding job candidates.

On average, digital skills are more relevant in Support and Management processes (20%) compared to Core Business Processes (17%). The DSR is particularly significant in the areas of Personnel management, Accounting, management control, finance and Secretary, staff and general services. In the Core Business processes, on the other hand, the DSR is particularly relevant in the areas of Design, Research and Development, Marketing, Communication and Customer Assistance and Production.
Figure 10: Digital Skill Rate (DSR) for non-ICT occupations – Service Sector

Source: WollyBI.

Also in this case, we observed growth in the demand for labour on the web compared to 2014 that was even greater than in Industry in the same time period. On average, we observe a quite similar DSR for the processes of Support and Management (14%) and Core Business (13%). The DSR is particularly significant for Core Business Processes in the areas of Quality Control and Design, Research and Development. On the other hand, for the Support and Management Processes, the areas with the greatest digital impact are Personnel Management, Human Resources and the Accounting, Management Control and Finance.

Digital Skill Types Matter

As one might imagine, the demand for digital skills may change as the profession changes. Indeed, a profession might ask for the use of some digital products to perform basic data exchange and communication tasks. Alternatively, another profession might need a technical skill like knowledge of a digital plat-
form or programming languages that are (often) strongly related to ICT-specific professions. Generally speaking, digital skills encompass a range of different abilities that allow an individual to use ICT tools at different levels, from the use or manipulation of and interaction with standard ICT tools down to the design, implementation and deployment of complex ICT systems and services. This is what motivated us to separate hard digital skills into four distinct categories as follows:

- **Information Brokerage Skills**: refer to the ability to use ICT tools and platforms for data exchange and communication (e.g. social media);
- **Basic ICT Skills**: refer to the ability to use some standard ICT applications for supporting individual professional activities (e.g. using of spreadsheets or word processing software);
- **Applied/Management ICT Skills**: refer to tools and software used within an organisation for supporting management, operational and decision-making processes (e.g. administrative software);
- **ICT Technical Skills**: refer to solutions, platforms and programming languages that are strongly related to ICT-specific professions (e.g. programming languages, advanced ICT software).

In this way, we can further analyse the need for digital skills in each profession. Focusing on Core Business Processes within the Industry sector, we can partition each business area according to their skill rates, as shown below. As one might note, skill rates change considerably between areas. For example, Graphic and Multimedia Designers have a high demand for information brokerage skills, much like Education Methods Specialists. Alternatively, Mathematicians and Statisticians have the highest demand for ICT technical skills within this group, but are among the lowest in terms of demand for information brokerage skills. These dynamics shed a light on the differences that digital skills have within each profession. Being able to catch these differences at such a granular level is crucial for properly observing labour market needs and characteristics to support decision-making activities.
Figure 11: Distribution of digital skills in selected professions of Core Business Processes

Source: WollyBI.
Figure 12: Skill degrees for selected professions of Core Business Processes

DSR: Digital Skill Rate; SSR: Soft Skill Rate; NSR: Non-digital Skill Rate.

Source: WollyBI.

Clearly, our analysis of online job vacancies also allows us to go more into depth within each profession, creating a sort of Identity Card for each profession. Below we report an example for mathematicians, actuaries and statisticians. Each card is composed of:

- A radar plot showing the relevance of digital skills, comparing these values to both the business area and the sector;
- Digital Skill Rates compared to its own business area and the corresponding sector;
• A selection of skills for some selected professions in the same sector, along with their relevance, which can be directly compared between professions.

Example of Identity Card for the profession Mathematicians, Actuaries and Statisticians

Area: Research and Deployment
ISCO Code: 2120
Description of the profession on ESCO: http://data.europa.eu/escod/isco/2120
Skill Rates: Digital (33%) – Non-Digital (34%) – Soft (44%)

Figure 13: ESCO skills and relevance (1 to 5) for some ESCO professions in the Service Sector
Focusing on mathematicians, actuaries and statisticians, one might observe that their demand for digital skills tends to among the highest of all professions in its sector (Services) and even the corresponding area (R&D). Specifically, companies that seek these professionals ask for competences related to ICT technical skills. In addition, one might note that these professionals have a greater need for digital skills than all other professions in the R&D area. Finally, a selection of most relevant skills is also provided (according to the ESCO taxonomy), that are the use of database, ERP and the ability to deal with Big Data and SAS. They should also know about Hadoop and ABAP and have strong SQL language competences. Finally, the demand for brokerage and information skills is lower in this profession than it is for other professionals within the same business area.

General Remarks

Due to limited space, we cannot provide information about each profession, as it would require discussing more than 30 cases (one for each Industry-Sector pairing). Nonetheless, here we provide some general remarks that we were able to derive:

- Digital skill rates may vary considerably within professions. Generally speaking, we observed that digital rates range as follows: Industry (between 8% and 44%), Services (between 5% and 36%), Commerce (between 8% and 17%);
- There are business areas in which the DSR is more relevant with respect to other. The following sectors/areas are worth mentioning where digital skills have a relevant impact, as shown above:
  - Industry: Personnel Management and HR, R&D, Marketing and Communication;
- Services: Quality Control, R&D, Personnel Management and HR, secretariat and general services;
- Commerce: General Direction, R&D, Accounting, Management control and Finance;

• Soft skills are relevant in all professions, as the SSR is always ranges between 33% and 35%. This also confirms the hypothesis that soft skills play a key role in job automation (as we discuss in the next section).

From a general point of view, an in-depth analysis of the online labour market – from sectors down to skills and then the digital skills category – is crucial for a deep understanding of labour market changes and needs and for reducing mismatch by identifying the labour market needs in terms of skills and supporting data-driven policy-making.

**Relation between Hard/Soft Skills and Job Automation**

In this section we look more thoroughly at the relationship between automation and skills. In order to do so, we mapped the ISCO codes of our classification onto the corresponding SOC codes. This procedure is not straightforward, as there is not a one to one correspondence between SOC and ISCO. In the case of multiple correspondences, we have attributed the same SOC code to multiple ISCO codes. We then use the dataset of Italian online vacancies and assigned the probability of automation to each occupation as estimated by Frey and Osborne (2017). Finally, we used this information to explain the probability of automation on the basis of the characteristics of skill demand emerging from online vacancies.¹

Colombo et al. (2018) show that both hard and soft skills tend to be negatively related to the probability of automation.² Among soft skills, thinking and social skills have the strongest negative effect. In terms of hard skills, non-digital hard

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¹ In doing so we have implicitly assumed that the impact of the automation process in the US estimated by Frey and Osborne (2017) is analogous to what is occurring in Italy. Given the pervasiveness of the impact of technology in advanced economies, this assumption is legitimate.

² The use of the full micro data set where standard errors are clustered at the occupational level and the inclusion of a full set of controls allow to state that this result holds within occupation and controlling for sector and geographic area.
skills have a negative effect on the probability of automation while ICT technical and information brokerage are the most relevant digital skills. Thus the relevant digital skills that appear to lower the probability of automation are advanced ICT skills and skills related to communication and social media. This provides hard evidence to the recent trends outlined by recruiters and experts (Manyika et al. 2017). One interesting element that can be explored is the role of the possible interaction between different skills in explaining the probability of automation for a given occupation. Are soft and hard skills complements or substitutes?

Figure 14 shows the value and the confidence interval of the soft skills coefficient interacting with a dummy that signals the presence of hard skills. The coefficient of soft skills is generally below zero, showing a negative effect on the probability of automation. However, there are some differences when exploring interaction terms. Thinking skills have a larger coefficient when hard skills are not requested while the coefficient becomes less negative when hard skills are requested, suggesting substitutability between skills. However when considering digital skills, we find the opposite result: the negative coefficient becomes larger when digital skills are present, suggesting complementarities between digital and thinking skills. Social interaction skills are always substitutable with hard skills while no clear relationship emerges with attitudes and values. Thinking skills can therefore complement the use of machines and software, making the job less substitutable even for occupations that are typically highly automatable.
Figure 14: Interaction effects between skill requirements

![Figure 14: Interaction effects between skill requirements](image)

Source: WollyBl.

Conclusions

Technical progress, globalisation and the re-organisation of the production process – with outsourcing and offshoring – have radically altered the demand for certain skills. Here, the ageing of the population in advanced economies intensifies the need for continued training, and is likely to affect the structural demand for certain competences, in particular those related to health and elderly care. In such a scenario, the analysis of online vacancies can support the understanding of the labour market dynamics real-time and at very fine-grained level. This is the case of digitalisation, that has a strong impact even on non-ICT professions, in spite of sectors and business areas.

On the other hand, several studies are investigating the degree of automation as a consequence of the technological innovation (robotisation, Industry 4.0, etc.). These studies identify competences that might drive the automation process through a conceptual point of view, by following a top-down approach. Conversely, we aim to empirically validate the correlations (if any) between skills and probability of automation by analysing online job vacancies. In this sense, our approach is completely data-driven. Our preliminary results reveal
that the demand for social and digital skills is related to the probability of automation.

In such a complex and dynamic scenario, the analysis of Big Data related to the labour market, as in the case of job vacancies, can represent a competitive advantage to all labour market specialists and analysts to:

- Deeply understand labour market changes;
- Monitor and identify these changes promptly and at very fine-grained level;
- Support policy making for reducing mismatch between labour market demand and supply.

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2.2. Supply of Skills and Competences and Their Evolution in Different Target Groups of the Labour Market

Generation Z versus the Labour Market: Skills Expectations in a New Era

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Introduction

As the Fourth Industrial Revolution makes its presence felt and, soon enough, four generations will collide in the labour market, the need to design and implement new learning approaches has become critical. In order to understand the specificities of this new socio-economic context, one of the preliminary steps to be taken is to assess the perceptions and align the expectations regarding soft skills and competency development among two of the main actors involved: employers and Generation Z. The purpose of this article is to describe the present regional landscape regarding employer expectations of future Gen Z employees’ soft skills and competences, on the one hand, and Gen Z’s perception of and need for further learning in order to increase its employability and chances for a successful career, on the other.

Several global or country studies indicate that Gen Z expects and values learning opportunities, partly because of age specifics and/or the dynamic digital, social and economic environment. On the other hand, companies that recently felt and dealt with the shock of the millennial cohort’s first years in the workforce expect several soft skills to be either already acquired or further developed by the new wave of employees. This study uses a questionnaire administered to representatives of Gen Z and semi-structured interviews with regional employers. It unveils each side’s top expected and self-perceived skills, as well as a comparison between the respective perceptions of Gen Z and employers regarding the presence of or need for developing important skills for the future
labour market. As this research is one of the first of its kind in Romania, its specific findings may serve as a valuable source of information for employers, the educational system, local authorities and NGOs. Secondly, this paper can be a cornerstone for further extensive research and also for the future alignment of the needs and expectations for creating coherent, feasible learning and development programmes.

There are many demographic categories used to classify social generations based on their common psychological and sociological characteristics. One of the most recent classifications splits generations into five broad categories (Hughes and Burke 2018):

- Traditionalists, or the Silent Generation, born before 1945;
- Baby Boomers, born after WWII until the 1960s;
- Generation X, born between 1965 and 1976;
- Generation Y, or Millennials, born between 1977 and 1995;
- Generation Z, also named iGen or Centennials, which includes all individuals born in 1996 or later, until approximately 2010.

Additionally, some demographers inserted a new category, called Generation Alpha, which comprise individuals born after 2010 (McCrindle 2014) (see Figure 1). Beyond these classifications, which are still under debate within the current literature, one thing is certain: members of each of these generations display similar attitudes, behaviours, preferences, goals, expectations and needs. The similarities between individuals of the same generation are generated by the existence of a shared temporal location, which refers to a generational site or birth cohort; the existence of a shared historical location, which means that a generation is exposed to a common era; and the existence of a shared sociocultural location, meaning that each generation has a generational consciousness (Mannheim 1952).
When different generations meet, conflicts and clashes can occur due to their specific identities. These issues are highly visible in a multigenerational environment such as the labour market. In the labour market, the clash of the generations is a topic of much discussion. At the moment, there are at least three generations in the labour market: Baby Boomers, Generation X and Generation Y. Additionally, individuals belonging to Generation Z are preparing to enter the labour market very soon if not they are already there, as the first representatives of Generation Z have just graduated university.

In this context, a big challenge for employers is to shape the work environment to fit all of these different generations. Employers should understand the wide-ranging work styles of the multi-age labour force, especially as the Fourth Industrial Revolution brings about technological transformations that require new and permanently diversified skills.

The objective of the study was to analyse the self-perceived importance of interpersonal skills by both Generation Z and employers. The following research questions were proposed:

• Which employability skills are considered to be the most important by individuals belonging to Generation Z?
• How do the Gen Z representatives assess themselves in terms of those skills?
Additionally, a third research question was proposed mixing the findings from the previous two with the opinions of professionals:

- Are there any differences between the importance placed on skills by representatives of Gen Z and employers, respectively?

The paper starts with a literature review on the skills of Generation Z in terms of supply and demand, addresses the methodological issues guiding the survey and concludes with the presentation and discussion of the results.

**Literature Review**

Both national and international literature contains abundant forecasts regarding the future of skills, mainly from the point of view of businesses and the emerging Industry 4.0. The global labour market is rapidly reshaping due to innovations in technology and automation, new radical business concepts and strategies, social and economic shifts, human longevity and evolving lifestyle mind-sets (Davies 2011, PWC 2014, WEF 2016). By now, the concept of preparing for jobs that we have not thought of yet has almost become common sense (ManPower 2017, PWC 2014).

Ray Kurzweil’s prediction in 2001 might have been slightly exaggerated. Maybe we will not experience, as he said, 200 years of progress in each of the following 100 years (Kurzweil 2001). Nevertheless, statistics such as an average 60-70-year career span with an average job tenure of 4.5 years (Gratton 2016), two out of five people seeing the traditional career concept totally reshaped in the future (PWC 2014) and 38% of Gen Z expecting to have a job in college (Villa et al. 2017) make us reconsider Kurzweil’s metaphor. In addition, talking about the future of the workforce puts many other practice-derived concepts on the table, like replacing the traditional status of “employee” with the notion of a “member of a professional network” (PWC 2014), new social and life phases like “emerging adulthood” (Arnett 2004) or a “lifelong learning career” (Deloitte 2017). On the other hand, companies’ plans and expectations for future forms of employability also confirm a leapfrogging trend. Bernstein (2016), for instance, notes that we are already facing what ManPower CEO Jonas Prising calls “geolocated pools of skills” and advises companies to bring resource attraction flexibility to a new level by shifting the locations where the

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critical necessary skills are available faster than competitors, which he calls dynamic parsing (Bernstein 2016).

Watching this phenomenon, it seems we are facing a paradox. We live longer and have better life conditions and more opportunities than ever. It would seem we have all the time in the world to learn and adapt. In spite of that, we are moving faster as we are given less time to adjust to this pace than ever before.

Major changes are of great concern to governments, scholars, businesses and employees, especially when increased attention is paid to the younger generations and efforts are made, at least to some extent, to integrate them into the labour force. All of these changes raise important concerns for the learning and development chapter of this puzzle, such as shortened skill cycles (Manpower Group 2017, WEF 2017, Schwartz and Collins 2017), the need for whole new skillsets by 2020 (WEF 2017), talent and/or labour force shortages and the need for new means of learning.

Terms such as “skills stability” (WEF 2016), “lifelong learning”, “learnability nurturing” (Manpower Group 2016) and “open talent economy” (Schwartz and Collins 2017) are already serving as the base concepts for innovation in education, training, research or even business strategies regarding the present and future generations of employees, with countries like Singapore, Finland, the UK or the USA leading broad programmes to support the future of the labour market (WEF 2017).

When conceptualised or actually put into operation nowadays, labour force strategies will have a major impact on Generation Z. Business managers and consultants are reshaping organisational strategies to better prepare organisations for “newcomers”, be they natural or artificial forms of intelligence. As opposed to several years ago, Deloitte notes, executives are placing tremendous importance on career and learning strategies and the focus is moving towards perfecting the organisational competence framework, as the strategic management of competences becomes essential for securing sustainable business goals (Davies 2011, Hecklau 2016, Schwartz and Collins 2017). Moreover, as automation cuts old human jobs, there is an emerging need for HR professionals to differentiate between essential and non-essential human skills in or-
der to properly integrate technology both as a future “worker” and as a valuable training, up-skilling or re-skilling tool (Deloitte 2017).

Speaking of education, learning and training for the younger generations, the World Economic Forum advises looking at or inventing new models that can more effectively contribute to a future workforce that is well-prepared by integrating technology, peer-to-peer learning or early business exposure (WEF 2017). In addition, interdisciplinary training, a focus on transferable skills and implementing Education 3.0 or 4.0 are said to nurture better prepared Millennials, older generations, and especially Generation Z for work-readiness, as “the traditional classroom training model” becomes history (Stuart 2015, Benešová 2017, Schwartz and Collins 2017, Davies 2011).

Looking ahead to the entrance of Generation Z into the labour market and its need for learning and development, opinions regarding the desired future skills and competencies are divided. There are, however, some skills that appear to be cited more often than others.

Although Gen Z is said to bring with it creativity and technological capability (Stuart 2015), youngsters lack a range of skills in the communication area such as interpersonal communication, teamwork or relationship building, writing skills or listening (Weber 2016, Stuart 2015, Half 2015, Schwartz and Collins 2017). It does seem that even the representatives of this generation agree with these statements, admitting that they need to enhance their communication skills to succeed at their future jobs (Villa et al. 2017). Social or emotional intelligence skills are closely related to the above skills, since new Gen Z employees need to learn to build social capital, and adapt their vocabulary as well as their para-verbal and non-verbal language by being aware of people’s emotions in social and business contexts, which in many cases means that they need to be more self-aware in the first place (Davies 2011, Stuart 2015, Half 2015).

As machines will soon replace some human driven tasks, it is said that Gen Z will be asked to show skills like problem solving, decision-making or managing people with more emphasis than other generations before it (Chui et al. 2016). A 2017 Deloitte report refers to the first two of these skills, problem solving and decision-making, along with creativity and project management as “critical human skills now and in the future”, regardless of how much technology advances (Schwartz and Collins 2017). In a 2011 study, Anna Davies and her team
put together a list of the most desired skills for the future, which included the aforementioned skills in addition to critical thinking, trans-disciplinary virtual collaboration, cross-cultural competency and cognitive load management (Davies et al. 2011).

A 2015 Chartered Institute of Personnel and Development study refers to some skills such as confidence, business awareness (commercial skills) and communication to be more challenging to learn than others, also quoting an Ashridge Business School research which additionally mentions acceptance of criticism as an important skill to be developed by youngsters (Stuart 2015). “Working life” skills or “work habits” are also brought to the forefront by these and other authors referring to planning, prioritisation and time management (Half 2015). Bruce Tulgan, gathering the opinions of several professionals, concludes that Gen Z employees will need to work harder on their personal branding, responsibility and positive attitude to succeed in their future careers (Half 2015).

On the other hand, Gen Z seems to have either guessed or already been aware of the demands they will face upon entering the labour market, understanding the need for lifelong learning (Patel 2017), as a continuous cycle and a means of constant development and training (Weber 2016, Hecklau 2016). When comparing soft and hard skills, Gen Z considers the former to be more important in the interview process, for example, as many of them think that they lack real-world business skills (Adecco 2015), in a future business context which, in their vision, will result in a greater nontechnical skills gap (Half 2015).

Although the digital era in which they grew up may affect the development of some of the skills needed for the future, the use of internet, for instance, may be more beneficial than we think. In a 2016 study, skills like problem-solving, information gathering or proactive study have been proven to be enhanced in tech savvy youngsters (Issa 2016), with 85% of Gen Z using online videos to learn new skills every week (Villa et al. 2017).

**Methodology**

The study used a mixed methodology, integrating quantitative and qualitative methods. In order to address the first research questions, data was collected from members of Gen Z using a questionnaire. The questionnaire was carried...
out using computer-assisted web interviewing (CAWI). Data was gathered following confidentiality procedures. The questionnaire consisted of ten questions referring to technical and generic skills, going in depth on perceptions regarding interpersonal skills. The answers were rated on a five-point Likert scale from 1 (very important) to 5 (not at all important). The reliability of the questionnaire was assessed by computing the Cronbach alpha. Data from the questionnaires was manipulated and analysed using SPSS for Windows.

Additionally, semi-structured interviews were carried out with representatives of the employers. The respondents were selected because they had work experience in multigenerational labour environments. The interviewed employers represent important companies in the regional private sector as well as a diversity of sectors and ages. The interview was designed to provide data about the importance of various categories of skills required for recruiting graduates in their company and comprised seven questions. Nine representatives of employers were interviewed. Respondents were asked questions face to face, given the option to not respond to questions they did not want to answer, and were permitted to discuss certain themes in greater depth than other themes, if they desired. They were also permitted to focus their responses on narrating their experiences in connection to the questions asked. The responses were categorised and classified using NVivo.

Finally, in order to compare the views of Gen Z and employers, the interview results were triangulated with the survey results. This allowed us to better evaluate the divergence and convergence between Gen Z and employers in terms of perceived or expected skills. Consequently, the scope of our research was broad, descriptive, comprehensive and exploratory.

**Results and Discussion**

A total of 146 people responded to the survey. Table 1 shows the demographic composition of the population surveyed. The rate of completion for each dimension of the questionnaire was over 97%. The value of the Cronbach alpha was 0.962, allowing us to analyse the findings of this study with confidence.
The analyses in this study are largely descriptive. First, we examined the demographic composition of the total sample, and then we analysed the results for males and females separately (see Table 1).

### Table 1: Demographic composition

<table>
<thead>
<tr>
<th>Gender</th>
<th>Origin</th>
<th>School</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>32.6</td>
<td>11.5</td>
<td>44.1</td>
</tr>
<tr>
<td>Female</td>
<td>41.6</td>
<td>14.3</td>
<td>55.9</td>
</tr>
<tr>
<td>Total</td>
<td>74.2</td>
<td>25.8</td>
<td>100%</td>
</tr>
</tbody>
</table>


Even though the sample is not representative for the whole universe of the population, the results offer a valuable insight into the characteristics of Gen Z. We particularly focused on the career decision-making of Gen Z and their opinions regarding the skills that are important for employability.

Job choice was broadly measured by a question that asked respondents to situate themselves in relation to a range of factors that matter in choosing a job, such as: income, social prestige, stability, etc., using a 5-point scale with responses ranging from “1 – it influences me in a great extent” to “5 – it does not influence me at all” (see Table 2).
Table 2: Job choice

<table>
<thead>
<tr>
<th>Expectations</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quickly earning an above-average income</td>
<td>146</td>
<td>2.42</td>
<td>1.247</td>
</tr>
<tr>
<td>Social status/Job social prestige</td>
<td>146</td>
<td>2.58</td>
<td>1.282</td>
</tr>
<tr>
<td>Job security</td>
<td>146</td>
<td>2.13</td>
<td>1.346</td>
</tr>
<tr>
<td>Learning on the job and growing within the company</td>
<td>146</td>
<td>2.21</td>
<td>1.398</td>
</tr>
<tr>
<td>Internal mobility</td>
<td>146</td>
<td>2.42</td>
<td>1.204</td>
</tr>
<tr>
<td>Free time after work</td>
<td>146</td>
<td>2.18</td>
<td>1.331</td>
</tr>
<tr>
<td>Working in teams</td>
<td>146</td>
<td>2.61</td>
<td>1.206</td>
</tr>
<tr>
<td>Using already acquired knowledge</td>
<td>146</td>
<td>2.23</td>
<td>1.357</td>
</tr>
<tr>
<td>A variety of activities</td>
<td>146</td>
<td>2.33</td>
<td>1.231</td>
</tr>
<tr>
<td>Work environment with regards to colleagues (organisational culture)</td>
<td>146</td>
<td>2.12</td>
<td>1.409</td>
</tr>
<tr>
<td>Work environment with regards to location and space design</td>
<td>146</td>
<td>2.38</td>
<td>1.237</td>
</tr>
</tbody>
</table>


Half of all respondents (50%) pointed out that colleagues are very important when choosing a job (M=2.12, SD=1.409). Job security was next (45%), indicating a strong desire for a stable job (M=2.13, SD=1.346), followed by having free time after work (43%). Surprisingly, these Top 3 most important expectations did not match with the opinions of professionals. Youngsters expect to learn on the job (41%), which suites the employers’ expectations, while also using the knowledge they already have (39%). Contrary to the employers’ opinion, which ranked the financial desires of Gen Z at the top of their list, only 30% of our respondents said that quickly earning a good income is very important (M=2.42, SD=1.247). The desire to learn on the job sits at the same position (30%).

The importance of skills for employability were assessed through individual items asking respondents to indicate their agreement with 15 statements on a
5-point scale with responses ranging from “1 – strongly agree” to “5 – strongly disagree” (see Table 3).

Table 3: Opinions concerning the importance of skills for employability

<table>
<thead>
<tr>
<th>Skills</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team work/building relationships</td>
<td>146</td>
<td>1.79</td>
<td>1.026</td>
</tr>
<tr>
<td>Problem-solving/decision-making</td>
<td>146</td>
<td>1.72</td>
<td>1.035</td>
</tr>
<tr>
<td>Creativity/innovation</td>
<td>146</td>
<td>1.93</td>
<td>1.037</td>
</tr>
<tr>
<td>Active listening/acceptance of criticism</td>
<td>146</td>
<td>1.81</td>
<td>1.072</td>
</tr>
<tr>
<td>Responsibility</td>
<td>146</td>
<td>1.57</td>
<td>1.105</td>
</tr>
<tr>
<td>Flexibility and adaptive thinking</td>
<td>146</td>
<td>1.64</td>
<td>1.130</td>
</tr>
<tr>
<td>Self-awareness</td>
<td>146</td>
<td>1.94</td>
<td>1.131</td>
</tr>
<tr>
<td>Cross-cultural understanding</td>
<td>146</td>
<td>2.40</td>
<td>.957</td>
</tr>
<tr>
<td>Industry/business knowledge</td>
<td>146</td>
<td>2.15</td>
<td>1.050</td>
</tr>
<tr>
<td>Critical/analytical/abstract thinking</td>
<td>146</td>
<td>2.03</td>
<td>1.109</td>
</tr>
<tr>
<td>Lifelong learning mind-set</td>
<td>146</td>
<td>1.83</td>
<td>1.144</td>
</tr>
<tr>
<td>Time management/planning/prioritisation</td>
<td>146</td>
<td>1.84</td>
<td>1.061</td>
</tr>
<tr>
<td>Working under pressure/stress management</td>
<td>146</td>
<td>1.96</td>
<td>1.204</td>
</tr>
<tr>
<td>Communication skills (written and verbal)</td>
<td>146</td>
<td>1.60</td>
<td>1.119</td>
</tr>
<tr>
<td>Work autonomy</td>
<td>146</td>
<td>1.89</td>
<td>1.215</td>
</tr>
</tbody>
</table>


69.8% of Gen Z representatives ranked being responsible as the most important skill for being more employable (M=1.57, SD=1.105), followed very closely by knowing how to communicate (69%, M=1.6, SD=1.119). Being flexible and open to new ways of thinking and doing things comes in the third place with 67% (M=1.64, SD=1.130). Gen Z also thinks that knowing how to efficiently solve a problem and having a lifelong learning mind-set are of great importance to be a desirable candidate, with both skills ranking the same, at 53%. The list ends with skills such as industry/ business knowledge (31%) and cross-cultural understanding (17.2%).
On the other hand, we wanted to assess the self-perception of Gen Z regarding the skills they already possess using the same 15 statements. The respondents were asked to grade them from “1 – I need to work hard on this skill” to “5 – I already possess this skill” (see Table 4).

Table 4: Self-perceived level of employability

<table>
<thead>
<tr>
<th>Skills</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team work/building relationships</td>
<td>146</td>
<td>2.90</td>
<td>1.324</td>
</tr>
<tr>
<td>Problem-solving/decision-making</td>
<td>146</td>
<td>2.95</td>
<td>1.282</td>
</tr>
<tr>
<td>Creativity/innovation</td>
<td>146</td>
<td>2.86</td>
<td>1.316</td>
</tr>
<tr>
<td>Active listening/acceptance of criticism</td>
<td>146</td>
<td>2.87</td>
<td>1.347</td>
</tr>
<tr>
<td>Responsibility</td>
<td>146</td>
<td>3.00</td>
<td>1.408</td>
</tr>
<tr>
<td>Flexibility and adaptive thinking</td>
<td>146</td>
<td>2.98</td>
<td>1.344</td>
</tr>
<tr>
<td>Self-awareness</td>
<td>146</td>
<td>2.75</td>
<td>1.301</td>
</tr>
<tr>
<td>Cross-cultural understanding</td>
<td>146</td>
<td>2.95</td>
<td>1.088</td>
</tr>
<tr>
<td>Industry/business knowledge</td>
<td>146</td>
<td>2.30</td>
<td>1.197</td>
</tr>
<tr>
<td>Critical/analytical/abstract thinking</td>
<td>146</td>
<td>2.93</td>
<td>1.322</td>
</tr>
<tr>
<td>Lifelong learning mind-set</td>
<td>146</td>
<td>2.85</td>
<td>1.243</td>
</tr>
<tr>
<td>Time management/planning/prioritisation</td>
<td>146</td>
<td>2.69</td>
<td>1.351</td>
</tr>
<tr>
<td>Working under pressure/stress management</td>
<td>146</td>
<td>2.78</td>
<td>1.246</td>
</tr>
<tr>
<td>Communication skills (written and verbal)</td>
<td>146</td>
<td>3.01</td>
<td>1.405</td>
</tr>
<tr>
<td>Work autonomy</td>
<td>146</td>
<td>3.12</td>
<td>1.428</td>
</tr>
</tbody>
</table>


Gen Z believes that they first have to enrich their industry knowledge, with this skill having the highest score in our survey (59% ranked this skill with either 1 or 2 points; M=2.3, SD=1.197). They also feel that they need to become more self-aware (50%, M=2.45, SD=1.301) and learn to prioritise and manage their time better (49% of our respondents gave it a score of “1” or “2”). Responsibility and communication skills, which were the highest ranked skills in the previous question, ranked number 9 and number 7 this time, which could mean that
members of Gen Z consider themselves to be in possession of these skills already. In fact, the two sets of results strongly differ in rankings.

In order to find out the opinion of employers we conducted nine semi-structured interviews, which were analysed using NVivo 12 qualitative data analysis software. The analysis was based on the a priori coding framework used in the questionnaire. Thus, indicative codes developed in NVivo included the list of skills used in the questionnaire as follows: working under pressure, time management, communication, cross-cultural understanding, problem-solving, self-awareness, active listening, flexibility, industry knowledge, work autonomy, critical thinking, creativity, lifelong learning, responsibility and teamwork. The codes were conceptually linked to each other in order to explore their interrelationships. The absolute frequency for each code was placed on a linear scale from “less skilled” to “more skilled”.

The relationship between the self-perceived skills of Gen Z, as reported by the questionnaire, and the employer evaluation of the presence or lack of skills detailed in interviews is presented in Figure 2.
Figure 2: The relationship between Generation Z’s self-perceived skills and employer expectations

Conclusions

The comparison between the two perceptions, with Gen Z on one side versus employers on the other, reveals both similarities and divergences. First, we could conclude that representatives of Gen Z do have a good level of self-perception, since they ranked themselves highly on the vast majority of the skills.
soft skills, resulting in a rather compact distribution. The only notable exception was the “Industry knowledge” item, which ranked the lowest, as can be seen in Figure 2. This matches previous opinions about the lack of updated and reality-checked business knowledge (Adecco 2015). On the other hand, the employers’ overall rankings were more scattered, with the “Lifelong learning” item being the exception in a positive way. The contrast between the overall images may be due to multiple factors, among which we can speculate high self-esteem among members of Gen Z, a lack of real and practical understanding of some skills (for example, what it means to think critically), disparities between what responsibility means for a teenager or a young adult versus an employee/employer, as well as differences in the life and work experience between the two groups. However, another important facet of this result may be the natural tendency of stereotyping which may have affected employers’ opinions, bearing in mind the age/generation gap between the two groups (the questioned employers were as much as 20 years older than Gen Z respondents).

Secondly, when speaking of each of the assessed skills, general similarities in opinions can be noticed. Members of Gen Z think they know how to communicate well on the written and spoken levels, and professionals agree. However, this finding does not match other previous data mentioned in the literature review, which states that Gen Z should adapt its vocabulary, para-verbal and non-verbal language to perform better in a business context (Davies 2011, Stuart 2015, Half 2015).

Opinions concerning general communication skills, active listening and cross-cultural skills display similar patterns on both sides of the graphic, which is not surprising, since we could assume these particular three groups of competences to have common roots in the communication area. However, based on this assumption, one could also think that teamwork skills should have had the same similar result, but this is not the case. It seems that employers believe that Gen Z has a lot to improve in terms of working with others, as does some of the previous research (Weber 2016, Stuart 2015, Half 2015, Schwartz and Collins 2017).

Professionals also state that youngsters must improve their time management, ability to work under pressure and flexibility, where the contrast between the
two perceptions is quite great. Interestingly enough, professionals assume a very well developed lifelong learning mind-set among Gen Z, at a noticeable distance from the generation’s own viewpoint.

While this exploratory study can enrich the existing literature on Gen Z, extend our understanding of their self-perceived skills and the expectations of employers, it has some limitations. The study was limited only to members of Generation Z from the western region of Romania. The employers interviewed were also selected from the same area, and the interviews were exclusively exploratory, and therefore not representative of all employers. The size of the sample and the area covered reduces the generalisability of the findings to the entire Romanian Gen Z.

The results will serve as valuable source of information for employers, the educational system, local authorities and NGOs seeking to ensure a better future alignment between needs and expectations in order to create coherent and feasible learning and development programs. Moreover, the research could be a cornerstone for further extensive research using our Mixed Methods approach, and also taking into consideration cultural, national or regional generational features and disparities.

References


Motherhood as Period of Professional Growth

Patrizio Di Nicola and Mariaroberta Cioce

Introduction

According to the President of the Statistical Institute of Italy, Giorgio Alleva, in the second quarter of 2017 the employment rate for 25-49-year-old women living alone was 81.1%. However, only 70.8% of women who lived with their partner and did not have children were employed. Furthermore, merely 56.4% of women who had one pre-schooler at home and as little as 39% of women with two or more pre-schoolers were in employment (Alleva 2017). This situation is widespread over several countries: the U.S. Bureau of Labor Statistics, for example, reported a few days ago that in 2017, the labour force participation rate of mothers with children under six years of age (65.1 %) was lower than the rate of those whose youngest child was six to 17 years old (75.7%) (Bureau of Labor Statistics 2018).

In Italy, there are several reasons that lead mothers to quit productive work. One common reason is the difficulty of balancing work time with family care due to the lack of adequate services for children at reasonable costs. But other reasons are not related to the framework conditions, but to the decisions of employers who consider women no longer productive and attentive to work after becoming mother. Some stereotypes come up already in the job interview. Many women are asked questions about the desire for motherhood and at the time of recruitment, some are forced to sign an open resignation letter to be used if she decides to go on maternity leave. Both of these practices, in addition to being discriminatory, are illegal in Italy, but are still used by some HR managers, especially in SMEs. These discriminatory practices do not only

1 Patrizio Di Nicola wrote the introduction and reflected on the motherhood as a phase of professional growth involving new tasks and skills/abilities, while Mariaroberta Cioce described what happens to the brain during pregnancy and maternity, presented the approach adopted in the MAAM project and summed up the line of argument.

2 Even in the UK 54,000 mothers are forced to resign each year (Cassidy 2015). The situation could be similar in many other countries.
affect women; they have an effect on Italy’s entire economy. Job precariousness among young women and the risk of being fired contribute to making Italy the country with one of the lowest birth rates in the world. According to Istat, the number of live births dropped to 464,000 in 2017, which is 2% less than in 2016: a new all-time low (Istat 2018).

Women represent an important economic force, allowing families to have two incomes and avoid the risk of poverty. The increase in working mothers leads to GDP growth (+3% in GDP for every one million working women), as higher household income produces increased consumption, investments and jobs in the service sector. Furthermore, each working mother creates jobs for paediatricians, nursery workers and babysitters, etc. because much of the income earned by women is spent on childcare.³

Companies do not realise that maternity requires women to become more trained, competent and prepared, because the experience of motherhood creates new important resources and skills that can be useful even in a workplace environment. Mothers who hold a managerial position learn the importance of a high quality of life, well-being, tolerance, teamwork and many others important managerial skills that are normally gained during Master’s programmes in costly business schools. Instead, after the birth of the child women are trained in leadership, empathy and emotional intelligence, all organisational and social skills that are required in the world of work. A person who must take care of another individual becomes more autonomous, strong and determined.

What Happens to the Brain During Pregnancy and Maternity?

During pregnancy, a woman’s body changes and prepares to welcome a new life. This process also involves the brain, which is a plastic organ and therefore exquisitely sensitive to the changes that occur during pregnancy and ready to adapt in order to nourish, grow and educate the new life on its way. The hu-

³ In the U.S., the increase in the number of hours worked by women in 2012 raised the GDP by about 11% (Appelbaum et al 2014).
man brain is a wonderful organ and changes its structure and activity when faced with a challenge like motherhood, for example, during which the woman undergoes behavioural changes as a result of hormones. The coordination of hormonal and neurochemical systems induce alterations to the brain that make it more alert and attentive to the needs of other people, improve the memory and prepare it for learning those new skills that will be required of them, focusing on care and well-being. During pregnancy, birth and lactation, major hormonal fluctuations occur in the brain as a result of protein synthesis; in this long period, the constant production of two reproductive hormones, oestrogen and progesterone, intensify maternal behaviours in anticipation of the birth and the needs of motherhood. Added to this is the increase in the size of the cell bodies of neurons, which is useful for governing maternal behaviour and regulating memory, learning and responses to stimuli. There are many areas of the brain involved in these changes such as those of thought, memory, learning, control and the response to fear and stress, which are all areas involved in the care, management and protection of children. Endorphins produced by the hypothalamus, a preoptic medial area of the brain responsible for maternal behaviour, are pain-relieving proteins, which relieve pain during pregnancy and especially during birth and prepare for maternal behaviour (Ellison 2005). These proteins create the mother’s attachment to the child because taking care of him activates the areas of the brain that regulate reward. This continuous attachment consistently releases small amounts of endorphins, allowing the relationship of care and attention to continue. Also contributing to this task are the high levels of cortisol, the hormone that makes the typical child’s scent enjoyable for mothers. Cortisol leads to increased sensory abilities, which allow mothers to recognise the many sounds and smells unique to their children, developing greater attention, vigilance and sensitivity. At the time of birth, oxytocin, an important hormone called “the hormone of relationships”, triggers the contractions for birth. Oxytocin also has the effect of increasing generosity and empathy. During breastfeeding, prolactin is produced, which continues to stimulate maternal behaviour. These substances influence different areas of the brain in different ways but for the same purpose, making women ready to learn the new skills required by this new challenge. Even the neural pathways of the thalamus, a brain relay station that transmits most of the sensory stimuli, and the cingulate cortex, which regu-
lates emotions, are involved in the regulation of maternal behaviour. These hormonal changes lead to benefits for women, such as reduced anxiety and fear. Improvements are also found in spatial learning and memory, which allows women to achieve goals at a greater speed. All of these changes occurring during the nine months of pregnancy and maternity bring long-term benefits (Kinsley and Lambert 2006).

Maternal behaviours are the main drivers of human brain evolution, serving above all to improve spatial learning and memory and alleviate fear and stress. Thanks to all behavioural changes being mainly focused on the care and well-being of the child, the acquired skills, such as successful leadership, which is nurtured by sensitivity to the needs of others and constant vigilance for challenges and threats, can also be applied in the workplace. One of the most important skills for motherhood is multitasking, or the ability to manage multiple activities at the same time. Is this not a crucial skill for a manager?

**Motherhood as Professional Growth**

To date, maternity is perceived by managers as a burden, a period in which women lose their professional skills and knowledge, slowing down and hindering their career. Women therefore return to work demotivated, do not feel valued and achieve less than they could. Instead, managers should look at motherhood as a period of growth, both personal and professional, that features the extraordinary development of skills that are highly sought-after on the job. Women who return to work after maternity leave are more trained and competent as a result of the transformations that have affected their lives and have enabled them to develop essential skills that fit into the competence framework of the firm. During maternity leave, a woman develops parenting, organisational and management skills that become the basis for building leadership practices. As we saw in the previous paragraph, by nature, the woman’s brain starts working more and more effectively during pregnancy. With the arrival of the child, the energy increases and women develop a special sensitivity, mental agility and desire to care, all characteristics applicable to the world of work. The ability to delegate and be flexible is fundamental for the organisation, making it easy to collaborate on projects and create unity within a work
team, a climate that is not always easy to implement. A mother develops a complex, articulated vision of situations, learns to work with the resources and potential available and also assumes a leadership role by coordinating and managing an equilibrium within the family unit. Many mothers learn to coordinate the help of husbands or companions, grandparents and other family members who wish to support her in taking care of the child. Empathy and the ability to understand new languages are vital skills in the activity of care, which requires an almost exclusive relationship between mother and child and a quick understanding for languages, such as those of the child, that are in constant change and evolution. This ability can be applied in many contexts in the office. The skills that a child allows the mother to learn and then bring to the office are many: improvisation, prioritisation, tolerance, etc. For instance, mothers learn with their children how use subtle persuasion to achieve their goal, a method that can be applied when leading a team.

All these skills and characteristics make it possible to define maternity as a training path that teaches generative leadership, which is the ability to help others grow and manage all the aspects of a project. Without realising it, many women develop important management skills during maternity, such as time management, organisation and planning, patience, tenacity, active listening, multitasking and outthinking. The concept of multitasking is associated with a broader value, understood as a succession of activities that follow one another and require rapid changes in attention. We can now speak of “roundness”, which is the sum of three capacities: knowing how to focus even for short periods, knowing how to quickly recognise priorities and being able to recognise quickly which of these two skills apply. Roundness allows women to be more organised in managing everything.

The New Skills and Abilities

As we have seen, motherhood is a very intense period in which women acquire many skills and competences that they learn in their role as mothers. We now analyse those that best apply to work such as leadership, empathy, problem-solving and change management.
Leadership

Mothers who take care of a child develop so-called “generative leadership” skills that allow them to grow and keep track of all aspects of a project. This first happens during pregnancy and their ability improves at the time of birth, when even the midwives in the hospital ask the woman what to do, if she wants to nurse the child, how to dress it, etc. This is just the beginning of an endless series of decisions that the mother must make on every topic related to the child. Recently, a survey of female managers noted that motherhood can be seen as a metaphor for leadership as well as a training field (Erkut 2006). The terminology used by these women in discussing their work roles is the same one they use to talk about motherhood, their role as a mother and their family experiences. Men, on the other hand, use military and sport-related terms related to power, success, risk and confrontation to talk about leadership. The use of family terminology threatens to make women appear unprofessional and focused on themselves. However, thanks to the combination of leadership and family roles, women have a democratic, participatory and people-oriented attitude, are concerned with the well-being and career development of their collaborators and are ready to share power and information. With the metaphor of the “good mother”, one can speak of exemplary leadership because motherhood reinforces leadership. Researchers call motherhood “a gym for leadership” because it constantly trains the skills required in the workplace; managing a group of children allows you to train and manage a working team (Evans 2016). Motherhood is a daily gym that allows women to train for victory and bring teams to a competitive level. At home, with family and children, the woman is trained in care and attention to the people who are part of her staff and the work they do, supervising progress, pointing out when the work is good and then focusing on the positive side of things and taking care of the office and the well-being of the people who are in it. All of these activities are carried out with kindness; mothers are strong and intelligent without being aggressive. Applying parenting practices in the workplace allows one to work better with his or her employees, understand how to best coordinate work, promote talent and allow people to grow by assigning tasks and encouraging them to deliver but also ask for help in case of difficulty. Time management is another of those abilities that having children teaches very well: those who become parents are forced to learn how to define time be-
cause children do not wait and want to be told what to do by their parents. Team-building is the basis of motherhood: with the birth of the child one must learn how to manage the family and all of the needs that change with the newcomer and set priorities. Leadership is a capacity inherent in everyone, but you cannot teach people how to use it; the only way to learn is to put it into practice with experiences such as motherhood.

This training, however, does not seem to be recognised by companies, who do not appreciate daily life experience as a driver of leadership development and therefore do not create situations and contexts that allow women to transfer this ability into the business context and train it further. This makes employees feel ignored, and companies are deprived of strong, creative leadership by ignoring the cultural capital of every employee. Recognising motherhood as a metaphor and a training moment for leadership would allow women to enter a world that is still considered to be male-dominated.

Empathy

Empathy is the ability to recognise and understand the feelings of others. For mothers, it is essential to be able to understand the needs of their child. In the first year of the child’s life (and beyond), the mother will always be asked what the child needs and how to satisfy them. Mothers must be quick to understand problems and find solutions. Later, she must aid the child in developing the ability to take care of the needs of others. The child, under the guidance of the mother, will soon learn how to play, share and help others, entering society with a developed relationship skills. Empathy is innate in everyone and resides in the limbic system of the brain, an area that controls memory, emotions and instinct. Empathy is necessary for survival, because it allows us to communicate and collaborate. Mothers learn empathy themselves and can then explain this complicated subject to others, which means they have an important life skill in their hands. A woman who returns to work after maternity leave will be able to dialogue and understand others much better, be part of a working team, collaborate calmly with others and pursue goals. She will be an excellent leader who is able to understand the needs of the people who are part of their staff and ensure their well-being. She will thus be able to gain the trust of her colleagues, creating a healthy and pleasant environment for work. For this reason, empathy is among the most important factors for companies, managers,
leaders and successful entrepreneurs. Empathy allows people to widen their point of view, understand the difficulties experienced by others, not be critical of others and have sincere and trusting relationships. It is necessary to collaborate in order to achieve satisfying results in life, and empathy is essential for this type of relationship.

Problem-solving

Problem solving is the ability to analyse a problematic situation in order to identify and implement the best solution. This is often asked of a mother. When there is a child at home, the unexpected is always waiting around the corner, and knowing how to make decisions is the basis for managing everything properly. To develop problem-solving skills one must have a sense of responsibility, which is also a fundamental component in the decision to give birth to a child. This sense of responsibility can be translated into the work as the ability to be safer, more assertive and determined to affirm and defend one’s opinions. Having responsibility for decisions allows you to get straight to the core of the situation effectively and directly. It is important to make fast decisions: caretaking teaches people to simplify the complexities that arise and facilitates the understanding of situations. A decision made in a rapidly changing environment may be wrong, but this should not be a problem, because one must be allowed to make mistakes: many decisions are made under uncertainty and therefore the managers have to be prepared to try, fail and start again. A mother who must make decisions needs the help of other members of the family; it is therefore important to know how to involve the entire family and to study problems and opportunities with them.

Change Management

Change management is a process of transformation from a present to a desired future organisation of the firm. It is a very difficult undertaking because, according to Kurt Lewin (1947) – one of pioneers of social psychology – it requires a three-stage process, known as the “Unfreeze – Change – Refreeze” model, to manage the human impact of transformation. Who better than a mother, who is required to manage the greatest change of her life and sees her body, habits and timing change, to handle a change management situation? A child changes every day and so does its schedules, needs and contingencies, so
a mother must be ready to deal with these changes. A mother’s daily life is full of decisions, unexpected events and curiosities, which teach her resilience, flexibility and firmness. All of this helps to manage stress better, which is a very useful ability in the ever-changing workplace. When a problematic situation arises, it is important to know how to change the mental scheme in order to avoid panicking and reach the goal⁴.

Perceptive Capacities

Motherhood makes it possible to enhance perceptive and sensory capacities. Mothers are always vigilant about what happens around them and their children in order to be more responsive to the needs of the child and ready to protect them at all times. Heightened perception allows them to understand what a baby needs from its cry and if he or she is sick or throwing a tantrum. From experience, the woman quickly learns to react immediately. The auditory system, which is already more sensitive in women than men, certainly benefits from this enhancement and becomes more attentive to certain sounds with motherhood. A woman’s brain becomes more alert to the world by enhancing the ability to listen. Along with this ability, mothers also learn patience because children are often poorly understood, especially if one is in a hurry. Learning to stop and listen is the basis for understanding. Efficient listening is very useful in the workplace for understanding the needs of colleagues and employees and reducing explanations and listening time by focusing carefully and patiently on what others are trying to communicate to you. Vision is also upgraded, as mothers learn to be ready at all times and keep the surrounding environment under control. The strengthening of these senses gives the woman a global view of situations and helps them analyse every aspect of the situation. For this reason, when mothers are working on a project, they will develop an all-encompassing attentive and precise capacity to analyse situations.

⁴ Some, referring to the bankruptcy of Lehman Brothers investment bank, asked “whether we would be in the same mess today if Lehman Brothers had been Lehman Sisters” (Lagarde 2010). However, other researchers affirm that there is a gender angle to the financial crisis, but that it is not about “differences” in traits that men and women bring with them to their jobs (Nelson 2012).
Efficiency

The intense emotional training required by motherhood allows women to become more efficient. The maternal instinct is a long-term resource that can be used in different situations of life, including both personal situations and workplace scenarios. All of the skills and abilities discussed above give an idea of how efficient a woman can become in several areas: listening, managing time, communicating, problem solving, managing work groups, multitasking and concentrating on essential aspects of the job. From some points of view, mothers are more reliable, focused and organised. They manage to be productive and carry out many tasks in a short period of time.

The MAAM Project: Maternity as a Master

Many woman are not aware of how important and profitable the period of maternity and childhood is, what changes they have experienced, or the skills and abilities they have developed. Even employers must be convinced that motherhood is not a period of loss, but a real moment of personal and professional growth and development. These are the goals of the project “MAAM: Maternity as a Master”, which was created to make women and firms more aware of the soft skills taught and acquired during maternity (Vitullo and Zezza 2014). As the authors of the project stated in an interview, “to take care of and raise a growing human being is the most instructive and vital leadership experience” (Ghelma 2015). Motherhood implies an increase in relational skills, emotional resources and the ability to transmit these capacities from one area to another, a process that Vitullo and Zezza (2014) define as “transilience” (from “transition” and “resilience”). Transilience is a meta-competence that allows the fluid passage of energies and skills between different spheres of a woman’s life, from personal life to work and vice versa. To make women aware of the skills and abilities they have developed and how they can be put into practice in their professional lives, MAAM created a learning method called Life-based Learning, which develops a multidimensional perspective applicable to the current complexity of the world of work. Each experience is an opportunity to develop skills that become personal resources and can be used in many scenarios in life. According to the authors, female managers have developed four basic
skills for being leaders: making room, being productive, caring and letting go. All of these activities are included in the months of pregnancy and caring for the newborn and must be seen as a highly qualifying training experience.

The MAAM digital platform is rich in multimedia content, thoughts, exercises and reflections that create a path to accompany women through their maternity experience and goes beyond the rigidity of traditional training with support for managing these changes and a guide to transferring the skills acquired during maternity into the working environment. Since September 2016, the MAAM approach has been adopted by many national and international companies, and since January 2017, even fathers can follow a path on the platform dedicated to them. Among the first institutions to propose the MAAM approach to its employees were the Province of Trento and the Municipality of Milan.

Conclusions

As we have argued, the changes that occur in a woman’s brain make them predisposed to learning in addition to strengthening and developing many soft skills also required in the workplace. For this reason, companies should start looking at their employees’ daily lives, and their parenting in particular, not as moments of loss for their capabilities, but as a period of growth and training that will allow firms to have workers that are highly skilled and more productive because raising and educating a child can be equivalent to earning a Master’s degree. Firms must stop making women feel defective and discriminating against them because they are absent from work due to a child’s illness or because they are mothers. Integration the skills learned in the different phases of life enriches a person by making them more competent. In conclusion, according to MAAM founder Riccarda Zezza (2015), a firm must hire a woman:

“Because she will not make meetings last longer than necessary and will not send useless e-mails. Time is too precious! Because she will understand even the things that are not said, and she will probably be protective of her colleagues in difficulty, even when it is not convenient. Because she sees the world as it is in everyday life, but also imagines how it could be for members of the next generations that she already knows by name and surname (and shoe size). Because she is used to solving more than one problem at a time, managing the discomfort of herself and others, gaining strength...
and reacting to difficult times. Because she knows the meaning of the words ‘team-
building’ very well. Because she wants everything to work in the best possible way.
Because, even after a difficult day at the office, at home a mother will find different
problems that will distract her and put everything back into perspective”.

However, it first must be made possible for the resources and skills that wom-
en learn during motherhood to be developed in an adequate and profitable
way within a stimulating working environment in which the firm’s manage-
ment maintains an open mind.

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Replay-VET: Up-skilling People with Low Qualifications to Improve Their Employability and Cover Future Replacement Positions

_Eugenia Atin and Raquel Serrano_

In the framework of an ERASMUS+ strategic partnership, eight members of the European Network on Regional Labour Market Monitoring (EN RLMM) are working together on the Replay-VET project with the aim of strengthening the skills of less-qualified people. The project has been specifically conceived to provide more effective opportunities for low-skilled or low-educated people in order for them to acquire or develop those skills through initial and continuing vocational training.

The inclusion of people from disadvantaged backgrounds and people with low skill levels is an important challenge in the implementation of European policies for growth, jobs and social inclusion. The new knowledge economy may be defined by highly skilled workers, but there continues to be a significant demand for low- and intermediate-skilled workers. Many of the low-skill, high-manpower jobs have changed or are at a risk of disappearing as a result of automation and digitalisation. Furthermore, the ageing of the EU workforce means that the number of workers leaving jobs that need to be replaced will increase greatly. Such replacement gives opportunities for the low-skilled and those outside of the labour market.

Supporting and up-skilling low-skilled people through the VET system can help to tackle these challenges and equip people with the skills required by the labour market and the economy. The Replay-VET project will do this specifically by utilising the many job opportunities in Europe resulting from expansion and replacement demand by identifying the major challenges as well as the job opportunities, best practices and strategies addressing the training of low-skilled people in order to take advantage of concrete opportunities in selected sectors and occupations.
Replay-VET promotes a structured inter-regional and cross-border co-operation enhancing the commitment of local and regional public authorities with the participation of public bodies active in the labour market as well as knowledge organisations active in innovative practices. The issue of labour market integration for low-skilled people and the challenge of covering future replacement demand is a Europe-wide issue.

The partners of the Replay-Vet project, Prospektiker (ES), University of Exeter (UK), IWAK/Centre of Goethe University Frankfurt (DE), CRISP/University of Milano-Bicocca (IT), Narodní Vzdělávací Fond (CZ), University of Stirling (UK), Céreq (FR) and Lanbide (ES), have been working together since December 2016 to build the tool kit of strategies that will be presented in Exeter this year at the Annual Conference of the EN RLMM.

During the first year of the project we captured the needed skills and competencies for the low-qualified with qualitative and quantitative methods. Furthermore, we identified approaches for developing these skills.

**Background**

The emerging knowledge economy is one in which many companies are focused on raising productivity through labour saving techniques and hiring highly skilled workers that can help drive innovation. It is very likely that these trends will be enhanced by changes in organisation of work and the implementation of tasks arising from technological and organisational change, among other factors. Although the replacement vacancies are going to increase, the job opportunities cannot be identified precisely and it is difficult to forecast and identify the skills that will be needed in the near future.

Our project is focused on low-skilled people (including workers, the long-term unemployed, young people, migrants, etc.) as a specific target group. The population with low qualifications was defined as those older than 16 years with educational levels ranging from ISCED 0 to ISCED 2, which include preschool education (ISCED 0), primary education or the first stage of basic education (ISCED 1) and the first cycle of secondary education or second cycle of basic education (ISCED 2). In Europe, there remains a large section of the population with low-level qualifications for whom there will not be employment op-
opportunities unless these groups are able to boost their skills and qualification levels significantly for entering into and remain in the labour market. At the end of 2015, there were 43,802,200 low-skilled people (Eurostat 2015). Replay-VET tries to enhance the access, participation and performance of these disadvantaged learners and facilitate the transitions between different levels and types of education and training, from education/training to the world of work, and/or from one form of employment to another.

Understanding our changing labour markets, the demand for skills and the opportunities within it and the constraints and existing barriers related to professional training is pivotal in designing educational policy and to Europe’s future.

**Challenges Addressed by the Replay-VET Project**

Combating rising levels of unemployment in adults and young people has become one of the most urgent tasks for European governments. Supporting and up-skilling low-skilled people through the VET system can help tackle these challenges and equip people with the skills required by the labour market and the economy. Our project addressed this specifically by utilising the many job opportunities in Europe resulting from replacement demand, providing the disadvantaged and low-skilled with targeted opportunities to acquire the VET skills to cover these replacement vacancies.

Cedefop’s latest ten-year forecast indicates over 107 million job opportunities in Europe, of which only 9% will be “new” or “expansion” jobs. 91% are replacement jobs. Replacement demand describes those jobs that become available due to people leaving workplaces for different reasons (retirement, migration, etc.). The situation is driven by:

- **The quantitative significance of replacement demand**: the baby boomer generation will retire between 2018 and 2030;
- **The qualitative gap**: future job opportunities will not correspond precisely to current jobs. The changes will be profound with variations that affect working conditions and create a need for increased qualifications and skills. The expected evolution of the labour market will see an increase in the relative skill levels in all economic sectors. The low-skilled will lose representation in absolute and relative terms in all sectors, falling to 22% in Europe by 2025 (Cedefop 2015).
The European Commission’s Strategy for Growth and Jobs recognises the need to anticipate changes in skills and work profiles and to have a more responsive VET system. It also recognises the need to ensure that VET is designed to ensure the inclusion of those from disadvantaged backgrounds and with low skill levels.

The Replay-VET project nuances the requalification needs of the lowest skilled people to help them move from jobs where there is decreasing or no employment into new replacement jobs and, ideally, into jobs that will have the capacity to develop and grow into intermediate and even higher-skilled positions. Without this shift, we face a future where there will be too few workers with the necessary skills to drive economic growth and too few job opportunities for low-skilled workers, resulting in perpetually high unemployment and underemployment.

Methodology

Within the Replay-VET project, we used a mixed methodology employing both qualitative and quantitative activities. The partners analysed the Labour Market Intelligence (LMI) in sectors and occupations currently employing large volumes of low-skilled individuals (generally equivalent to EQF Level 3 and below). In addition, through qualitative interviews, the partners identified the obstacles and opportunities for up-skilling the low-qualified. Partners identified major challenges and links between quantitative replacement demand for certain low-skilled positions in critical sectors and occupations in order to identify emergent opportunities and necessary skills. The project therefore has a sectoral character that has allowed us to better identify the skills required by companies that low-skilled people should attain in order to find or retain a job.
Table 1: Selected opportunity sectors and reasons for the approach

<table>
<thead>
<tr>
<th>Region</th>
<th>Sector of Opportunity</th>
<th>Reasons for selecting this sector</th>
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</thead>
<tbody>
<tr>
<td>Basque Country, Spain</td>
<td>Social Care</td>
<td>• The significance of the sector and its positive evolution in the last few years;</td>
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<td></td>
<td></td>
<td>• The positive projections for the coming years, due to both expansion demand and replacement needs;</td>
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<tr>
<td></td>
<td></td>
<td>• The suitableness of the sector for low-skilled people, since it already hosts an important number of jobs related to this group of people and continues to be one of the most important sectors for inclusion in the labour market.</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Manufacturing</td>
<td>• It is the sector with the largest share of employment and strategic importance that also had a positive evolution the last few years;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• It is the sector currently employing the second highest share of people with a low education level as well as the sector with the highest total number of low-skilled people and is expected to employ low-skilled people in the future as well;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Although it is expected to decline over the period 2015-2025 (change by -1.5%) it has one of the highest levels of expected replacement demand.</td>
</tr>
<tr>
<td>France</td>
<td>Logistics and Metallurgy</td>
<td>• The mobilisation of low-skilled workers remains substantial. National Strategy focuses on “human capital development” by improving the readability of jobs and training and simplifying qualification paths. There is a generational challenge;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Certain activities, sectors and trades are labelled “sensitive” in the sense that low-skilled employment is important and is under serious threat, particularly as a result of the digital transition. New technology could be both a source of job losses as well as an opportunity for new products and jobs;</td>
</tr>
<tr>
<td></td>
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<td>• These two sectors are boosting economic</td>
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growth to the point of driving regional development.

<table>
<thead>
<tr>
<th>Location</th>
<th>Sector</th>
<th>Notes</th>
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| Hesse, Germany            | Logistics (Transport and Storage) | • It is one of the four sectors employing the most people, the overall employment situation is good, and it is still growing.  
  • The share of low-skilled employment in the transport and storage sector is significant (about 19.3% of workers).  
  • It is increasingly difficult to find skilled workers and retain them in a sustainable manner. Due to this, the further education and training of low-skilled people remains an important approach to meeting the demand for labour. |
| Lombardy Region, Italy    | Metallurgy                       | • This sector is already suffering from recent transformations, like Industry 4.0, the gig economy and the risk of the polarisation of employment.  
  • Technical and specialist skills will continue to be needed, but adapting to a constantly evolving technological context will require constant investment in training and updating to avoid rapid obsolescence. |
| Scotland, UK              | Early Learning and Care          | • Significant policy-driven expansions are currently being implemented and appear to be planned based on inclusive principles while aiming to offer opportunities for disadvantaged and excluded groups of individuals.  
  • There are positive labour market projections for the coming years, due to both expansion and replacement demands.  
  • There is likely suitability for the employment of low-skilled people, as it requires a variety of diverse roles, including: managerial, professional and support roles.  
  • It is more difficult to be easily replaced by automation.  
  • It offers opportunities for innovation and a cultural change that can be transformed into a more diverse and desirable context to work in. |
| South-West England, UK    | Construction                     | • It has been a significant source of economic growth in the last years and it is expected that |
this will continue;

- It is expected to generate new employment opportunities over the next ten years and as well as big job opportunities to replace those leaving (more than one third of the workforce in the region is currently aged 50 and over)
- One-fifth (21%) of the workforce has low skills – a higher share than in other sectors. Ensuring that the sector attracts and retains sufficient numbers of suitably qualified workers will be a significant challenge underpinning the region’s wider economic development objectives.


Each sector or industry selected by partners from their future favorable economic prospects to create jobs has been explored to better understand how technological, economic and organisational changes and future developments may affect the future qualifications and skills demanded by companies. Partners have explored the likely evolution of skills in each strategic sector selected in light of what has been learned from the opportunities detected in the national/regional projections for the replacement demand.

The involvement of other stakeholders/external organisations has been essential for identifying skill needs and the obstacles to up-skilling. For this purpose, semi-structured interviews were conducted to identify these factors. The objective of the qualitative interviews was to obtain information from key agents about the relevance of the opportunities for the low-skilled labour force identified in the selected sectors and occupations, as well as the viability of up-skilling them, focusing on obstacles and best practices.

The stakeholders helped in the characterisation of current skills and the identification of needs regarding training, including: participation in training exercises, insertion level, companies’ interest on training, etc. The interviewees also assessed the appropriateness of the selected sectors for the target group (projections for expansion and replacement demand), opportunities for up-skilling the low-skilled: new skills requirements, trends, challenges of the sectors, etc. Finally, the interviewees talked about the obstacles for up-skilling the low-skilled, needs for coordination (in the fields of education, training, guidance,
counselling and employment but also in immigration, mobility and social policy) and best practices for training.

Interviews were conducted in all the regions by all partner countries in July, September, October and November 2017. The partners worked together to establish a common structure for the interview process, and three basic questionnaires and a common list of key questions were developed in order to take the transnational nature and perspective of the project into account. The initial objective of 40 interviews (five to six per partner) with key stakeholders was met with a total of 40 interviews completed. Interviews were conducted with the following three types of stakeholders (more details in Table 2):

- 15 interviews with training centres, educational professionals and training associations, universities, experts on training and social training organisations.
- 20 interviews with policy-makers from public sector and social organisations, labour offices, employment agencies and job centres, public education departments, city councils, territorial authorities and trade unions.
- 15 interviews with small and large companies, professional and employers’ associations, social companies and professionals in these sectors.

Table 2: Number of interviews by country/region

<table>
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<tr>
<th></th>
<th>Basque Country</th>
<th>Czech Republic</th>
<th>France</th>
<th>Hesse</th>
<th>Lombardy Region</th>
<th>Scotland</th>
<th>South-West England</th>
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<tr>
<td>Training providers</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Policy-makers</td>
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<td>2</td>
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<td>5</td>
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<td>4</td>
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<tr>
<td>Companies</td>
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<td>5</td>
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Furthermore, a sectoral Triple Helix working group was established in each of the participating regions between VET centres, companies and public authorities, which jointly searched for opportunities to requalify low-employability groups. These stakeholder groups discussed the occupations, job opportunities, and skills that were most appropriate for low-qualified people within each
partner country/region. Through the involvement of policy-makers, the Triple Helix working groups are a channel for transferring informal knowledge into formal structures.

Through different workshops assessing the detected opportunities and their appropriateness according to their experiences working with low-skilled people, the working group discussed existing types of training for employment and how they could be adapted to better support these groups displaying low levels of employability. In the workshops, discussions were focused on identifying the demanded skills for the selected sectors and determining which occupations and job opportunities were more fitting and adaptable to the profiles of low employability groups. The Triple Helix working groups also discussed the existing types of training for employment, their adequacy for these low employability groups and the best practices for approaching them.

The qualitative methods used (interviews and workshops with the Triple Helix working groups) helped to bridge the gap between companies and the VET providers. The working groups proved to be successful in all regions and will in most cases outlive the Replay-VET project. The regional and local agents involved in the working groups recognised the importance of such interactions between training providers, companies and policy-makers and the project has hopefully sparked the start of a new stable coalition that will be used to enhance skill and competence development.

The labour market observatories involved in this project contributed to identifying the challenges and pointing out the needs that must be addressed. The regional and local observatories can therefore trigger the creation of these kinds of structures in order to define skill paths. Partners are currently putting together a new “Occupational Kit” with good practices and tools that will be available via open access for anyone wishing to use it in order to help people take advantage of the opportunities and jobs that become available through replacement demand. The last step, which has not yet been undertaken, consists of assessing and reflecting the identified strategies in order to develop guidelines and recommendations (career, VET and policy) for various target groups and actors in the field.
Key Findings of the First Phase of the Replay-VET Project

The interviews and workshops helped identify the main barriers that affect low-skilled workers when searching for or retaining a job. In terms of finding a job, the stakeholders acknowledged the lack of sufficient language and numeracy skills as well as a lack of soft skills, such as motivation or attitude. Traditionally, the demands of companies were more focused on qualification-related skills, but now they are more focused on soft skills. In terms of retaining a job, there are difficulties staying motivated (vocation – passion – self-motivation), and the stakeholders specifically mention the lack of digital skills in this era of digitalisation and automatisation. The impact of robotics/cobotics mainly threatens manual routine professions that are defined by repetitive procedures. These are relatively simple to accomplish using algorithms, which will probably lead to more automatisation. Nevertheless, a new generation of jobs that are less labour-intensive and more problem-solving oriented could appear.

In the past, internet usage rates have been significantly lower for this group than for more highly skilled people. Thanks to the gradual development of information technologies, a number of low-skilled workers are experiencing some information and social isolation. On the other hand, we are in the process of democratising access to IT. This is especially relevant concerning young people, however, so it might not have a significant impact on the digital divide in the near future.

In the phenomena of workless families and double-generation long-term unemployed families strengthen the case for drastic action. In cases where whole families are on social benefits, and several generations are affected, the target group is more complicated to approach. The lack of positive examples in the family has a negative impact on the motivation of young people from this group, both for pursuing further education and for being active in the job-search.

According to the stakeholders, the main gaps in employability have to do with soft skills such as attitude, team-work, the capacity to be mentally flexible, sense of responsibility, autonomy, communication skills, service-oriented character, work ethic (i.e. understanding the importance of work), openness to shift work, fitness, mobility, resilience, etc.

The main gaps in academic skills and qualifications naturally depend on the sector. In some sectors (Metallurgy, Construction), technical competences could
be more important than soft skills. For all sectors, the initial qualifications provide the basics and there is a lack of appropriate certificates or licenses. Where the labour market is tight, there are exceptions regarding the requirements for formal certificates; nevertheless, they will still be essential for obtaining and retaining a job in the future.

All sectors have recognised the need to adapt qualifications to these new requirements. In this sense, learning on-the-job or apprenticeships are identified to be crucial for improving the technical or vocational skills. Language (speaking, writing, and reading) and basic numeracy skills are very important topics in all sectors, as are information-processing skills in more technology-rich environments. Digitalisation and robotisation are impacting the way machines are produced and managed, and low-skilled people will be less involved in production and more involved in the maintenance or control of the machines. Indeed, the monitoring of production processes is well-suited for low-skilled people.

In the near future (five to ten years), there is a primary need for a change in mentality, especially for middle- and lower-level workers, who still perceive ICT as a “complement” to work, not as a basic prerequisite for business activity. Digitalisation will destroy some jobs, but will create new opportunities such as maintaining and operating the machines, for example.

The skills that will be crucial for the future of low-qualified people will be interdisciplinary knowledge from multiple professions, concentration, dexterity, precision and patience, which will all be in greater demand. The processes are going to be more complex, which means that low-skilled people will require better understanding and specialisation to prepare them for handling digital devices such as tablets.

Developing digital competences is very important both for people who have been out of education for a long time and for those with few or no qualifications. For them, technical changes are particularly overwhelming and they need support while learning.

More flexible formats in VET provision are required by stakeholders in order to be able to respond to the changing work environment. Digitalisation in training (e.g. virtual reality, serious games that allow players to learn by doing), new ways of training and new opportunities to train are all techniques that can be used. Even in sectors with a low risk of workers being substituted due to tech-
nological change, more and more digital skills will be required and the need for knowledge of other technological advances as well as the ability to adapt to specific technologies will be increased.

Training remains essential despite the fact that the specialisation of industry and the increasing complexity of training professional skills has made it increasingly difficult for training providers. To do so, a closer co-operation between schools and universities could be encouraged. To nurture and develop the appetite for life-long learning within low-qualified people we need suitable types of training. As motivation is a critical factor in the education of the less-qualified, bite-sized-courses can help stimulate them.

**Impact of the Replay-VET Project**

The project is seeking to make an impact through both the inclusion of people with low skill levels in the labour market and better policymaking on VET strategies for up-skilling these people with the skills required by replacement demand. Once Replay-VET is complete, each participating region will have an Occupational Kit that will provide the keys for successfully training low-skilled people to prepare them for the job vacancies that are arising as people leave work. We are seeking to reinforce (and foster new) links between education and training within the world of work by better aligning VET policy (education/training) with replacement demand.

We look forward to impacting vocational trainings systems directly at the national/regional levels. It is they who will be the beneficiaries of both the new strategy to identify those low-skilled positions in critical sectors that will have the greatest impact in the future and the best practice strategies gathered in the Occupational Kit aimed at strengthening the key competencies of low-skilled people. Policy-makers at the regional and national levels will benefit directly from different outputs of this research: country reports on job replacement forecasts, research on the employment and labour conditions of low-skilled people in their region/country, the Occupational Kit, national strategy and career guidelines.

The observatories working on Replay-VET project benefit from the problem-solving research into quantitative and qualitative labour market replacement
demand. Furthermore, the conclusions of the outputs can be used by VET planners and other stakeholders for developing and implementing strategies. If successful, the project will enable the better matching of skills demand to skills supply by upgrading the professional skills of those with low qualifications and will enable VET strategies to take advantage of the opportunities to be more closely aligned to the predicted and forecasted replacement needs of the labour market. Consequently, we seek to directly impact the work of VET policy-makers working across the European Union who are seeking to understand, which skills are needed where and intend to use this information for medium-term training offers. The VET policy-makers will benefit the most from the alignment of future replacement positions with opportunities for low-skilled people.
How to Survive in the Precarious Labour Market: New Skills for the Unemployed and Employers: A Mutual Approach

Rolf Keil and Bettina Splittgerber

Introduction

Far-reaching changes are currently taking place in the world of work. The processes of digitalisation and robotics dominate the current public discussion. In addition, however, the tendencies towards further flexibility and globalisation also have a major influence on the conditions under which work is carried out: so-called “regular labour”, i.e. permanent full-time employment, is losing its importance whereas other – in some cases new – forms of labour are playing an increasingly important role in the labour market. Various forms of part-time work, but also posted work, (“solo”) self-employment and temporary employment, as well as new types of jobs resulting from information technologies such as cloudworkers, etc., which are usually minor jobs, are to be taken into consideration. The increase in these labour conditions makes it possible for many people to participate in the labour market, but it also causes problems that the concerned authorities and institutions have to address.

These economic conditions pose major challenges for the unemployed as well as those who are employed and have to orient themselves or hold their own in the labour market. The situation is even more complex for the long-term unemployed, who – in addition to the general burdens arising from their situation – are usually first integrated into the precarious sectors of the labour market. In addition to appropriate professional and social skills, they must also cope with a working situation, such as temporary employment, that places high demands on their self-management skills.

The following article explains the perspective of the Hessian Ministry of Social Affairs and Integration. In the Ministry, the Department of Labour is responsible for labour market integration as well as occupational health and safety. Af-
ter a mutual examination and the following discussion of these areas of law, which are currently quite independent of one another, some ideas for joint actions between these state institutions emerged, which are to be presented here.

In this context, a joint project was developed as part of the reflections on the umbrella brand “Arbeitswelt Hessen”: up to now, the institutions for labour market integration – also responsible in the area of planning and promoting qualification measures – and the supervisory authorities in occupational health and safety act independently of one another and without more detailed knowledge of the focal points of action for the respective other institution. The original functions of both job centres and the departments for occupational health and safety are to give advice, support and information for the companies and employers in the Hessian regions. One of the goals of the concept “Arbeitswelt Hessen” was and is to initiate a dialogue between these different authorities.

Background Information about the Concerned State Institutions

The Role of Labour Inspection in the Field of Occupational Health and Safety in Germany

Occupational safety has a long tradition in Germany, since the first regulations for the protection of children, young people and pregnant women were implemented at the beginning of the 19th century at the very beginning of industrialisation. The central objective of occupational safety is to guarantee and improve health and safety protections for employees. With the adoption of the Health and Safety at Work Act in 1996, a comprehensive approach was introduced in Germany that includes aspects of physical, mental and social well-being at work in addition to technical safety. Fewer requirements are imposed on companies and a greater scope is also granted for specific solutions – as long as the protective objectives of the law and the various supplementary ordinances are complied with.

Compliance with the regulations is monitored by the occupational safety inspectorates of the federal states. They have the task of monitoring the imple-
mentation of health and safety legislation in companies, advising employers on the fulfilment of their obligations and – where necessary – sanctioning violations by means of decrees, orders or administrative offence proceedings. The aim is always to ensure the protection of health and safety for employees. The occupational safety authorities fulfil their task primarily through plant inspections and approving industrial plants and other workplaces as well as through direct advice to the responsible people within the companies, i.e. mostly employers and staff representatives. However, they also provide advice and legal information for employees and other interested parties.

In recent years, the topic of psychological stress has gained considerable attention against the background of flexibilisation, digitalisation and the associated changes in workloads. For this reason, many companies have now begun to prepare risk assessments for psychological stress and, as a result, have achieved a certain degree of openness to the subject matter within the company. The development of qualifications among inspectors and company managers required in this context also shows some progress. Nevertheless, it should be noted that around 50% of the companies either completely do not or only insufficiently comply with their legal obligations to prepare a risk assessment and implement the necessary measures (Lüßner et al. 2014).

The abovementioned changes in the world of labour lead to particular challenges for occupational health and safety: supervision is becoming more demanding due to flexible economic structures. But protecting the health safety and safety of employees is particularly urgent in the precarious section of the labour market, where working conditions are often particularly stressful and involve a broad spectrum of potential hazards (DGB-Index Gute Arbeit 2015). For this reason, the Hessian occupational health and safety authority has carried out special campaigns in the following sectors in recent years: logistics, parcel delivery services, hotels and restaurants, security and long-distance truck traffic. In addition to the respective sector-specific risks, the focus was always on the organisation of working hours and possible violations of working time regulations.

It turned out that in these industries in particular there is often below-average knowledge about legal regulations, and compliance is also rather low even though working conditions are particularly stressful. Employees themselves are also often unaware of their rights (e.g. concerning breaks, reliable deployment
planning and working hours or personal protective equipment). It should therefore be taken into consideration by all involved institutions that in these particular sectors, where the long-term unemployed are most likely to return to work, there is often insufficient protection against health and safety risks, and the stabilising function of work – as integration into a company’s social fabric – is lacking when work is only carried out for a limited period of time as a temporary worker or under conditions of self-employment.

For this project by the HMSI Labour Department, however, it is of primary importance that the occupational safety inspectors are present in the companies and able to assess both the conditions at individual workplaces and the company structure because due to an increase in mental illness, topics such as company organisation and psychological stress have been increasingly addressed in recent years. The occupational safety inspectors therefore have a very practical view of the working conditions in companies and have specific knowledge of the sectors in the region.

The Organisation of Labour Market Policy in Germany

A substantial part of the concrete organisation of the working world is carried out by social partners within the framework of collective bargaining autonomy. The state has the task of creating the legal framework and monitoring compliance with standards. However, the state also has a social and labour market policy mandate, due to the welfare state requirement of the German Constitution¹.

Government-organised labour market policy in Germany is complex, not only in its organisation, but also in its financial structure and responsibilities. The Federal Government is responsible for developing the legal framework. The aim of the state-organised labour market policy is “to counteract the emergence of unemployment, shorten the duration of unemployment and support the balance between supply and demand on the training and labour market. In particular, long-term unemployment must be avoided by improving individual employability”.²

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¹ Article 20 Paragraph 1 of the Basic Law for the Federal Republic of Germany: “The Federal Republic of Germany is a democratic and social federal state”.

² § 1 SGB III Employment Promotion Law.
In the tradition of Bismarck’s social reforms, unemployment benefits in Germany are designed as social insurance and are financed by employers and employees (Volume III of the Social Security Code, SGB III). As a part of the social reforms passed by the second Schröder government in the years 2003-2005, the period for receiving unemployment benefits was reduced to one year (as a general rule) and the tax-financed catch-all system of unemployment assistance was replaced by a new transfer system as the basic provision for job-seekers according to the Second Volume of the Code of Social Law (SGB II), which also included the social assistance for which the municipalities were previously responsible.

Unemployment benefits are administered by the Federal Employment Agency; the relevant ministry at the federal level, Federal Ministry of Labour and Social Affairs³ (BMAS) is responsible for technical supervision. If the unemployment benefit is insufficient or expires, the basic provision for job-seekers (SGB II) is available as a state transfer system. This social security system is administered by job centres. As a result of political compromises over the course of the introduction of SGB II, there are Job Centres that are administered jointly by the Federal Employment Agency and the municipalities (303) Job Centres that are solely administered by the municipalities (105).

Within the basic provision for job-seekers stipulated by the Second Volume of the Code of Social Law (SGB II), the federal states are responsible for the legal and technical supervision of the municipal Job Centres on the one hand, and agree with the Federal Government on the principles and goals for labour market policy on the other. The Federal State of Hesse concludes annual target agreements with municipal Job Centres concerning the integration of the unemployed into working life. Furthermore, the state of Hesse is in the process of establishing a target agreement with all districts and district-free cities regarding social integration services, such as debt counselling or psychosocial care. In the context of SGB II, the state organises and supports symposia and initiates a discourse with actors in labour market policy on various questions of labour market policy. In addition, the state provides its own impetus for shaping labour market policy with its subsidies.

³ In German: “Bundesministerium für Arbeit und Sozialordnung” (BMAS).
Current Situation on the Labour Market and the World of Labour

The labour market in Hesse is robust. At the end of 2017, 3,467,200 people were registered as gainfully employed. The employment rate is 59.1%. The unemployment rate was 4.7% as of April 2018. A total of 157,860 people are registered as unemployed, 52,411 of them in SGB III and 105,448 in SGB II.

Looking closer at the unemployed within the basic provision for job-seekers (SGB II), three main problem groups can be identified, which of course overlap with each other to a high degree. Of those registered as unemployed, 91,803 have no vocational qualification, 58,981 are foreigners (i.e. people without German citizenship) and 55,439 meet the criterion of long-term unemployment.

While long-term unemployment remains at a worryingly high level on the one hand, there are also over 50,000 vacancies in Hesse, especially in logistics, sales and in the areas of health care and care for the elderly. Statistics on the labour market in Hesse show that for several years, atypical employment relationships have been steadily gaining in importance, especially in the logistics, transport, hotel and catering, retail, cleaning and security sectors.

Objectives of the Ministry

The aim of the activities of the Department of Labour is to create and establish good living and working conditions for the people of Hesse and to further develop the humanisation of working life while at the same time making a contribution to economic stability and prosperity.

The Constitution of the State of Hesse, signed on 1 December 1946\(^4\) established the legal framework for the world of labour in Hesse. Further legal regulations are found in the social law books as well as in numerous other laws and ordinances regulating labour law and occupational health and safety in Germany. On this legal basis, the Hessian Ministry of Social Affairs and Integration is responsible for legal and technical supervision with regard to Volumes II and III of the Social Security Code. It is also responsible for the supervision and guidance of labour inspection in Hesse.

\(^4\) Article 28ff. of the Hessian Constitution.
Thus, the Department of Labour within the Hessian Ministry of Social Affairs and Integration also has a central task in shaping the framework conditions conducive to and supportive of Hesse’s world of labour and economy. In addition to the respective specific responsibilities – which will not be dealt with here any further – the Department of Labour considers it its challenge to monitor the Hessian world of labour as a whole as far as possible and to derive action concepts from interfaces and overlaps between the legal areas concerned. These concepts aim, for example, to improve and promote transitions from either training or unemployment into a working situation.

The creation, promotion and maintenance of employability forms an important bridge between the different areas of labour:

“[Employability is] the ability to gain initial, meaningful employment, or to become self-employed, to maintain employment, and to be able to move around within the labour market. This ability is influenced by personal qualifications, skills and circumstances, but also by external factors (labour market, economic situation)” (GD Bildung und Kultur).

The issue of employability is of course not only part of the EU’s employment policy, but is also an important objective of education policy, aimed at a sustainable qualifications and training for unemployed people and employees. In today’s knowledge-based societies in Europe, it is the task of education systems to prepare people for these increasingly complex social and political contexts as extensively as possible. Furthermore, it is important to enable people to maintain their ability to work in an environment of continuous change. The aim is to provide sufficient knowledge and skills at an individual level to enable citizens to participate in economic and social life and make their own contribution to it.

At the level of society as a whole, employability is an important prerequisite for meeting the challenges of the labour market and strengthening Europe’s competitiveness. Employability is promoted in particular through suitable framework conditions such as humane, supportive and well-organised work, workplace health promotion, etc. While occupational health and safety and health promotion improve subjective employability, objective employability focuses

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on the possibility of employment arising from company conditions and the labour market, in the sense that there is employment or demand for the respective worker.

Against this background, particular attention must be paid to those who work in atypical or insecure circumstances.

Avoiding a „Revolving Door Effect“

The interdependence between unemployment and health problems has been sufficiently researched and proven. Unemployed people have a significantly higher mortality rate than the comparable group of employed people. The same applies to various physical and mental illnesses (Kroll et al. 2016: 228ff.). Even after relatively short periods of unemployment, negative effects on self-esteem and self-confidence often become apparent. When labour market integration does takes place, it is primarily in employment conditions in which workers are exposed to high psychological and physical stress. The result is often a so-called revolving door effect, i.e. people switching several times between phases of work and periods of unemployment, which in turn exacerbates the health problems of this target group.

The mutual approach between the labour market and occupational health and safety is looking for ways to counter this revolving door effect. The focus is on the following questions:

- **Which qualifications do the employees of the job centres need to acquire in order to successfully and sustainably integrate the long-term unemployed into working life?**

From the labour market perspective, long-term unemployment is the most pressing and difficult problem to resolve compared to other issues of labour market integration. But especially here, the prerequisites for a return to the labour market are being established by creating and stabilising the employability of the people concerned. Generally speaking, the reasons for long-term unemployment do not lie in non-existent or non-fitting qualifications, at least not primarily. Long-term unemployment triggers processes in the affected people that have a strong negative impact on their mental and physical health. An often reported consequence is the loss of self-confidence, which prevents them from regarding themselves as active members of the working society and act-
ing accordingly (Ibid.). This is, as a rule, accompanied by the loss of social and informal networks.

Successful integration can therefore only succeed if it takes place in an environment that has a minimum awareness of this problem and also offers an appropriate – stabilising, if possible – working environment. Accordingly, Heinrich Alt (2017: 18) emphasises in his report on basic income security:

“If this is the case – and research confirms the assumption – that most employment relationships result from personal networks, this is precisely the greatest obstacle to a placement in companies or plants for the long-term unemployed. Many long-term unemployed people no longer know of anyone in their family or peer-group or even in their neighbourhood who holds a regular job and could be available as a reference or “sponsor” for an employer.

In 2015, the personal contacts or recommendations of their own employees were still the most successful way for firms to fill vacancies. This result is particularly important for the long-term unemployed because, unlike the “cyclically unemployed“, they generally do not arouse any interest in employers, neither with a professional profile close to the market nor their often very fragile employment histories that require explanation. Therefore, with the help of a third party, at best a workmate, they must find direct access to a personnel decision-maker who weighs up the risks and opportunities in relation to that person. References, sponsors and, if necessary, wage subsidies can help to lower recruitment hurdles. It can be concluded from this that the establishment of a network promoting integration is the best placement aid for the long-term unemployed. Every engagement in a self-aid group, associations, church communities and parties etc. provides valuable support. In their integration work, these institutions have gained a lot of knowledge about how long-term unemployment can be ended (professional counselling, proximity to the employer, flexible and suitable instruments, sponsorships in private and business contexts, follow-up support, etc.). This requires professional and permanent staff, an adequate budget and a receptive labour market”.

However, this also implies that the job centre employees will have to acquire new skills. What is needed is an insight into the relationship between long-term unemployment and psychological stress as well as a trained view on the labour market in the area of precarious employment options. But new partnerships or networks, for example with those involved in occupational safety, should also be identified and structures of co-operation should be established.

- **Which measures are suitable for moving the target group closer to the labour market?**
The HMSI is convinced that the labour market stakeholders in the Hessian municipalities know best what needs to be done in view of heterogeneous target groups and different regional conditions. The HMSI sets binding target agreements within the framework of Hessian labour market promotion. Together with the Ministry, the regional labour market actors decide on how the funds will be used and what measures and initiatives are necessary to promote the respective target groups.

Room for manoeuvring and flexibility is particularly necessary for promoting the extremely heterogeneous target group of the long-term unemployed with multiple problem situations. From the projects funded within the framework of the Hessian funding instrument “KoPe – Kompetenzen fördern – Perspektiven eröffnen”, we have come to the conclusion that there is no approach that can be generalised. However, it is possible to describe framework conditions that are conducive to successful qualification. The successful qualification and labour market integration of people at the margins of the labour market can only succeed if it is low-threshold and pursues an appreciative approach that emphasises (their) strengths. In concrete terms, this means that the chain of sanctions and measures, failure and renewed sanctions must be broken.

Qualification offers must be low-threshold. They have to create success stories instead of repeatedly tackling the deficits. They must strengthen the self-esteem and self-confidence of job-seekers. At least in part, they must take place in the real world of labour. Finally, they must contain a coaching element because the way into the job market will not succeed without setbacks.
• **What prerequisites must the employer fulfil in order to employ the long-term unemployed?**

Employers should be involved in the integration process as early and as closely as possible. From experience, they can usually determine within a short time whether an applicant is suitable or not, and confirm the reasons for their decision accordingly. If an employment relationship does not materialise, from the employer’s point of view this is often due less to a lack of qualifications than to an insufficient ability to work under pressure or a lack of motivation on the part of the applicants.

Companies see their need for skilled workers but also their own social responsibility. However, they often lack the knowledge or competence to deal with particularly difficult groups of applicants. Reliable contacts, e.g. company recruiters, can build a bridge here so that companies can also hire people with supposedly difficult starting positions. These recruiters can make it possible for the management to get to know the applicants without obligation, inform them about possible funding opportunities and, in the best case, conclude an employment contract. In addition, they are also available to the companies as contact people after the conclusion of the contract.

• **What role do the health and safety authorities have in establishing health-friendly working conditions in the sector of low-skilled jobs?**

The state occupational safety authority advises and monitors the companies and plants in Hesse. It provides information on all issues related to occupational health and safety and safety technology both in the course of its company visits and through informational material and public events. Questions and concerns of individual employees and other interested parties are also answered. In recent years, in addition to the topics of “classical” occupational safety – noise, hazardous substances, machine safety – questions of psychological stress caused by traumatic events at work, the high intensity of work, and unfavourable working hours, etc. have also been addressed.

Experience has shown that it is disproportionately difficult to reach companies (Becker and Engel 2015) and implement good occupational safety standards in those industries where a high proportion of low-skilled people are employed or where precarious work is being done (DGB Index Gute Arbeit 2018). The reasons for this are the somewhat complex chains of subcontractors and self-
employed, the generally tight economic framework conditions and the high proportion of non-German-speaking employers and employees, to name but a few.

In order to make workplaces safe and less stressful in these sectors as well, special campaigns were realised by the health and safety authorities in order to inform these employers about their responsibility – with sanctions, if necessary – to design their workplaces in a safe and healthy manner. The risk assessments required by the Occupational Health and Safety Act should include the specific needs or impairments of some employees, i.e. the long-term unemployed, people with disabilities and members of minority ethnic groups.

In connection with the integration of the unemployed into the labour market, the knowledge and experience of the occupational safety and health authorities may provide an additional source of information. The supervisors have specific knowledge of the hazards and workloads at the respective workplaces. Therefore, a dialogue between authorities can also lead to a relevant exchange of information and underline the necessity of working conditions being taken into account for the process of integration.

- **Can a coordinated approach by occupational safety and the placement services of the Job centres lead to an improvement in the placement of the long-term unemployed and increase their job tenure?**

With a common focus on employability, the issue of mental strain/mental health plays a main role both for the integration of the long-term unemployed into the labour market as well as for occupational health and safety. The stakeholders are aware that their respective perspectives on the topic are quite different. In this respect, the issue of mental stress and mental health offers a certain overlap in integration into the general labour market; both legal spheres are called upon to develop joint concepts in order to prepare the long-term unemployed for the labour market as optimally as possible (in terms of psychology and qualifications) on the one hand and to protect these particularly vulnerable groups as well as possible in their working situations on the other.

Another area of great topicality is the fact that the so-called “normal employment relationship” has been steadily losing importance for about 20 years and that the various forms of atypical work – often accompanied by a high risk of precarity – have increased. Conflicts of objectives between occupational health
and safety and the labour market are not excluded here because the target system in Book II of the Social Security Code is designed for rapid placement, which often primarily serves temporary work or the labour market segments that are open to low-skilled people. At the same time, however, these are also the fields of work with a high need for occupational safety intervention.

This misguided tendency towards a quick start of work in SGB II must be resolved. The “Work First” approach, which is a part of SGB II, ought to be modified for the target group to a “Career First” approach, as Ronald McQuaid and Vanessa Fuertes (2014) describe it:

“There is a need to move towards preparing the long-term unemployed for better careers – a “Career first” approach, rather than purely “Work first” job entry, but this requires investment in their skills development, training and job-seeking support, plus better aftercare to support them when in work, especially those with particular issues such as the need for childcare or dealing with health issues... Among organisations involved in Active Labour Market Policy support, there is a requirement for greater career support with skilled support workers providing career choice, career development and career management, which will involve holistic approaches to the needs and aspirations of the individual. There needs to be specialist skills among the workers of support providers themselves, especially for certain groups such as those with disabilities or lone parents, as well as among their partner agencies. Also, there needs to be greater consideration of the capacity of local communities to support people moving towards and into sustainable employment”.

A first major workshop, which was held at the end of 2017 between several job centres and occupational safety departments in south Hesse, addressed a wide range of topics of technical interest to both sides. For example, issues related to the health-conscious organisation of working time, the prevention of traumatic events and the details of the obligations of temporary employment were on the agenda. Specifically, questions of the organisation of “transition management” between unemployment and employment were also addressed, during which those affected could possibly also be prepared more concretely for understanding their rights and obligations in their role as employees.

Furthermore, it was pointed out that the employing companies and the occupational safety authority are usually not familiar with the specific problems of (long-term) unemployed people despite the greater importance now attached to the topic of psychological stress.
The discussions identified the need for action in the following areas, which will only lead to labour market integration if they function in parallel:

- Establishing and preparing suitable structures for the process of placement and in the employing enterprises:
  - A stable relationship of trust between employer services and companies on the one hand and between the long-term unemployed and the intermediary on the other;
  - A fairly sound knowledge of the operational conditions inside the companies by the agent;
  - Good mutual coordination of information throughout the placement process;
  - Raising the company’s awareness of the particular problems faced by the long-term unemployed when they return to work (e.g. management training, similar to BEM or the integration of people with long-term illnesses);

- Assistance for the long-term unemployed in the process of entering working life (job-coaching): closer co-operation between placement services and occupational health and safety authorities is particularly useful and effective if the integration of an unemployed person into the labour market is realistic, i.e. if they are “close to the labour market” in terms of health, social competence and qualifications:
  - Measures of qualifications in labour market-related areas should then be examined to see whether it makes sense to supplement modules on prevention/health/labour law/occupational safety. The occupational safety and health authorities could provide technical support here.
  - Furthermore, in connection with job application training, it should be analysed to what extent it is useful to systematically and very specifically prepare the long-term unemployed for their job – i.e. job- and sector-related training. The occupational safety and health authorities could provide information – leaflets, seminars, presentations – for some industrial sectors, which could be consulted here.
  - An informational conference for the Job Centres on the subject of working time law can also be offered. It is particularly important to support the unemployed when they change to a temporary employment relationship (posted work), as the unemployed are confronted with two employers and a particularly complex working situation in these situations. Here a supportive aid should be implemented to ensure – if necessary – that a dialogue between the two companies has taken place and that the newcomer in the en-
enterprise has received the necessary instruction and (safety) information.

**Conclusion**

- The successful and sustainable integration of long-term unemployed people requires a re-orientation of the existing activating labour market policy. Instead of striving for rapid placement, concentration must be placed on building strengths and competences;
- The placement of the long-term unemployed happens, if at all, predominantly in the precarious sectors of the economy. Therefore, the cooperation of health and safety authorities and the employer services of the Job Centres is necessary in order to interrupt the spiral of placement in precarious work and the frequently ensuing discontinuity due to working conditions;
- Employers – especially in the lower segments of the economy – must be put into action to be able to deal with the often multiple problems of the long-term unemployed. A crisis intervention structure providing fast and unbureaucratic advice before jobs are seriously threatened seems to be a necessary measure;
- The design of the labour market in the lower segments is a joint task of the occupational safety authorities and job centres, but the social partners – trade unions and employers – should also be involved. Initiating this process is the task of our joint project.

**Outlook**

As a direct result of what has been established so far, concrete steps are being prepared:

- The workshop will be held again in two or three other regions of Hesse in order to make the concept known to a broader segment of the institutions involved and to be able to take up further suggestions and ideas;
- The development of an information/training concept for occupational safety inspectors, including the organisation of corresponding information seminars;
- The development of an information/training concept for the employer services of job centres, including the organisation of the corresponding information seminars;
• The establishment of network structures between the authorities to facilitate a regional exchange of information;
• The realisation of a supra-regional conference to deepen – and broaden – the topic.

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2.3. Regions and Localities as Contextual Frameworks for Skills, Competence and Knowledge

A New Regional Labour Market Intervention: The Creation and Delivery of a “Data Analytics Skills Escalator” in the Exeter SUB-region of SW England

Andrew Dean and Ben Neild

Background

This paper describes how partners in Exeter and the Exeter sub-region have collaborated on a new intervention in the labour market – establishing a “Data Analytics Skills Escalator”, which will firstly enable enterprises to recruit the skilled workers they need and secondly to enable people within the sub-region to develop the skills necessary to gain access to these well-paid and sustainable job opportunities. This in turn will benefit the region’s growth and innovation success.

In the Exeter area a review of regional assets identified the presence of: the Met Office, which has one of Europe’s fastest supercomputers; a Russell Group University; a new science park; an “Outstanding” College; and some world-leading SMEs and resulted in a decision to build Exeter as a nationally recognised centre for data analytics. To take this forward, the main private, public and education partners, working together as “Innovation Exeter”, identified a number of priorities:

- An active and supportive innovation infrastructure, including a growing Science Park and Innovation Centre, business support services and access to investment funds for tech businesses;

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1 The Data Analytics Skills Escalator has been developed in partnership and we would like to acknowledge the work of our colleagues in Exeter City Council, Exeter College and Innovation Exeter. The work was also made possible through the support received from the Erasmus+ Programme of the European Union via the EN RLMM Project SIMOVET managed by Prospektiker.

2 The term denotes the UK’s research-intensive universities.
• A new centre for data science building research and skills in data science to drive innovation and realise the potential of regional strengths in environment and health;
• Establishing the city and wider area as a test bed and laboratory for addressing the challenges facing urban areas by making use of data through Exeter City Futures: a Community Interest Company seeking to make the Exeter sub-region congestion-free and energy-independent by 2025;
• Establishing a “Data Analytics Skills Escalator”.

The Exeter Sub-region

In recent years, Exeter has been a remarkable employment success and is driving employment growth across its region – the Heart of the South West (HotSW) LEP area. Over the last decade, the number of 16 to 64-year-olds employed in Exeter rose by 30,000, while across the whole of the HotSW LEP region it rose by just 20,000. Exeter’s travel-to-work area is growing to the extent that 37,000 people (equivalent to 45% of all employees) now commute to the city each day to take advantage of the growth in productive and highly-skilled employment.

This has led to a growth in economic output. Between 2000 and 2015, Exeter’s Gross Value Added (GVA)\(^3\) grew by 48%, a figure 50% faster than the output growth found across the Heart of the South West region as a whole. Output per full-time employee in the city is now nearly 25% higher than the surrounding area. The data suggest that the benefits of agglomeration – the better exchange of goods, ideas and people – are starting to draw enterprises to Exeter, to the benefit of the whole region.

In a recent report by Engeli et al. (2018) looking at the County of Devon – in which Exeter is located – they recognised that digital skills were of topical importance to policy-makers locally and found that over half (54%) of all respondent businesses stated that it was very important that all or most of their employees have at least some basic knowledge of how to use everyday technology. Business employees within those firms surveyed appear to be in-

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\(^3\) Gross Value Added (GVA) is the measure of the value of goods and services produced in an area, industry or sector of an economy. GVA is output minus intermediate consumption; it is a balancing item of the national accounts’ production account.
creasing their capabilities in digital and technological skills. This demonstrates the increasing importance businesses are placing on digital skills.

The 2018 Centre for Cities Report (Cities Outlook 2018) found that the City of Exeter continues to grow strongly and recorded the second fastest rate of population growth of UK cities over the last year. Exeter’s economy is also growing strongly, and currently has the 6th fastest-growing GVA in the UK. Private sector employment growth remains exceptionally strong, and currently ranks 10th of all UK cities. In terms of productivity rankings Exeter’s growth in productivity has moved up the rankings from 23rd place in 2015 to 17th in 2016.

Exeter also continues to enjoy consistently high rankings for labour market participation. The claimant count (unemployed and not working) remains among the five lowest in the UK. Further, the workforce is well-qualified, with Exeter having the second lowest share of residents lacking formal qualifications of UK cities and being just outside the Top 10 for the share of residents with high level qualifications (NVQ Level 4 and above). However, workplace wages have dropped more than almost any other city between 2016 and 2017 (62 out of the 63 cities in the report) and earnings are now below the national average. This is partly a result of the UK Government’s “Austerity” programme, which has targeted local government, in which a large percentage of Exeter citizens work.

Exeter, one of the smallest UK cities, continues to perform strongly across a number of indicators, but particularly in terms of population, economic and productivity growth and private sector employment growth.

The Importance of Data Analytics

According to a claim by IBM (IBM Marketing Cloud 2017). 90% of the data in the world today has been created in the last two years. Advances in computer memory capacity, processing power and algorithms have made it possible to store and analyse the huge quantities of data that are generated by our everyday use of digital technologies, while imaging and sensing technologies now enable scientists to study phenomena with unprecedented precision. Corporate capacity to understand data about consumer behaviour or process efficiency, for example, is becoming central to competitive advantage, to the ex-
tent that e-Skills (the UK Sector Body) termed Big Data “the ‘new oil’ that will fuel our economy in the coming decades” (e-Skills UK 2014). National and local government bodies are similarly focused on working out how they can use these data to improve service delivery and quality of life.

Different regions and cities will respond differently to this new skills need. Exeter is unusual in that it has a large cluster of companies with significant need for data analytical skills for such a small city – in particular the Met Office, which is the United Kingdom’s national weather service and one of the largest organisations of its kind in the world.

Skills Needs Associated with Data Analytics

To support innovation and deliver the productivity growth that is increasingly the priority for the UK government’s economic policy, the UK’s business leaders and managers need to grasp the strategic implications of data analytics and to be able to access the skills they need to realise its potential. In the words of e-Skills, “The UK urgently needs to rapidly move up the maturity curve in terms of attitudes to technology: it should be no more acceptable for those in leadership roles to lack an understanding of technology than it is to lack an understanding of finance”.

Following consultation between partners and a literature review, the Innovation Exeter group established that developing the capacity for analytical thinking, i.e. supporting pupils, public service providers or business managers to think creatively about the challenges and opportunities they face and the role that data can play in resolving these, must run alongside technical and scientific training. Similarly, there was a need to raise awareness, interest and excitement about careers involving the application of mathematics and computing, by engaging industry and public authorities in curriculum enrichment activities that enable pupils to think creatively and to enjoy addressing real-world challenges using real-world data, including those rendered accessible through “gamification”.

The employment opportunities open to those with appropriate skills in the right sectors or fields are immense. According to e-skills UK, demand for staff with skills in Big Data analytics is rising at an almost exponential rate, with un-
filled vacancies rising by 972% from less than 400 vacancies in the third quarter of 2007 to almost 4,000 in the third quarter of 2012 (e-Skills 2013). As a result of this growth, four in five data-intensive businesses are now reported as struggling to find the skills they need (Whitby et al. 2014).

People who have the combination of coding skills, statistics, communication skills and entrepreneurship are hugely valued and so rare that they have come to be referred to as “unicorns” by some in the industry (Press 2017). Getting young people with mathematics and coding skills out into business through work experience, placements and internships through which they can acquire business acumen and employability skills is an important task to be addressed by the Escalator.

Recent research from the Tech Partnership (formerly e-Skills) found that tech skills shortages are driving up salaries. More than half of survey respondents to the Tech Nation 2017 survey said finding employees with the right skills for their business was challenging, and many of them feared the problem would grow post-Brexit, as international talent could become harder to access (Tech Partnership 2017).

A shortage of talent may also explain a disproportionate rise in tech salaries compared to those in other sectors. The report found that tech salaries are now, on average, 44% higher than those of non-digital jobs, averaging just over £50,000. But with these high salaries comes better productivity. The Gross Added Value of UK tech workers is now more than twice that of non-tech workers at £103,000 compared to £50,000.

The Tech Partnership has found that overall, the main groups of digital specialists required by UK employers in 2015 (and during each of the previous four years) were developers (27% of all positions advertised), analysts (17%), consultants (6%), architects (6%), administrators (3%), managers (2%) and designers (also 2% of the total). Further sub-division of these groups, however, reveals the single most commonly advertised position at the “operational level” for digital specialists was Project Manager, with these positions featuring in 6% of all adverts for digital specialists in 2015 (5% of adverts for permanent staff and 9% of contract jobs).

In the absence of “unicorns”, businesses are increasingly building their analytical capability through multidisciplinary teams, generating a need for data ana-
lysts with good teamwork and communication skills. Some have taken to off-shoring their data analysis functions, particularly the more basic functions, outside of the UK, resulting in domestic industry becoming increasingly highly skilled and research-oriented and moving deeper into the boardroom (Nesta 2014).

These challenges are very much at the “top end”, and it is important to remember that for many businesses, especially most small businesses, a significant impact can be achieved with digital skills such as a sound knowledge of Excel and basic mathematics (ex. correlation, causation and probability) and that not all data analytics jobs need to be “high end”.

The challenge for our sub-region can therefore be summarised as seeking to enable a variety of “problem owners” in business, government or research to access the skills that they need to address the full range of problems that they face.

A Nascent Data Analytics Cluster

The ability to capture and analyse data is a skill that is needed across a wide range of industries and occupations. As a result, it is difficult to nuance how much of this type of activity takes place or its precise geographical distribution.

Census data suggest that in 2011, 2,400 people in Exeter were employed as Information Technology Technicians and Professionals. This is equivalent to 2.9% of the workday population, a higher percentage than that of the wider HotSW region (1.6%) or the country as a whole (2.8%).

Industrial analysis conducted by NIESR identifies the Exeter travel-to-work area as being host to the largest number of companies in the “digital economy” south-west of Bristol, using both Standard Industrial Classifications (right on the map) and Big Data generated by Growth Intelligence (GI) (left on the map) (Nathan et al. 2013).
A Supportive Strategic Environment

Although there remains some distance to travel to become a nationally recognised centre for data analytics, Exeter is increasingly home to innovative small and medium-sized companies, such as ATASS, Black Swan, Argand, See Data and Crowd Cube. Following its relocation, the Met Office developed nationally significant expertise in climate science. This expertise is recognised by HotSW LEP, whose Strategic Economic Plan stresses the importance of building on the “presence of the most powerful environmental supercomputer in Europe as a catalyst for the growth of a wider Big Data/environmental analytic cluster” (HotSW 2014).

The Right Educational Infrastructure

Exeter hosts the educational institutions needed to build a nationally recognised Skills Escalator, including specialist maths schools, an “Outstanding” (according to an Ofsted Government Appraisal in 2013) college, and Russell Group University. Close links also exist between institutions that are collaborat-
ing through SPARX – a pioneering technology that uses data to improve the educational experience. The new Cranbrook Education Campus, adjacent to the science park, is committed to becoming a centre of excellence for mathematics and enterprise by rolling out SPARX and implementing cutting-edge technology across the curriculum. University of Exeter and Exeter College have jointly established an Exeter Mathematics School (EMS), which is one of two free schools specialising in maths in the country and a regional centre of excellence offering boarding facilities to attract talented 16 to 19-year-old mathematicians to Exeter from across the Heart of the South West and beyond. Opened in September 2014 in support of the government’s commitment to creating “the next generation of scientists and engineers to drive the economy forward” (University of Exeter press release), the EMS draws on the mathematical expertise of university academics, pastoral support from the college, and the input of local employers to enable students to follow an enquiry-based approach to learning and a curriculum that demonstrates the real-world applications of students’ mathematical skills and the job opportunities that are possible with these skills. It is also a model of the kind of effective collaboration that will hopefully underpin the success of the Skills Escalator.

Exeter College is the first college in Devon and Cornwall to be rated as “Outstanding” by Ofsted using Ofsted’s new enhanced framework and the only provider ever to gain the highest rating in different inspection regimes in less than two years. The BTEC College of the Year in 2014, the college offers mathematics and computer science at AS and A level, BTECs IT to Level 3, apprenticeships in computing and systems development to Level 3 and a Level 5 Higher National Diploma in computing and systems development.

The University of Exeter was ranked 21st in the UK for Computer Science and 14th for Mathematics in 2017 (Complete University Guide, Times Good University Guide). Its undergraduate computer science programme has doubled in numbers in recent years and it is also one of the only 15 universities in the UK to host a Q-Step Centre, a £19.5 million programme designed to promote a step-change in quantitative social science training. With a strong track record of collaboration and innovation, including three joint professorships with the Met Office, the University is part of Setsquared, the No. 1 ranked university business incubator in Europe. However, more needs to be done and partners
are therefore committed to establishing a new Centre for Data Science focused on research, education, delivering business support services and impact.

The Data Analytics Skills Escalator

The Escalator is illustrated in Figure 2.

Figure 2: Overview of the Data Analytics Skills Escalator

Source: Dean and Neild (2018).

The principal objectives and elements of the Data Analytics Skills Escalator are described below.

- **Raise young peoples’ awareness, interest and attainment in data analytics study and careers**

Learning identities and perceptions of different topics (e.g. whether maths is boring or fun) are formed early. Whilst a data analytics cluster will recruit talent from across the country, Innovation Exeter wants to build a model that engages young people, gets them excited about the use of data analytics from an early age, and offers clearly defined routes to related employment in the city.

Working with employers and public bodies, the aim of the escalator is to raise awareness of the role that data analytics plays across a wide range of careers...
by educating teachers and guidance professionals, generating opportunities for employer visits and placements, engaging parents, delivering master-classes and sand-pit sessions, and by recruiting young people as role-models and ambassadors.

Partners are seeking ways of enriching the maths and ICT curriculum, linking with the Exeter City Futures initiative to generate projects that open access to data and excite young people by focusing their learning on addressing real-world problems. The Exeter City Futures project identifies over one hundred hypotheses that could be tested through data analytics. Students will be challenged to test these and come up with additional hypotheses, such as:

- We can improve the flow of traffic by instructing drivers at what speed to drive;
- We can spot a crash or incident in the city algorithmically and alert emergency services;
- We can reduce hospital admissions by monitoring weather patterns.

Innovation Exeter partners are also seeking to extend existing initiatives such as summer schools, student mentoring and projects that link students to university research groups. Working with the Met Office and others to make learning fun through techniques such as gamification. The Escalator is also very much concerned with inclusion; we need to address the fact that women remain seriously under-represented in this area of study and work, accounting for only 15% of Computer Science undergraduates and 18% of the IT workforce (HESA data 2015, e-Skills 2012).

- **Establish an Institute of Technology in Digital Skills**

The UK Government is offering colleges in partnership with institutions of higher education the opportunity to set up institutes for technology, providing specialists higher-level professional and technical education in their geographic area. We are clear in our wish for the focus of the Institute of Technology for our area to be on digital technologies and data analytics, although the ultimate decision will only be made following area-based reviews of further education, which are likely to see college mergers.

In advance of this, Exeter College has enhanced its provision of ICT and mathematics, making the delivery of high quality vocational training in this area a strategic priority. The University of Exeter will expand our existing range of provision, up to an HND and Foundation Degrees. The Institute of Technology
will provide enhanced workforce training, delivering bespoke provision of training to employers in response to demand and will demonstrate excellence in teaching by recruiting teachers who are dual professionals and exemplars of relevant pedagogy and the use of technology in learning.

Currently no curriculum exists in further education for the delivery of qualifications in data analytics. The Escalator will address this by working with employers to create new curriculum materials and by adapting and re-purposing existing ICT and mathematics modules through a new CATALYST project funded by the Higher Education Funding Councils (HEFCE).

• Develop an apprenticeship pathway in data analytics
Exeter College and Exeter University are committed to working together to build flexible apprenticeship pathways, which lead to qualifications up to the degree level for students who prefer to learn while earning. Exeter College has expanded its existing IT user and IT practitioner apprenticeship pathways, as well as introducing a new digital pathway to allow progression to higher apprenticeships across a wide range of job roles such as IT technical support, software developer, web developer, database administrator, telecoms engineer and network planner. There is a new Data Analytics Apprenticeship based on an entirely new curriculum, developed with local employers.

In September 2016, the University of Exeter became the first Russell Group University to offer degree apprenticeships in Digital and Technology Solutions. These apprenticeships integrate academic learning with practical on-the-job training within a holistic programme that meets the specific needs of employers. Degree apprenticeships will deliver the competences needed to perform a variety of IT professional roles, including: software engineer, IT business analyst, cyber security analyst and data analyst. Funded by Government and employer and for SMEs this is also an exciting opportunity to challenge the view that apprenticeships are for the less able and to attract a cohort of extremely capable students excited by the prospect of gaining an Exeter Degree free from debt and also earning while learning.

• Establish a Data Science Institute

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4 The government pays up to £18,000 of the £27,000 tuition fees, while additional grants are available for each apprentice ( £2,700 upon successful completion).
The University of Exeter performs well in the undergraduate study of computer science and mathematics, but recognises that it needs to expand and align the study of these subjects with the skills needs of the growing data analytics sector. There is also a need to enhance the data literacy skills of natural and social scientists as well as humanities graduates. Exeter is therefore seeking to establish a Data Science Institute at the University. The focus for this centre will be broad, including business and research support alongside a focus on expanding the breadth and flexibility of the University’s educational programmes. As part of establishing a Centre for Data Science, the University of Exeter will create new modules and programmes enabling:

- Undergraduates studying relevant subjects (e.g. mathematics or computer science) to opt into modules and acquire degrees “with Data Science”;
- Undergraduates studying a wider range of subjects (e.g. geography, politics and economics) to undertake a limited number of modules to acquire a BSc “with proficiency in Data Analytics”.
- Students to pursue a four year MSc in Data Science by selecting a requisite number of data-intensive modules during their first three years of study, followed by additional specialist modules with an industrial placement or group project in their fourth year.
- Professionals and graduates with relevant experience to attain an MSc in data science while studying either full- or part-time or on a modular basis (see the section on continuing professional development).

New modules will be developed covering topics such as machine learning, text mining, mobile data, databases, image analysis, data visualisation and programming.

- **Boost employability and graduate retention**

  Industry needs people who combine technical skills (such as coding and statistics) with good communication, team-working and business nous to create a staff that can transform data into insight and commercial value. Enabling students and graduates to gain work experience within multi-disciplinary teams has enormous benefits. It improves individuals’ employability and their understanding of the career opportunities available to them, while enabling enterprises that benefit from the students’ work to review potential employees with reduced cost and risk.
Through the escalator we want to ensure that the people whose talents we build have the opportunity to remain in the area and use their skills to benefit local companies. To achieve this, we propose extending the range and level of support we can provide for internships, student placements and graduate business partnerships. In particular, we propose creating a new “Professional Pathway – Data Analyst”, which will enable graduates with data science backgrounds to work on task-focused projects with local business.

- **Raise business awareness of the value of data**
  As a part of a wider focus on increasing productivity, having the ability to identify, capture and use data is a growing concern for a large number of businesses. All manner of enterprises could make smarter decisions by managing information more effectively. Our escalator therefore needs to engage small enterprises from all sectors, not just those for whom data analytics is core business. It will seek to achieve this by reaching out to business managers and leaders and helping them better understand, explore and exploit the potential of their data though tasters and short master classes such as “Drive Sales and Generate Insights through Analytics”. Businesses that are interested can be assisted in identifying the right solution for them, be that an accredited short course, graduate placement, apprentice or, for business leaders, a place in the Exeter University four-day MBA module on “Practical Insights into Data Analytics”.

- **Deliver training to data professionals**
  Employers need to be able to up-skill and re-skill existing staff to enable them to remain at the leading edge of a dynamic industry in which knowledge and skills are rapidly going out-of-date. Our escalator therefore needs to include flexible short courses and programmes that allow professionals update their skills in response to specific needs.

  The University of Exeter will develop and deliver a suite of “short and fat” continuing professional development (CPD) modules that are condensed to take place in short periods over consecutive days, and followed by tutorials and an exam in the subsequent few weeks. Modules will be accredited, enabling participants to attain an MSc, should they desire.

  Exeter College and University will both work flexibly, designing bespoke CPD programmes in response to individual companies or groups of companies and...
are working with the Heart of the South West Local Enterprise Partnership to secure partial funding for a CPD offering.

- **Provide high-end analytical talent and support to business**

The Centre for Data Science will be a focus for doctoral training and the development of a cohort of analysts with high-level specialist skills. It will be responsible for supporting the development of a data analytics cluster within the City and Science Park and will recruit staff whose remit is to solve problems experienced by others in academia and industry. The Centre’s staff will work with business through the Impact Lab, where we will focus on developing a vibrant and creative culture where innovators and entrepreneurs mix with scientific experts and students.

In collaboration with the business sector, we will initiate and take forward joint projects, working to secure innovation, research and development funding where required, using sources such as Knowledge Transfer Partnerships, CASE Studentships, Doctoral Training Partnerships and research grants.

**Latest Developments Following Escalator Development**

With support from the LEP, the University of Exeter has secured £8m of Local Growth Deal funding to establish a Global Environmental Futures (GEF) Campus and Impact Lab in the Exeter Science Park. The GEF Campus aspires to become a focal point for a data growing analytics cluster and a place where:

- Data scientists from the University and Met Office will co-locate with businesses to take advantage of incubation, collaboration and grow-on space within the building;
- People will come to network, explore new ideas, share data and technology;
- Enterprises will access innovation and business support services and develop joint R&D proposals in partnership with the university and each other.

The Exeter City Futures initiative, also driven by Innovation Exeter, is a strategy for growing Exeter’s economy, safeguarding its natural resources and making life better for residents and businesses through pioneering technology and the innovative use of data. It seeks to demonstrate, though a competitive bid for £10m of Innovate UK funding, that with cutting-edge technology, Exeter can
provide an exemplar that shows other cities what is possible when partners collaborate. It is also, importantly, an initiative that involves the large-scale deployment of sensors that capture and analyse large quantities of information generated through the “Internet of Things”. This data will be used to measure the impact of a long list of real-world interventions precisely, establishing Exeter as a test bed for determining how UK cities can cost-effectively and collaboratively improve congestion, reduce energy consumption, lower costs and improve the health of their citizens.

Thus far £6.4m of ERDF funding has been secured to establish an Environmental and Big Data Impact Lab. The Impact Lab will enable SMEs working on innovative products and services to draw on the support of partners across the HotSW LEP area, including academics at the University of Exeter. It includes a £1.5m Challenge Fund providing innovation grants to SMEs in Devon.

Recognising the need to boost analytical skills in school-age children, the University of Exeter has pursued funding from the European Union’s H2020 and Erasmus+ Programmes bringing together academics from the Graduate School of Education and regional impact specialists from Innovation Impact and business. Since 2017, this resulted in the Strategic Partnership for Innovation in Data Analytics in Schools (SPIDAS), a new project exploring best practices in the development of data analytics skills, working in partnership with schools and colleges from Finland, Spain and Turkey. The SPIDAS partnership aims to be a platform for further activity pursuing this priority. The project began in November 2018. A new bid for 2018 is being finalised that also focuses on data analytics, this time looking at “aquarium learning”. Both bids include networks of local schools, and the former includes the Met Office as a supplier of innovative data.

To take the Escalator model forward and explore its potential elsewhere, the University of Exeter is partnering a bid to Erasmus+ with the European Network for Regional Labour Market Monitoring (EN RLMM) called ESCALATE which if successful will expressly extend and deepen the model to ensure greater provision locally for low participation groups and neighbourhoods. A new Institute of Technology is also planned with partners including the University of Exeter, Exeter College and Petroc College all seeking new provision for apprenticeships and other work-based learners associated with the digital and data fields. In response to local and national initiatives, the Heart of the South West LEP has
established a new Digital Skills Partnership, which is developing a new regional strategy in partnership with representatives from the triple helix of groups in education, the private sector and local government and policymaking. The escalator will also be a part of this effort.

References


Innovative Economy in St. Petersburg and the Development of Competencies

Nina Oding

Globalisation as an expansive exchange of goods, capital and services differs in various ways, not only in different countries and regions, but also in the branches and types of human activity it encompasses. In the field of employment, there are also problems caused by changes in the content of competencies and professions in general because of the emergence of new businesses, forms of marketing and technology. Thus, employers are often sceptical about assessing the adequacy of the necessary skills in their region, the amount of time required to find employees and the level of professionalism and skills of hired employees. Digitalisation and robotics have already appeared on the agenda and will soon change the labour market. Obvious changes will become a reality in the near future, but for the time being, they are perceived as separate fragmentary features of the demand for new competencies for several businesses and spheres of production.

Thousands of today’s schoolchildren and university students will have to decide what they will do in life. However, it is already clear that some of them will never use the knowledge gained during their studies and will not work in the specialties indicated on their diplomas. This means that some years will be spent on the job-search or finding new means of self-determination and re-training. Today’s popular professions will become irrelevant and unnecessary in the future.

Nowadays, many young specialists with diplomas from Russian universities could find jobs in other countries where digitalisation has become a reality. On the other hand, the inflow of foreign labour into Russia is associated with low- and medium-skill jobs in construction, hospitality, cleaning and communal services. Perhaps this was the case previously, but right now Russia is experiencing a bizarre mixture of the traditional economy, in which large and medium-sized enterprises operate, and a new economy, where start-ups, new industries and services based on other principles arise, develop or disappear. In the near fu-
ture, completely new skills that machines do not possess will be required in order to remain competitive.

Therefore, there is a radical restructuring of the education system changing the learning objectives, methods and evaluation system so that the new generation, Generation Z, has new qualifications and skills. In addition, these changes in the areas of employment and the content of qualifications gave rise to new problems related to the methods of observation and data retrieval used to create an adequate picture. This paper is an attempt to consider the possibilities for identifying new phenomena in sectors of the economy and the methods of collecting and analysing information in St. Petersburg – one of the most developed region of Russia.

Structural Changes and New Phenomena in the Economy

Since the end of the planned economic government, the country has undergone a long period of adaptation to market demand, passing through several crises. As a result, the Russian economy is a combination of industrial and post-industrial development, increased state participation, dominance by large corporations and monopolies and state and quasi-state financing instead of private investments. Despite significant changes in external conditions, Russia just starts the process of structural transformation of the economy. This is due to economic stagnation and the exhaustion of the potential for the raw material growth model widening the gap with developed economies and the insufficient development of new industries, medium and small businesses.

In recent years, economic growth rates in Russia have noticeably decreased: the average annual growth rate of GDP from 2009-2017 was 0.7% versus 6.9% from 1999-2008. Russian scientists Akindinova et al. (2016), have distinguished three macro-sectors in the Russian economy: the raw materials industry, the large non-primary resources industry and small and medium-sized businesses, which are defined by tight borders, varied financial models and different reactions to the changing external conditions in 2014-2016. The traditional commodity sector has had the greatest gains without experiencing losses while the remaining sectors faced falling demand due to the decreased income of the population. Since then, the orientation of the Russian economy towards raw material has only intensified. During this period, the share of mining in the GDP...
increased by 1.5%, while the share of manufacturing and agriculture decreased by 0.4%. In the structure of the country’s exports, raw materials and metals still make up about 10% of the world fuel market. However, Russia’s share in the market for high-tech products is less than 1%. In the 2000s, the service sector acted as a driver of growth against the backdrop of rising prices for the main exports of the Russian economy. Despite the deterioration of the general conditions for the functioning of non-tradable sectors after the fall in oil prices, the share of the service sector in the structure of the economy continues to grow. This is due to a more competitive environment and fewer barriers to entry for new technologies than for traditional production. (Akindinova et al. 2016).

In 2017, Russia adopted the “Digital Economy” programme. In it, stimulating the creation of high-tech IT enterprises, industrial digital platforms for the main sectors of the economy and small and medium enterprises in the field of digital technologies were mentioned in particular.

### St. Petersburg as an Advanced Region

In a country as heterogeneous as Russia, the situation varies considerably in different regions, determined by the structure of the economy, specialisation, co-operative ties and the quality of public administration. As noted in the OECD report, the strengthening of a country’s competitiveness is ensured by the development of innovative businesses, knowledge centres, modern production infrastructure and qualified personnel in certain territories (OECD 2012). All these conditions are available in several of Russia’s most prosperous regions, including St. Petersburg.

The most advanced regions can themselves initiate co-operative processes, create initiatives, projects and programmes to create a network of producers and, most importantly, reduce administrative barriers to business. In turn, emerging new firms and growing sectors of the economy can generate additional demand for new educational services and promote the transformation of the educational system into one capable of training specialists of a new type. Additional opportunities for the implementation of this approach are related to urbanisation, which in large cities leads to an increase in the “density” of diverse economic agents and the development of new sectors of the economy.
In St. Petersburg, companies that take part in international co-operation manifest the same tendencies that are seen in developed economies. Changes in consumer preferences and competition between enterprises leads to the fact that enterprises must adapt to changes in the external environment, change the training system and seek creative specialists to meet the needs of consumers of their products. In turn, educational organisations, in order to ensure their competitiveness, should, to a larger extent than before, work ahead of time, i.e. prepare specialists with the competencies needed for the future. That is why it is necessary to understand which specialists and competencies are needed now, and which will be needed for the economy in five to ten years to be effective both in a relatively stable environment and in times of crisis.

Next, we will consider the employment situation in the St. Petersburg economy, the combination of new and old in employment, and the problems of monitoring the emergence of new competencies, sources and methods of collecting information.

Factors of the Emergence of New Professions

New professions and competences are an integral part of progress, but for the first time in history, they are creating low-volume production and contributing to the disappearance of many professions and, conversely, the development of new competencies and changes in qualifications. In turn, high requirements for new specialists require a more flexible educational system (EY 2015).

New areas of activity arise primarily in the field of platform solutions, the formation of inter-industry digital platforms and, accordingly, new business models such as Alibaba, Uber and Airbnb. Within the framework of the new scientific and technological paradigm, it becomes possible to produce customised products at a price comparable to mass production. Digitalisation is not only innovation and IT systems; it is also the education and specialists themselves who will create a solid foundation for long-term technological development programmes.

Already, the tendency to automate work and replace human labour with robotic systems is becoming probable: more than 40% of jobs are in the high-risk zone and could be replaced within the next 20 years. For example, radio technicians who will monitor unmanned (autonomous) trucks will replace truck
drivers. The smallest probability of automation exists in those activities where the key is the accumulated experience, knowledge and skills in the field of people management, interaction with customers, suppliers and stakeholders and the use of specialised knowledge (expertise) for decision-making (The Economist 2015). Therefore, the role of soft skills as a necessary condition for effectiveness must inevitably increase. The content and importance of the components of this qualification is studied in the work of Fisher (2011). He considers skills and behaviours that are important for the successful application of people skills. Huemann (2010) studies the case of staff skills within a telecommunication company. Cicmil and Hodgson (2006) investigate the behaviour profiles of superior project managers working in the construction industry. Stevenson and Starkweather (2010) carried out research focused on investigating the human characteristics necessary to achieve success by defining and rating preferred IT project management competencies across US industries. The authors identified soft skills as highly valued indicators of effective project managers.

New technologies lead to the greater openness and accessibility of markets and increase mobility and competition within them. As noted in the Deloitte Consumer Review (2015), market power passes to consumers who prefer those products and services that are most appropriate for their specific needs and are willing to pay more for customised products. Manufacturers must adapt to the rapid change in demand and satisfy personalised needs in order to maintain a competitive position in the market. The “Millennials”, representing a group of people with diverse demographic characteristics, play a special role in the market as the main buyers. They have a high level of education and heterogeneous preferences (Kaye 2014).

It can be argued that the modern economy is becoming more and more customised, i.e. the main role in it is played not by the producer, but by the consumer. This means that an increasing number of goods and services satisfy not only the material, but also the psychological needs of customers. It is noteworthy that technological changes, especially those technologies that are beyond the capabilities of human perception, for example, bio- and nanotechnologies, often cause concern among different groups of people. This is taken into account when switching to new technological solutions. According to various studies (OECD 2017), the basis for assessing the popularity of new technologies
is not the level of awareness or education of citizens, but rather personal attitudes and values.

In Russia, final-product consumers also have their preferences and concerns about the use of new technologies (ISSEK HSE 2017a). The largest Internet resource in Russia is “Yandex”, which had 23.7 million visitors daily in February (Russia 100k +, 12-64). In second and third place were VK and Google.¹ So, in a special study of social demand for new technologies (ISSEK HSE 2017b), a great deal of interest (46% of respondents) was shown in the popular decision to seek the services of a remote doctor instead of directly turning to health care institutions; 35% were willing to pay for it. At the same time, only 22% are willing to use the services of an unmanned taxi.

In St. Petersburg, there are spheres with improved technologies: the provision of public services through MFC systems and electronic document management, which saved time and liquidated queues in state institutions. It made the provision of services transparent and understandable. E-health is one of the priority projects for St. Petersburg in the field of digitalising public services. At the same time, some of the city services developed by the city administration and presented in mobile applications on Android and iOS platforms and open access data sets for business needs are practically unknown to businesspeople (RBC 2018a).

In St. Petersburg, the transition to the digital paradigm began as consumers of new generations entered the active phase of their lives, in which they developed different values for life in the city, like the abandonment of personal housing and a car, for example. They are the consumers of the services provided by YouDrive, Uber, YouDo, DeliveryClub and Telegram. The emergence of these new features of production and consumption inevitably necessitates a change in the content of professions and the development of new qualifications.

The Labour Market in St. Petersburg

The economy in St. Petersburg has large, medium and small enterprises in many industries offering positions in various professions. In November 2017,

the number of people in the economically active population (EAP) amounted to 3,036,700 people, of them 2,980,800 employed. In this period of time, the employment rate (the share of employed people in total population aged 15 to 72 years) was 73.5% and the level of economic activity (the share of the economically active population of the total population aged 15 to 72 years) was 74.7% (Committee on Labour and Employment). In 2017, the largest number of vacancies filled was in education, processing industries, real estate operations, transportation and telecommunications and healthcare, and the lowest number was in agriculture and forestry, hotels and restaurants and other services (Table 1). The public sector employed 46% of all employees of large and medium-sized enterprises in the city.
Table 1: Employment at enterprises and organisations in St. Petersburg by type of economic activity in October 2017 (excluding small enterprises)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Total employment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>`000 people</td>
<td>% of the total</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>211.1</td>
<td>14.4</td>
</tr>
<tr>
<td>Production and distribution of electric power, gas and water</td>
<td>48.4</td>
<td>3.3</td>
</tr>
<tr>
<td>Agriculture and forestry</td>
<td>5.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Construction</td>
<td>58.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Transportation and telecommunications</td>
<td>179.1</td>
<td>12.2</td>
</tr>
<tr>
<td>Finance</td>
<td>55.3</td>
<td>3.8</td>
</tr>
<tr>
<td>Real estate transactions, leasing and services</td>
<td>35.8</td>
<td>2.4</td>
</tr>
<tr>
<td>Wholesale and retail trade, repair of motor vehicles and home appliances</td>
<td>153.2</td>
<td>10.4</td>
</tr>
<tr>
<td>Hotels and restaurants</td>
<td>26.4</td>
<td>1.8</td>
</tr>
<tr>
<td>Public administration, security and social care</td>
<td>88.9</td>
<td>6.1</td>
</tr>
<tr>
<td>Education</td>
<td>232.5</td>
<td>15.8</td>
</tr>
<tr>
<td>Healthcare and social services</td>
<td>142.8</td>
<td>9.7</td>
</tr>
<tr>
<td>Culture, sports, entertainment</td>
<td>47.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Science and technology</td>
<td>133.7</td>
<td>9.1</td>
</tr>
<tr>
<td>Administrative services</td>
<td>37.8</td>
<td>2.6</td>
</tr>
<tr>
<td>Other services</td>
<td>10.6</td>
<td>0.8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1467.7</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Committee on Labour and Employment.²

Manufacturing, education, transportation and telecommunications are the branches of economic activity with the largest number of employees. In December 2017, the demand of St. Petersburg enterprises for new labour amounted to 35,900 people, of them, 59.1% were recruited for blue-collar pro-

² For more information, please see: http://ktzn.gov.spb.ru/analiticheskaya-informaciya/.
fessions. In January-November 2017, the greatest demand for employees was reported by the enterprises and organisations engaged in economic activities such as cargo transportation and storage (17.9% of all reported vacancies), processing industries (15.0%), construction (18.4%), and wholesale and retail trade (9.8%).

According to the State Statistics Service, by the end of 2017 the unemployment rate (according to the methodology of the International Labour Organization) was 1.5% of the economically active population. This was one of the lowest unemployment rates of any region in the Russian Federation (compared to 4.4% in the North-West Federal District, 1.3% in Moscow, and 5.1% in the Russian Federation as a whole). At the end of January 2018, the level of registered unemployment (the average ratio of the number of registered unemployed to the economically active population for the year) was 0.4%. As of January 2018, as well as in the same period of 2017, among the employees who fell into the Top 10 deficit occupations, doctors, engineers, managers, policemen, architects and translators were the most in demand.

At the same time, the deficit of managers has slightly decreased and there is a shortage of masters, inspectors, nurses and commodity experts. The labour market is experiencing a professional deficit in the working professions, whose loss of prestige has been significant. Staff continuity has also decreased due to ageing. In terms of sectors, there is a shortage of workers in construction, engineering and metalworking, transport, housing and communal services. Among the specialists in the working professions, there was a shortage of chauffeurs, electric gas welders, controllers, cashiers, fitters and masons, and the deficit of concrete finishers increased. As before, the working professions of the construction industry remain in short supply, including: concrete workers, painters, plasterers, steel workers, and concrete finishers.

At first glance, positive trends are related to the recovery after the economic crisis and the increase in the number of jobs and employed people. Moreover, there is the largest number – over 3 million of officially employed people in St. Petersburg. At the same time, the employment structure remains almost the same without significant changes. However some changes in the employment structure are determined by digitalisation and more flexible forms of work organisation. On the other hand, contradictory tendencies towards the previous style of development among companies and industries coexist on the labour
market, with the presence of companies and sectors of a new type operating within the pre-existing industrial and post-industrial framework. If the first of these are predominantly experiencing a labour surplus, then the latter are, as a rule, labour-intensive.

While some industries still require workers that are time and location bound, it will become common in many sectors for workforces to be virtual, connecting to work anytime, from anywhere and on any device. However, this distinction is too generalising. Even within one group of similar enterprises, innovative solutions are being sought in production and management. Thus, in old industrial enterprises, which received orders from the state and market niches in connection with import restrictions, there is also the emergence and use of digital technologies, robotics and 3D modelling.

St. Petersburg is among the leading regions of Russia in developing an innovative economy. IT companies work successfully here, develop software and hardware and have accumulated experience in foreign contracts and achieved the level of competence necessary to enable them to compete on their own high-tech markets. There are domestic operating systems, telecommunications equipment, computer vision systems, robotic systems and their own implementation of basic Internet protocols conducting research and development in such promising fields as Machine Learning, the Internet of Things, mobile technologies, etc.

In the near future, the digital economy will include almost all economic activity, not just the IT sector and telecommunications. For example, design companies have given up drawing boards and moved to BIM-technology, builders are experimenting with 3D printing and developers use augmented reality in sales.

At the moment, the innovative sectors of the economy include bio and pharmaceutical companies united in one cluster and car companies represented by localised Japanese and South Korean automakers and power engineering design bureaus and enterprises in another. At the same time, even the traditional machine-building companies, like shipbuilding companies, are turning to digital technologies under the influence of market competition.

Construction companies are also now switching to digital building modelling. According to the general director of “NTTC Etalon” Arsenty Sidorov: “With regard to construction companies and the digitalization of these companies.... the
degree of digitization is determined by the size of the business: the more solid the company, the higher the level of automation and informatisation processes” (RBC 2018b).

The spreading digitalisation is not only innovation and IT systems; it is also the education of future specialists and the formation of new competences. Therefore, not only new sectors of the economy, but also IT, pharmacological companies, chemical production and biotechnology, need new specialists of a different type, without occupations in the usual sense, but as carriers of a set of competencies.

**Professional Standards**

The disappearance of traditional professions and activities that began in St. Petersburg in the last decade did not lead, however, to a surge in unemployment. Changes are manifested in the emergence and increase of a relatively new phenomenon named the “precariat”. Employees who periodically leave the labour market in St. Petersburg existed before, but the vast majority of employable people worked for hire. The term “modern precariat” refers to those specialists whose knowledge in the modern economy is easily replaceable. The most vulnerable here can be young people with diplomas from educational institutions, but without additional skills if the education system retains the inertia of training specialists using out-dated programmes.

In St. Petersburg, young people with diplomas who do not find a job in their specialty prefer working in trade or public catering. The diploma becomes not a certificate of received qualifications or the reception of a general education, but one of a life spent constantly out of work (Sizova 2018a). As a result, if there is a balance of supply and demand, there is an imbalance in the quality of employment. It manifests itself in a gap between the skills acquired in the training process and the real needs of businesses. At the same time, business and vocational education are weakly related, and the qualifications and new knowledge gained are also weakly related to the wage system.

Professional standards are used to match the interests of the business and public sectors with those of the educational system. Professional standards are the basis for the standards of education. The history of professional standards in
most European countries began more than 100 years ago. The European Centre for the Development of Vocational Education and Training (Cedefop) uses the concept of “qualification standards”, which includes occupational and educational standards as well as relevant assessment standards and procedures. At the same time, in European practice, there was an understanding of the professional standard as “a way of classifying and describing the most important jobs that people can perform” (Cedefop 2010).

In Russia, the process of forming professional standards began several years ago, before intra-departmental professional standards existed as a set of requirements. The Ministry of Labour and Social Protection of the Russian Federation issues a handbook of highly demanded jobs in the labour market and new and promising occupations, including those requiring secondary vocational education, containing a brief description of the profession and its compliance with the All-Russian Classification of Occupations of Workers, Officer Posts and Tariff Levels, requirements for education and experience and the code for the all-Russian classifier of occupations.

At the national level, the need to assess the content of professions was realised in the form of an institute for professional standards; while the system of qualifications is in its infancy, the process is just beginning to develop, and it currently encompasses 1,100 positions. This creates a legal tool for determining the content of professions. In addition, in 2015, the Federal Law “On the Independent Evaluation of Qualifications” 238-FZ was adopted. This allows the employer to have a legal basis for assessing the quality of the employee, and the employee, having learned independently and having passed the exam in the qualification assessment centre, confirms their competencies. For the employer the certificate is a document that guarantees the ability to perform labour functions qualitatively. Thus, this is the beginning of the formation of a national system of professional qualifications, including the development of a national and sectoral framework of qualifications, professional standards, a system of professional and public accreditation of professional educational programmes (POA) and an independent assessment of qualifications (NOC).

The analysis of the existing qualification assessment system allows us to conclude that such a system is organised not by a sectoral, but by a regional principle. A regional certification centre is being established, which, based on previously adopted industry standards and its own development, conducts such an
assessment of qualifications, which was previously called a Certification of Qualifications, and is now referred to as an Independent Assessment of Qualifications (NOCs). It is voluntary, and anyone who wishes to pass the test can obtain it, from the alumni of an educational institution up to a specialist with a long record of work. On the other hand, the employer does not rely on such a document, which is why it is not very trusted, and, consequently, those who have it do not receive any special advantages.

It should be noted that the sectoral professional communities have a different attitude toward the state system of professional standards, believing that they do not meet their real needs. Moreover, this useful tool for regulating the labour market is to a great extent in conflict with the emerging trends in employment. The essence of modern development is just going beyond the existing standards. Therefore, in the emerging clusters of the innovative sectors of the economy of St. Petersburg, there is a rapid change in technology and staff competencies, which the professional standard simply does not have time to take into account. Perhaps, in my opinion, two largely opposite phenomena, professional standards and a set of competences for the employee, could find a parallel existence. However, in our optimistic assessment, they could create a synergistic effect in the form of a dialogue between employers and formulate common requests to the education system. It could affect the formation of educational programmes and resources for their implementation, including in the evaluation of learning outcomes.

The Future Content of Selected Professions

Changes in the content of many types of economic activity in St. Petersburg necessitate a fundamentally different approach to training. In previous periods, it was required to learn a certain set of disciplines. Now, it is required to develop learning agility over the course of learning, i.e. to successfully extract experience from different situations. This ability is represented in a schematic form in Figure 1.
At the International Labour Forum, held on 1-2 March 2018 in St. Petersburg, many participants pointed to the growing demand for professionals with the competences of creative thinking and creativity. In addition, soft skills are gaining importance in the labour market. Moreover, the content of this concept acquires additional qualities; it is not just about handling stress and the ability to work in a team, but also about possessing more complex qualities, for example, leadership qualities, the ability to manage people and critical thinking.

However, in the presence of such significant sources of information, the analysis of labour market processes has been extremely difficult so far. While official statistical bodies do not catch these changes, it is worth collecting new evidence of these changes by using methods of direct observation and participating in events dedicated to personnel problems and the problems of the development of the digital/innovation economy (Figure 2).
Unions of industrialists and entrepreneurs and large enterprises in the city are partners of the resource centres. The resource centres of the city are working to optimise the provision of training resources, respond promptly to changes in the labour market and adapt the training programmes to the needs of employers. A particularly important source of information can be HR experts, who join an association of recruiting companies, hold conferences or competitions and issue up-to-date reviews of the situation.

Box 1: Examples of specialised recruitment agencies in St. Petersburg

DENIS Pharm Personal is the consulting company that selects medical personnel and pharmaceutical personnel of various levels: senior and middle managers, as well as specialists in various areas.

Kelly Services is the largest international company in Russia that provides solutions in the field of personnel management.

EMG Professionals is one of the leading recruiting agencies that exerts a significant influence on the formation of the market for recruitment and personnel consulting services in Russia.

IT-Dominant-recruiting company, established at the Faculty of Retraining Specialists at SPbSPU (“Polytechnic university”) in 2004.

IT Selection Agency is the leader in the IT recruiting market in Russia and the CIS. It carries out professional recruiting of IT personnel (developers, QA, analysts, project Managers, configuration managers, SAP-specialists, CTO e. C.).

SuperJob is an IT company that has been successfully developing technologies for recruiting staff and searching for work for 17 years.

The personnel agency Personnel of St. Petersburg offers services for the selection of top managers, engineers and IT professionals, as well as mid-level managers and skilled workers.


Gathering and analyzing information is hardly possible while official statistical bodies do not catch the new features of the labour market development. It is worth to conduct using methods of direct observation, participation in events dedicated to problems of innovations and digital economy development. There are additional methods of collecting information on new competency, profiles of required specialists:

- Surveys of employers;
- Face-to-face interviews;
- Focus group meetings;
- Foresight sessions involving businesses and university graduates.

It is worth taking a moment here to give an example of a particularly notable one of these foresights, demonstrating the utility of discussing the problems of the new economy and the transformation of employment. In January 2018, one of the first foresight sessions “The transformation of professions: the students’
view” was held, organised by the Committee for Labour and Employment of the Population of St. Petersburg with the participation of students from the Economic University. The participants identified the most significant trend: the digitalisation, automation and robotisation of production processes. Among the significant changes expected are the spreading of various forms of self-employment (freelancing, employment in the event industry), rapid change in the popularity of certain professions caused by technological revolutions and the emergence of a wide range of specialists. Another result of the foresight session was the observation of changes in society:

- The priority of career values over family values and the expected strengthening of family values after 2030;
- Competition between humans and robots raising the status of creative professions;
- Growth of communities for professional and thematic interests;
- Introduction of VR-technologies in tourism.

In addition, the participants agreed that some trends one could only be observed in the long term: the creation of strong artificial intelligence capable of replacing the creative thinking of humans, as well as the recognition of crypto currency as a means of payment (see Box 2).
**Box 2: Results of the foresight session in St. Petersburg**

- **Prospects for specific professions in the near future**: those that will cease to be in demand because their functions will be performed with the help of automated means: accountant, secretary, adviser-operator, control and security personnel, cashiers, sellers, pharmacists, merchandisers, guides and translators;

- **Professions related to the massive introduction of robotics**: a robotist (a lawyer who creates a regulatory framework that regulates the operation of robots in a wide variety of areas), a techno-coach (a human robotics trainer), a robotic (a specialist who supports people who need psychological adaptation to mass deployment of robots), a techno-psychologist (a specialist who provides psychological support to people who are attached to robots or suffering from their loss), etc.;

- **The emergence of poly professionals, who will arise in connection with the need for live human communication**: a baro-psychologist, a hairdresser, a psychologist, a masseur-psychologist, etc. (representatives of these professions should have an education in the field of psychology in order to fulfil the functions of communication and psychological support to visitors to cafes, hairdressing salons, spa salons and other public services facilities;

- **Professions related to the optimisation of the use of a large amount of information and resources**: Big Data journalist, shared logistics (technicians, robots, etc.) and resource optimiser;

- **The emergence of a class of owners, who will live on funds from renting robots**;

- **New professions related to the spread of alternative forms of education and new ideals of life**: navigators in education, trainers in the field of creative thinking and mentors for achieving a happy harmonious life.


Taking into account these perspectives, participants proposed project ideas to minimise the risks of losing their jobs and achieve employment opportunities:

- The gamification of educational processes and employment processes;

- The formation of tools for flexible interaction between employers and educational organisations that allow them to be informed in a timely manner about changes in the composition of competences required of workers;

- The creation of educational platform on the basis of corporate and state universities;

- The creation of new or the development of existing areas of social interaction between all members of the labour market with the use of social
technologies and the implementation of resource-intensive projects by means of sharing.

Changing skills needs in sectors and occupations are a significant feature of the modern period of economic development in St. Petersburg. The role of education, lifelong learning and finding resources for forming soft skills are on the agenda for regional development in Russia.

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Website

Komitet po trudu i zanyatosti naseleniya Sankt-Peterburga (Committee on Labour and Employment of St Petersburg): http://ktzn.gov.spb.ru
3. TAXONOMIES AND FURTHER DEMAND FOR DEVELOPMENT

International Systems of Labour Skills Monitoring in the Digital Economy¹

Vyacheslav Bobkov, Vadim Kvachev and Irina Novikova

The global digital labour market is forming as a result of the development of the digital economy. This is totally new space with a new form of labour relations between employer and employee. Even the status of “employers” and “employees” is changing in order to adapt to this completely new relationship. Sometimes it is hard to even draw a clear line between these positions, as a self-employed person could be an employer and an employee at the same time. It is indicative that some international organisations still have not decided in which category self-employed workers should fall under in terms of taxation and social protection. Furthermore, using information and communication technologies (ICT), a worker could carry out his or her activity beyond the borders of his or her country or territory. Consequently, new demands for labour qualities and the development of personnel are required.

Firstly, constant changes in the economy requires permanent retraining, as nobody knows which skills will be in demand in the future or which jobs will be replaced by capital, i.e. robots and computer programmes. Secondly, employers could use ICT to access labour from any country of the world where workers have the required skills, labour is relatively cheap and labour legislation is flexible. All of these factors widen the possibilities for employment for workers, but form new global competition among employers as well as among employees at the same time. In this regard the problem of skills development is a very substantial one for the global digital labour market. The solution to this problem is rooted in a deep understanding of international systems of skills develop-

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opment and the need to create a new unified global system for labour skills monitoring.

The International Labour Organization developed the International Standard Classification of Occupations for classifying workplaces in organisations, industries and countries as a strictly defined list of groups according to job tasks and responsibilities. However, the lists of skills required for each job position are not specified in the ISCO. Thus the standard cannot be used for building the unified system of labour market monitoring. At the regional level, three major regional systems of labour skills monitoring can be specified, namely the Russian, European and American systems.

The Russian System of Labour Market Skills Monitoring

There are several Russian databases that collect information about the labour skills and qualities demanded in the labour market. The National Qualifications System, which includes professional and education standards, a unified rating and skills guide for manual occupations and a unified skills guide for managers, specialists and non-manual workers.

These numerous and extensive databases unfortunately make interactions between employers, employees and educational institutions very complicated as they use different notions and concepts. Professional standards describe the requirements for workers on the basis of professional activities requiring specific skills, while educational standards use three different types of competencies: non-technical general competencies, general professional competencies and professional competencies. It is noteworthy that the Russian Labour Code claims that professional standards are a key element of the National System of Qualifications and that educational standards should comply with them. At the same time, workers’ qualifications are defined by the Labour Code as the particular knowledge, skills, professional competencies and work experience of a worker. The Education Act of the Russian Federation gives a more extended definition including the level of knowledge, skills and competencies. Thus the National System of Qualifications, which plays a role in forming the basis of training and development of personnel, lacks measures for practical skills evaluation.
The creation of a unified system of labour skills monitoring in Russia could help to provide an intercountry comparative analysis of labour markets, but the current state of the system is problematic because labour and educational legislation do not encourage this process. However, within the framework of the Priority Projects “Federal Centres of Competencies in the Field of Labour Productivity” and “Increasing Labour Productivity and Endorsing Employment”, Resolution o. 2662-p of the Government of the Russian Federation (29 October 2017) has established a new autonomous non-commercial organisation called “The Federal Centre of Competencies in the Field of Labour Productivity” with the help of WEB Engineering, a Russian OOO (Russian denotation for a limited liability company). The Centre will provide assistance in developing effective strategies for the promotion of labour productivity, create terms and potential for sustainable achievement in effective labour productivity and the implementation of organisational innovations in the production and decision-making processes. At the same time, labour skills monitoring is one of the functions of this centre, which, in our opinion, could significantly promote labour productivity in Russia.

The American System of Labour Skills Monitoring

The American system of labour skills monitoring “21st century skills” points out the following fields of skills (Pellegrino and Hilton 2012):

- Cognitive competency;
- Personal competency;
- Interpersonal competency.

With the support of the United States Department of Labor and the Employment and Training Administration, the new professional information network O*NET OnLine was developed to collect information on more than a thousand professional occupations. This network was built based on the Standard Occupational Classification (SOC), which has been the federal statistical standard in the USA since 2018. The SOC is used for classifying workers in professional occupational categories for the purpose of collecting, calculating and sharing data. Every worker is classified as a representative of one of 867 professions. To facilitate classification, detailed professions are gathered into 459 broad pro-
fessional groups, 98 small groups and 23 basic groups. Detailed professions in the SOC are grouped by professional functions, skills and education.

American research literature uses a set of interrelated notions and concepts but, as a result, usually considers skills as a complex combination of cognitive, interpersonal and personal competencies. Liu and Grusky (2013), for example, develop an eight-factor-system of professional skills.

The European System of Labour Skills Monitoring

There are several disagreements among European scientists concerning the understanding of labour skills. Competencies are most commonly considered from the point of view of functionality. Competency is considered to be the general ability to generate productivity: to mobilise resources (instruments, knowledge, methods) in a social setting (interaction and communication with others) for the purpose of goal attainment. Usually, competency is described from the point of view of applying knowledge and skills in day-to-day operations. Many researchers use the term “skill” in a broad sense (the ability to act in specific way in particular conditions) as well as in the narrow sense (a technical skill). ACT21S (Assessment and Teaching of 21st Century Skills) (Binkley et al. 2010), for example, identifies a set of twenty-first century skills as a technical implementation of this set. Moreover, sometimes the concept of competency is used differently in different contexts, sometimes even by the same researcher or organisation.

A good example of this is the European Commission. In the European Key Competencies for Lifelong Learning (European Commission 2007), the term “competency” is used as a notion unifying the terms “knowledge” and “skill”, which means that a skill is a form of measuring competencies. In the European Qualifications Framework, “knowledge”, “skills” and “competencies” are considered to be separate results of training, i.e. a “skill” is not a part of any “competency” (Bakhshi et al. 2017).

Key competencies include (European Commission 2006):

- Communication in one’s native language;
- Communication in foreign languages;
- Mathematical competency and basic competencies in the field of science and technology;
• Digital competency;
• The ability to learn;
• Social and civic competencies;
• Initiative and entrepreneurship;
• Cultural consciousness and expression.

The European System of Competencies for Citizens (DigComp)

The European System of Competencies for Citizens (DigComp) emphasises the following competency fields (Ferrari 2013):

• **Information**: searching for information about products and services, getting information from the websites of government bodies, reading or downloading online-news/newspapers/magazines, copying or pasting files and documents etc.;

• **Communication**: sending or receiving letters, making voice or video calls over the internet, participating in social networks, sending messages to websites and chats and downloading content on websites;

• **Creating digital content**: creating websites or blogs, writing computer programmes using special programming languages, using instruments for copying and pasting in order to duplicate or transfer information in the document, creating electronic presentations (slides) including video, sound, images, or diagrams using special programmes and using basic arithmetical formulas in electronic tables;

• **Security**: using software or security instruments for protecting personal computers and data as well as updating such software;

• **Problem-solving**: connecting and installing new software, installing or replacing operating systems, passing online courses, purchasing products or services over the internet, online sales, searching for jobs over the internet, online banking and meeting people online.

The OECD’s Survey of Adult Skills

The OECD’s Survey of Adult Skills carried out in the Programme for the International Assessment of Adult Competencies (PIAAC) summarises the following groups of competencies (see Table 1).
Table 1: Groups of competencies and examples of specific competencies in the OECD competency framework

<table>
<thead>
<tr>
<th>Competency groups</th>
<th>Examples of specific competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitive competencies</strong></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Reading, writing, oral communication, proficiency in foreign languages</td>
</tr>
<tr>
<td>Information processing</td>
<td>Thinking skills, managing information</td>
</tr>
<tr>
<td>Problem solving</td>
<td>Recognising problems and devising and implementing a plan of action, discovering a rule or principle underling the relationship between two or more objects and applying it when solving a problem</td>
</tr>
<tr>
<td>Learning</td>
<td>Learning to learn, reflexivity, effective management of one’s own learning</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Using numbers and mathematical reasoning, communicating in mathematical languages</td>
</tr>
<tr>
<td><strong>Interpersonal competencies</strong></td>
<td></td>
</tr>
<tr>
<td>Interpersonal</td>
<td>Team work, cultural sensitivity, working with others, relating to customers, negotiating, participating in projects and tasks</td>
</tr>
<tr>
<td><strong>Intrapersonal competencies</strong></td>
<td></td>
</tr>
<tr>
<td>Self-regulation</td>
<td>Self-awareness, reflexivity, meta-cognition, adaptability, coping with stress</td>
</tr>
<tr>
<td>Management</td>
<td>Planning (on behalf of oneself and others), organisation, responsibility.</td>
</tr>
<tr>
<td>Creativity/entrepreneurship</td>
<td>Initiative, creativity, the ability to assess and take risks.</td>
</tr>
<tr>
<td><strong>Technological competencies</strong></td>
<td></td>
</tr>
<tr>
<td>ICT</td>
<td>Working with a variety of technologies, using IT to organise data.</td>
</tr>
</tbody>
</table>

Source: OECD (2016).
The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution

The system of skills monitoring presented at the International Economic Forum defines the following modern skills and competencies of workers (World Economic Forum 2016):

- **Abilities**:
  - Cognitive abilities: cognitive flexibility, creativity, logical reasoning, problem sensitivity, mathematical reasoning, visualisation;
  - Physical abilities: physical strength, manual dexterity and precision;

- **Basic skills**:
  - Content skills: active learning, oral expression, reading comprehension, written expression, ICT literacy;
  - Process skills: active listening, critical thinking, monitoring oneself and others;

- **Cross-functional skills**:
  - Social skills;
  - Systems skills;
  - Complex problem solving skills;
  - Resource management skills;
  - Technical skills.

The systems of labour skills monitoring examined here show that there is no single approach to understanding them. There is no unified instrument to evaluate the competitiveness of a modern worker. Let us briefly explain why a unified approach is needed:

- Under the conditions of the modern global digital labour market, an employer should be able to reasonably formulate his or her demand for labour resources;
- The worker should have a unified complex system to identify his or her competitive advantage in order to accurately assess his or her position in the labour market;
- A unified classification is required by states for education and training-related policy-making and to facilitate the comparative analysis of the competitiveness of their respective national labour resources in the global digital labour market.

The Unified International Classification of Abilities and Skills of Workers (UICASW) could be based on the European DigiComp system and would pro-
pose a more accurate measure for digital skills than the system presented at the IEF by fully reflecting different groups of skills and abilities, including those required for flexible and precarious employment. We propose that UICASW should be oriented towards creating labour resources that will be able to work in a digital society under flexible or precarious conditions and the uncertainty of the future. This classification should consist of:

- **Basic skills**: high-level speaking and writing skills in the native language, knowledge of foreign languages, computer literacy and the ability to use basic digital operating systems;
- **Cognitive skills**: reflexivity and the ability to learn, etc.;
- **Psychological skills**: stress resistance, virtual communication skills, high adaptability, the ability to interact with robots and AI, etc..

Many of the groups of skills listed here that will be in a high demand in the future world of work are not included in the abovementioned systems of labour skills monitoring. This is evidence of the need to modify existing systems.

One of the important things about the Unified International Classification of Abilities and Skills of Workers is that it is possible to detail specific groups of skills depending on particular socially vulnerable groups of workers (seniors, youth, women, disabled people, migrants, etc.). For each group it is possible to highlight specific criteria that might be developed by a specialised training programme to ensure its members’ position in the labour market.

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**Websites**


O*NET OnLine: https://www.onetonline.org/
Monitoring Skill and Competence Needs in Slovenia

Tjaša Žakelj

In this time of fast technological developments and economic growth that is accompanied by constantly changing employer needs, it is extremely important for labour market stakeholders to have detailed data on labour market needs. Well-defined needs, shortages and gaps are a pillar of evidence-based national labour market policy, education system adjustments, etc. Today it is no longer sufficient to have data on the contemporary labour market needs in terms of job postings according to the requested occupations. Nowadays it is also necessary to monitor the skills, knowledge and competences that employers search for and the skills and competences that job-seekers possess.

This paper presents a national overview of relevant Slovenian stakeholders and their approaches to the definition and monitoring of skills and competences. Special attention will be given to the roles of relevant stakeholders working in the field – the Institute of the Republic of Slovenia for Vocational Education and Training, the Chamber of Commerce and Industry, the Employment Service of Slovenia (ESS) and the Public Scholarship, Development, Disability and Maintenance Fund of the Republic of Slovenia. The current activities and future plans of the ESS will be presented in terms of the strategic target of implementation for the digitalised competence model, which will enable to identify skills shortages and gaps, search for job candidates according to their skills, competences and knowledge and search for posted jobs in accordance with job-seekers’ occupations, qualifications, skills and/or competences.

Lists of employers’ needs when looking for a candidate for a certain job position are getting longer and longer. Even if the occupation of the candidate remains the crucial condition defining job posts, vacancies are also described in terms of the required knowledge, skills and competences for the position. The mentioned requirements become more and more complex due to the fast

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1 The author would like to thank Bojan Dolinar and Tina Cerk for sharing their valuable knowledge and for their suggestions regarding the description of the current situation of the ESS and plans for the monitoring of skills and competences in the labour market.
technological changes that influence our everyday lives. The recruitment process can be regarded as the final step in checking the compatibility of candidate characteristics and employer needs. In this regard, the basis for matching labour market supply to demand lies in the coherent understanding of the different concepts, knowledge of current and future needs and the consistency of the educational system with the needs of employers – that is, in a comprehensive, responsive (national) approach that would be targeted towards changing labour market needs.

The relevance of definitions and data for the required and/or available skills and competences can be recognised within numerous social contexts that are interlinked with the labour market. At the macro-level, approaches that are oriented towards the effective coordination of supply and demand in the labour market are of extreme importance. Here, it is also relevant to identify the crucial needs and available competences in order to recognise relevant gaps and determine measures for minimising them while creating an environment that encourages training and lifelong learning in order to obtain or upgrade the necessary competences. At the meso-level, dealing with the abovementioned issues is relevant within the field of human resource management. The meso-level of monitoring skills and competences is often used in practice as employers recognise the importance of knowing which competences predict successful task completion and increase the potential for the success or sustainability of a company or institution. At the micro-level, the relevance of skills and competences of the individual is recognised because they mirror an individual’s competitiveness in the labour market.

In general, the debate on competences is more than four decades old. There are many different definitions and uses for the concepts related to this discussion. The terms “skills” and “competences” can either be used interchangeably or have a strictly determined meaning, which usually includes subordinated positions. The concept of competences usually includes the development of competence taxonomies, which are adopted according to the needs of their architects. Consequently, addressing skills and competences monitoring in the national context requires special attention not only with regard to crucial stakeholders, but also concerning their approaches, understanding and usage of these concepts.
In order to define and explain the relevant terms in general, the first part of this article focuses on the theoretical background. In the second chapter, we will outline Slovenian approaches to the definitions of the concepts we are analysing in this paper, which will be followed by descriptions of the crucial stakeholders, including their understanding of these concepts and the methodologies they use for monitoring competences and skills. This article will focus on the roles of the Institute of the Republic of Slovenia for Vocational Education and Training, the Chamber of Commerce and Industry, the Employment Service of Slovenia and the Public Scholarship, Development, Disability and Maintenance Fund of the Republic of Slovenia. Special attention will be given to the Employment Service of Slovenia and its current and planned actions aimed at monitoring skills and competences. In the last subchapter, we will present examples of the classifications of relevant competences and skills for a selected occupation group unit.

**Understanding the Concepts of Skills and Competences**

**Skills and Competences**

Though constantly used within the broad field of educational outcomes, labour market demands and business research, etc., the concept of competences does not have a singular meaning (Weinert 2001). McClelland (1973) was a pioneering author who focused on the relevance of competences. In his article “Testing for Competence rather than for Intelligence” (1973), he argues the results of the intelligence tests used for the college admission process or job candidate selection do not predict job success. McClelland questions the validity of such tests and stresses that a competence test could be an alternative to intelligence tests. Though he did not give a direct definition of competences, he stressed the role of a generalised model that would include traditional “cognitive competences” including reading, writing and maths skills along with “personality variables”. A few years later, Boyatzis (1982), defined competences as the underlying characteristics that are “causally related to effective or superior performance in a job” (Boyatzis, quoted in Getha-Taylor et al. 2016: 307).

In the work context, competence refers to the quality of a person’s fit with regards to their work (Vazirani 2010: 123). Vazirani (2010) defines “competen-
cies” as the underlying characteristics of people that indicate ways of behaving or thinking, which are generalised across a wide range of situations and endure for long periods of time. He defines five components of competence (Vazirani 2010: 124):

- **Knowledge**: information and learning;
- **Skills**: one’s ability to perform a certain task;
- **Self-conception and values**: personal attitudes, values and self-image;
- **Traits**: physical characteristics and consistent responses to situations or information;
- **Motives**: emotions, desires, physiological needs or similar impulses that prompt action.

A literature review confirms the conclusion of Kohont (2011) that there are as many different definitions of competences as there are authors dealing with them. There is no singular use of the term “competences” and the complexity of analysing the issue increases when using the terms “skills” and/or “competences”. Skills are usually understood as a part of competences. Within the ESCO framework, competences are defined as the proven ability to use knowledge, skills and personal, social and/or methodological abilities in work or study situations and in professional and personal development. Competences are described in terms of responsibility and autonomy. ESCO definitions clarify that the terms “skills” and “competences” are sometimes used as synonyms, but the two terms can be distinguished according to their scope. The term “skill” typically refers to the use of methods or instruments in a particular setting and in relation to defined tasks. The term “competence” is broader and typically refers to the ability of a person facing new situations and unforeseen challenges to use and apply knowledge and skills in an independent and self-directed way.

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2 Vazirani (2010) uses the term “competency” to stress the behavioural aspect of being competent or fit for a job.

3 ESCO is the multilingual classification of European Skills, Competences, Qualifications and Occupations launched by the European Commission. The ESCO classification identifies and categorises skills, competences, qualifications and occupations relevant for the EU labour market, education and training. Some detailed information on ESCO is presented in sub-chapter 2.2.3.

An almost opposite\(^5\) definition is given by the World Economic Forum (World Economic Forum 2014: 7), which stresses that job candidates and potential employees come into the labour market with varying knowledge, competences and abilities that can be broadly defined as “skills” and are the outcome of the individuals’ choices of education, training and work experience combined with innate abilities and preferences. In this context, competences are regarded as an integral part of skills.

In some cases, institutions avoid strict differentiation between the terms and decide to use the terms interchangeably. The OECD Skills Strategy defines skills (or competences) as a bundle of knowledge, attributes and capacities that can be learnt, enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning. This definition includes the full range of cognitive, technical and socio-emotional skills. The sum of all skills available to the economy at a given point in time forms the human capital of a country. The Strategy shifts the focus from traditional proxies for skills (such as years of formal education and training or qualifications/ diplomas attained) to a broader perspective that includes the skills people acquire, use and maintain — but also sometimes lose — over the course of a lifetime (OECD 2017).

The interchangeable use of both terms is sometimes evident within ESCO, as even their website states that the terms “skills” and “competences” are sometimes used as synonyms, in addition to stating elsewhere that the two terms can be distinguished according to their scope\(^6\).

Approaches to Understanding Competences

Definitions of competences can be divided into three approaches (Civelli quoted in Kohont 2011: 69f.):

- Within the French approach the “competency” of the individual is seen as a result of different psychological elements of the individual with self-esteem as its basis. The approach links competences to abilities, personal traits, motives and acquired knowledge;

\(^5\) The opposite meaning is evident if we compare the contents of the terms competences/skills.

\(^6\) See ESCOpedia of the European Commission.
• The American approach defines competences as characteristics of the individual that are causally linked with the superior acting of the individual;
• The British approach (sometimes also referred to as the Anglo-Saxon approach) stems from the activities of the Management Charter Initiative and the National Council for Vocational Qualifications. The goal of this approach is to define national standards of hard (occupation-related) competences and implement them in the field of education. Occupation-related competences are understood as the ability to carry out the duties of a certain occupation according to occupational standards. Competence is the measure of the output of the educational system.

The third approach that has been widely adopted in the EU area focuses on the following features and characteristics (Clarke and Winch 2015: 595):
• A focus on the immediate needs of employers;
• The ability to translate these needs into curricula and assessment processes;
• Removing the need to incorporate “surplus” requirements into vocational curricula;
• The ease of constructing qualifications suited to the particular needs of employers;
• The aptness for the assessment of prior learning in informal and non-formal contexts;
• The capacity for rapid a response to changes in employer needs;
• The use of a learning outcomes approach, allowing for the “reverse engineering” of curricula and pedagogies.

Classifications of Competences

Soft/Behavioural/Generic/General and Hard/Technical/Core/Occupation-related Competences

Just as the term “competence” is understood in many different ways, there are also multiple versions of how competences are sorted, classified or structured. In general, we can divide soft competences, also known as behavioural/generic/general competences, and hard competences, also known as technical/core/occupation-related competences. Soft competences include cognitive and personality characteristics and are highly transferable. Hard skill competences are related to the technical competences related to the field of science (Riyanti et al. 2016: 123). Technical competences also include learned expertise. The link between core competences and generic competences is
made through competence modelling and competence assessments. Competence modelling is used to identify the critical success factors driving performance in organisations while competence assessment is used to determine the extent to which individuals have these critical competences (Delamare-Le Deist and Winterton 2005: 32).

At the individual level, Kohont (2011) differentiates between key/general-generic competences, work-specific or organisation-specific competences and managerial competences. Key competences are general for all of those employed in a certain organisation and are transferable. This group of competences consist of computer literacy, foreign language knowledge, communication skills and social and interpersonal competences. Work-specific competences are common to those employed within a certain job or occupation. Organisation-specific competences are unique to those employed in a specific organisation (Kohont 2011).

In the educational context, the European Commission stresses the role of key competences defined as the knowledge, skills and attitudes needed by all people for personal fulfilment, development, employability, social inclusion and active citizenship. Key competences include: literacy and language, maths, science and engineering, digital competences, personal, social and learning competences, civic competence, entrepreneurship, cultural awareness and expression (European Commission 2017).

**Competence Models and Profiles**

A competence model is a set of interlinked competences that are believed to directly predict the success and efficiency of particular company or sector. Each competence model includes a list of soft and hard skills, and provides definitions of selected skills in addition to determining the level of relevance of selected competences. Competence models help organisations to take a unified and coordinated approach to human resource management (Vazirani 2010). A competence profile is usually made for each occupation and details the competences required for an adequate job performance.
Approaches to Understanding and Monitoring Skills and Competences in Slovenia

In Slovenia the concept of competences was systematically elaborated by Kohont (2005, 2011). He defines a competence as intellectual abilities, situation-related knowledge, strategies, perceptions and routines which contribute to learning, problem solving and success of the individual (Kohont 2011: 63).

Similar to English, in Slovenian, there is no consistent or comprehensive use of the terms “competences” or “skills”. In addition, the question of terminology becomes even more complex due to the different translations of English terms. In the scope of the PIAAC Survey, two terms were used to define the research subject in Slovenian and foreign literature, namely “adult competences” and “adult skills”. The research group participating in the PIAAC Survey in Slovenia has drawn attention to the fact that these terms should not be used as synonyms and recommended a differentiated use. An original paper on the importance of understanding and using the terms “competences” and “skills” was prepared. In the clarification of the terminological use, authors explain that only skills can be directly measured and compared while competences cannot. The Slovenian PIAAC Survey enforced the distinction between the terms so, as in the case of this survey, the terms are not understood as synonyms. The term “skill” refers to one of the key ingredients of every competence.

Additionally in the Slovenian language we also come across the differentiation between the terms “skills” and “abilities”. Such differentiation becomes especially problematic when we try to translate terms (according to their meanings) into English.

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7 The PIAAC study was implemented in Slovenia by a consortium of partners: The Slovenian Institute for Adult Education, The Statistical Office of the Republic of Slovenia and The Faculties of Social Sciences, Economics and Arts at the University of Ljubljana.

8 In Slovenian: “kompetence”.

9 In Slovenian in this research: “spretnosti”.

10 In Slovenian: “sposobnosti”.
Crucial Stakeholders and Their Approaches to Monitoring Skills and Competences in Slovenia

In this subchapter, we will present crucial stakeholders active in the field of defining or monitoring competences and skills and will focus on their activities related to defining concepts and selecting or determining the relevant competences and skills. In order to understand the differences or similarities between the approaches discussed in the previous chapter, we will use case studies to demonstrate how relevant competences and skills are identified in selected occupations.

**The Institute of the Republic of Slovenia for Vocational Education and Training**

The Institute of the Republic of Slovenia for Vocational Education and Training (IRSVET) is a public institution dealing with development, research and counselling in the field of vocational and technical education. IRSVET works at a national level and coordinates a dialogue on occupational profiles and standards. The Institute’s main fields of work that are directly linked with the question of relevant competences are:

- Studies of development trends in the labour market and the preparation of occupational profiles and occupational standards;
- The development of methodologies and the preparation of modern, module-based education programmes for pre-secondary and secondary vocational education and secondary and college expert education;
- Monitoring the process of the introduction of education programmes, the evaluation of final examinations and vocational “matura” and the development of new methodological and didactic concepts of knowledge, learning and teaching;
- The stimulation and co-ordination of various development and innovation projects in vocational and technical schools.

IRSVET directly addresses competences, especially in the context of developing occupational standards and within the preparation of educational programmes. It specifies competences as the developing and expressed abilities of the individual.

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11 The Ministry of Labour, Family, Social Affairs and Equal Opportunities and the Ministry of Education, Science and Sport have central roles in activities anticipating key skills and competences (Cedefop 2017). As the role of these ministries is especially policy planning, funding and coordination, this article addresses stakeholders that tackle issues related to defining, anticipating and monitoring competences and skills needs in practice.
individual that enable them to efficiently and ethically act in the complex, changing circumstances within their occupation and within broader social and personal life. Competences consist of specific occupation-based and generic (general) competences.

The approach of ILSVET is based on the Anglo-Saxon conception of competences as learning outcomes. In the Slovenian language, learning outcomes can be also be referred to as learning results, learning achievements and the results of learning. Learning outcomes encompass knowledge, skills and competences that are standardised at a determined qualification level. Within modules, which can be understood as a defined unit of educational programmes for vocational and technical education, expert theoretical knowledge, practical skills, general knowledge and competences are linked to the coherent whole of contents and goals. Technical modules define occupation-based and general competences and contain field/expert knowledge and practical lessons.

In the period 2011-2014 CIP carried out a project called “Modernisation and Enlargement of Professional Standards and Catalogues”. One of its activities was aimed at establishing a system of defining and forecasting employer needs regarding competences, knowledge and skills. The system was implemented in pilot sectors with qualitative and quantitative research methods targeting need assessment by the employers directly. The project’s aim was to build a system of constant monitoring and data renewal, but the methodology has not been transferred into general use.

The Public Scholarship, Development, Disability and Maintenance Fund of the Republic of Slovenia
One of the tasks of the Public Scholarship, Development, Disability and Maintenance Fund of Slovenia is to promote the growth and development of knowledge, skills and lifelong learning. The Fund supports the competence development of young people, encourages adults to pursue higher education, promotes lifelong learning, stimulates investments in employee competence development, helps employees gain relevant knowledge, skills and competences and connects the educational system with the economic sector in order to contribute to positive changes for both individuals and society in general.

The implementation of the Competence Centres for Human Resources Development is one of the tasks of the Fund that is directly linked with the above-mentioned goals. The Fund launches tenders for Competence Centres for Hu-
man Resources Development. Currently the result of its efforts is 27 financed models for the assessment of sectoral competence needs with accompanying training models for the participants of the Competence Centres (eleven models were financed within the last call 2017-2018). From 2010 on, the fund supported Competence Centres for Human Resources Development in the following industries: glass (twice, most recently within the context of future factories), computing, telecommunications, tool-making (twice), accounting, chemistry (twice, most recently within the context of smart specialisation), robotics, beverage production, paper, design management, timber, logistics, trade, construction (twice, most recently within the context of contemporary sustainable construction), waste management, security, sustainable tourism, water, electrical industry, circular economy, logistics, food and smart cities and communities.

Available reports on Competence Centres show different approaches to understanding the names and classifications of competences, as well as the methodology for identifying the competences relevant for a given the sector (Medarić et al. 2017). For instance, in the competence model for the toolmaking industry (designed in 2017), competences are defined as the ability to use the knowledge and skills necessary for successful and efficient task completion. They encompass an individual’s knowledge and skills as well as personal and behavioural traits, beliefs and values. Possessing the set of all of these elements combined with a positive self-image is understood as increasing the potential for success. The aforementioned competence model differentiates between knowledge (set of knowledge defined as a list of specific knowledge) and skills (general skills).

**The Chamber of Commerce and Industry**
The Chamber of Commerce and Industry (CCI) is another relevant stakeholder that takes part in monitoring competences and encouraging their development. It is active in this area through co-operation with various partners. CCI is often a partner in Competence Centres for Human Resources Development. The Chamber follows Perrenoud’s (1997) definition of competences, which understands the competences of an individual as the activation, use and interconnection of knowledge, skills, motives, self-image and values as a whole that enable the individual to perform tasks successfully and resolve problems in complex, diverse and unforeseeable situations. It is a body of patterns that an
individual has to master to do their work successfully and effectively and the ability to implement these in (multicultural) teams that require the individual to face differences (Perrenoud quoted in Kajnč and Svetličič 2010: 86).

In 2015, CCI financed a project called the “Model of longer-term forecasting of competences within the electronics and electrical industry”. The Model was developed by the CCI and the Faculty of Economics at the University of Ljubljana and it serves as a reference model that is planned to be implemented at the national level as a Career Platform that will assure holistic, long-term assessments of competence needs and the identification of competence mismatches in the population of Slovenia. As a holistic and complex concept, the Career Platform\textsuperscript{12} will also contribute to upgrading the education and training offer within formal and functional education.

In addition to this project, CCI also takes part in the development of the Informal Occupational Qualification and additional qualifications in the field of chemistry and is a project partner in numerous international projects that address the issue of developing competences in the metal industry (KnowME, SkillME), the construction industry (SCilco) and projects that aim to encourage apprenticeships that teach competences using practical training in the working environment (the projects “Learning by Doing” and “New Models of Work Based Learning”).

**The Employment Service of Slovenia (ESS)**

The Employment Service of Slovenia is a public institute operating across the entire country and is one of the key Slovenian labour market institutions. The main activities of the ESS that are directly or indirectly related to the need to monitor competences are employment advising, job brokering, lifelong career guidance, the implementation of active employment policy measures and programmes, the issuing of work and employment permits for foreign workers and the preparation of analytical, developmental and other professional materials related to ESS activities and the labour market.

The ESS follows Kohont (2011) and defines competences as an expressed of individuals’ knowledge, skills, abilities, personal characteristics, value and motivation systems, self-esteem, emotions and the mindset. Having a competence

\textsuperscript{12} The Career Platform is a project in the development phase. The competent ministry supports its plans and it will probably be financed within current financial scheme.
means having the knowledge, understanding, abilities, skills and motivation to do something according to the demands of the workplace or employer. The ESS distinguishes between general and occupation-based competences. General competences are transferrable to all occupations while professional competences cover expert knowledge and skills that are necessary to practice their specific profession.

At the moment, the ESS does not yet possess a system that would allow comprehensive information on the competences of the unemployed and the current employer needs. Competences of the unemployed are, to some extent, included in the personal profile of the unemployed person, which is filed into the database of unemployed people. It is the role the counsellor to check and list each individual’s competences. General data on the unemployed consist of information regarding education, informal occupational qualifications, the migration area (the regional area where an individual is willing to work), foreign language knowledge, computer skills and whether the individual possesses a driving license. In the application system (called ZPNet) the entries for some competences are very detailed. For instance, the entry for “computer skills” consists of 78 different computer skills, the entry for foreign language knowledge allows for the specific language to be identified and a 4-level knowledge assessment (basic/good/very good/fluent) to rate the understanding, speaking and writing. Counsellors can also add data on Informal Occupational Qualifications and can list the following competences: organisational skills, communication skills/the ability to work with people, leadership in small groups, leadership in larger groups, teamwork, training and education readiness. Though the ESS has the potential to collect quality data about the unemployed, regional units and counsellors have different approaches to data filing, the terminology is inconsistent, and counsellors have different levels of knowledge regarding certain occupations. Consequently, there are several challenges to be tackled within the current application:

• Data quality;
• Data quantity (it is not currently obligatory to collect all data on potential competences, knowledge etc.);
• Need to upgrade the possibilities for the practical use of gathered data in a user-friendly manner. The current system does not allow users to carry out a simple search of the unemployed on the basis of competences.
The main shortcomings of job candidates: With the aim of having information on what will happen in the labour market in the next six months, the ESS conducts a survey called the Employment Forecast twice a year. This research is carried out using a representative sample of approximately 5,000 employers with ten or more employees. With this research, the ESS aims to predict employment trends in the next six months with the focus on planned employment by occupation and also to collect data on recruitment difficulties employers had in past six months. The principle reasons for potential recruitment difficulties among employers were also analysed. Among these reasons we differentiate between the absence of applications for jobs and the candidate’s lack of skills, knowledge, or competences. Certain crucial skills and competences that candidates commonly lack were selected, including: a suitable education, work experience, computer skills, numeracy skills, reading and writing skills, foreign language knowledge, occupation-related knowledge, organisational skills, teamwork, physical abilities and a suitable attitude towards customers. Such differentiation allows us to define the crucial shortcomings of job candidates within a given occupation.

Future ESS plans: The development of a competence model is one of the strategic targets within the ESS Strategy 2020 that determines crucial areas of development in which the ESS plans to make an intense improvement during the period 2014-2020. The development of a competence model for working with unemployed people and job-seekers will enable the ESS to better recognise the knowledge, skills and characteristics of unemployed people as well as the possibilities for further development and effective brokering. Additionally, a competence model is a prerequisite for effective searching and matching using a digital platform that will enable easy connections between employers posting jobs and job-searchers (ESS 2020 Strategy 2015).

There a few different taxonomies of skills that European public services are using for job matching and other services for their clients and that is why the European Commission started to develop one common taxonomy, which would provide a common reference terminology that would enhance the functioning of the labour market, help to build an integrated European labour market and bridge the communication gap between the world of work and the world of education and training (European Commission 2017a).
Upon the adoption of the implementing decision, which is expected to occur in July 2018, ESCO will become the “European classification”. As Slovenia does not have an existing national taxonomy of skills and the Member States will be obliged to harmonise national classifications with the ESCO system for the EURES network\textsuperscript{13} within three years of the adoption of the implementing decision, the decision was made for the ESS to adopt and implement ESCO in its services for all clients and employees.

To better understand the opportunities and the challenges that the implementation of ESCO in services and work processes brings, it is essential to present ESCO as a taxonomy and to discuss its vision and purpose.

The aim of ESCO is to establish a common language that bridges the communication gaps between different countries and between the domains of employment, education and training. Its plan is to increase the transparency of occupations, qualifications, skills, competences and learning outcomes. Having this transparency and a common reference point would enable people to exchange information with an unambiguous and universally accepted meaning, independent of the language or electronic systems used.

ESCO is supposed to allow for the exchange of information on the demand for labour (job vacancies), the supply of labour (candidate profiles) and the improvement of human capital (training opportunities, career pathways). By facilitating communication, ESCO could help improve skills development, the matching of people to jobs and labour market intelligence in various cases.

ESCO aims to:

- Help employment services and guidance counsellors to provide better e-services to their customers, serve customers in several languages;
- Build partnerships and exchange data with other service providers;
- Strengthen the co-operation between public and private employment services as well as with education and training providers, employers, individuals and education and training providers.

The collection of data detailing the content and structure of ESCO skills referred to as the “skills pillar” is quite detailed and complex and provides a list of

\textsuperscript{13} The use of ESCO will be obligatory within the EURES network of employment services in order to exchange job vacancies and CVs between Member States and with the Commission, which gave the ESS a relevant reason for adopting ESCO skills.
skills that are relevant for the European labour market. It contains 13,485 skills (European Commission 2017a).

The skills pillar includes knowledge, skills and competences that are defined as follows:

- The body of facts, principles, theories and practices that is related to a field of work or study. Knowledge is described as theoretical and/or factual, and is the outcome of the assimilation of information through learning;
- The ability to apply knowledge to completing tasks and solving problems. Skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments);
- The proven ability to use knowledge, skills and personal, social and/or methodological abilities in work or study situations and in professional and personal development.

While sometimes used as synonyms, the scope of the terms “skill” and “competence” can be differentiated. “Skill” refers to the use of methods or instruments in a particular setting and in relation to defined tasks. “Competence” is broader and refers to the ability of a person to use and apply knowledge and skills in an independent and self-directed way when facing new situations and unforeseen challenges. However, there is no distinction between the skills and competences discussed in the ESCO skills pillar (European Commission 2017b).

The content of the skills pillar provides additional metadata for each concept in the skills pillar, including the preferred, non-preferred and hidden terms of the concepts, skill type (whether it is knowledge or a competence), the relationship with ESCO occupations, and the reusability level, which indicates how widely a skill, competence, or type of knowledge can be applied.

ESCO also covers transversal knowledge, skills and competences, which are often referred to as core, basic or soft skills. Within the skills pillar, they are organised in a hierarchical structure under the following five headings: thinking, language, application of knowledge, social interaction and attitudes and values.

The skills pillar is currently structured in four different ways:

- **By relationship with occupations**, using occupations as an entry point: this shows for which occupations a given type of knowledge, skill or competence is typically relevant, including those for which it is essential and those for which it is optional. In some cases, a relationship will show
how the knowledge, skill or competence is relevant for other types of knowledge, skills and competences. The relationship also includes the distinction between the essential and the optional;

- **By using a hierarchy** (only for transversal knowledge, skills and competences);
- **By relationships** indicating how knowledge, skills and competences are relevant to other knowledge, skills and competences (particularly in cases of the contextualisation of skills);
- **By functional collections** that group together only the subset of available skills that is of interest for selected cases. ESCO v1 includes three functional collections: digital competences (identical to the Digital Competence Framework 4), language skills and transversal skills (European Commission 2018a).

Covering certain user needs requires the improvement of ESCO’s current structure. Such user needs would include searching for specific skills, doing semantic searches, filtering search results, clustering skills into groups (e.g. language skills, digital skills or management skills) to work at a more aggregated level, identifying related concepts and concepts of a specific interest for the user, using only a partial subset of the classification and statistics, etc. To address this need, the ESCO team developed and carried out a pilot project to arrive at a structure for the ESCO skills pillar that would better serve such functions.  

(See: European Commission Skills Pillar).

As already stated above, the ESS is planning to adopt the ESCO skills pillar and integrate it into the national classification of occupations, making national adjustments to ESCO skills and implementing it in their services, creating new self-services for ESS customers, developing skills-based matching and enhancing the quality of work processes for the employed.

While ESCO can bring a lot of opportunities to the ESS, it is a relatively new taxonomy and therefore there are quite a few challenges that Slovenia could face when adopting ESCO skills and implementing them in the upgraded services that are developed.

The first challenge is the quality of the linguistic translations made for the system. If the ESS wants to develop services using ESCO it is essential that everyone who uses the competences understand the meaning behind them in the

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14 See the European Commission’s Skills Pillar.
same way. Some translations are adequate; however, many are either unintel-
ligible, unclear, or fail to reflect the content of a particular competence. Often-
times, the Slovenian terminology used by the translators is unusual and there-
fore difficult to understand.

In addition, the terminology of ESCO is not always user-friendly, especially for
the final users -- employers and the unemployed. They need a simple, common
terminology that is not completely new, which makes considerations about
terminology in general another challenge when thinking about integrating ES-
CO into the national context.

Additionally, ESCO provides numerous concepts. On the level of occupations,
the number is similar to the number of occupations in the national taxonomy,
but there is a significant number of competences at the granular level that
could be challenging to apply directly to the competence model for the pur-
pose of customer self-assessments of competences. It suggests a need to make
a proper selection of the relevant skills for the national labour market. Howev-
er, in the selection process it is essential to consider the complexity of the ex-
isting structure of the skills described above. This complexity enables the de-
velopment of many functions within ESCO, such as identifying skills or
occupation gaps between supply and demand in the labour market and sugges-
ting job mobility and related skills and occupations.

At the same time, the complexity of the skills pillar structure itself represents a
challenge. On the one hand, it provides a range of different relations that ena-
bles the development of various functions, but on the other hand, it also brings
more complexity to the process of implementation.

There are also no examples of good practices in implementation for ESCO to
follow because it is a new taxonomy and it has not yet been utilised fully. Nev-
evertheless, there are some advantages and opportunities\(^{15}\) that ESCO can bring
to the ESS. It is a complete and already developed taxonomy of skills based on
several European taxonomies that, in addition to skills and knowledge, provides

\(^{15}\) The above-mentioned opportunities listed are taken from the written plans for ESCO.
Though European countries do not have practical experiences regarding full ESCO imple-
mentation yet, Clarke and Winch (2015) stressed some potential concerns for this “learning
outcome” approach, including translational issues, differences in VET organisation between
countries and the problematic concept of transversal skills. The main concern (if we see it
through the lens of labour market needs) is that qualification requirements are apparently
different than actual requirements in the workplace (Clarke and Winch 2015: 601).
contextualisation and numerous relationships between different elements. This makes it applicable (if adjusted to national context) for the purpose of skills-based matching, the development of many other functions and the creation of self-services. It will also be regularly updated and improved by the European Commission. Additionally, Slovenia already uses a national taxonomy of occupations that is, similar to ESCO, based on the ISCO (International Standard Classification of Occupations), which makes the process of adopting skills not quite simple but certainly easier.

A Draft of the Model of Key General Competences

As the ESS is faced daily with the need to suggest a competence model that could be easily integrated into the system (in terms of data on unemployment, the competences of unemployed people and employer needs regarding specific job posts), a draft of the model of relevant general competences was prepared in order to respond to labour market needs. The proposed\(^{16}\) competence model consists of five elements: knowledge, abilities, goal attainment, personality and values. The model includes a selection of key general competences, skills and abilities for 430 occupation unit groups. Three to five key competences relevant for practicing the profession has been selected for each occupation unit group with additional information on the relevance of expertise level for practicing the occupation. Expertise is understood as expert or general knowledge attained within formal and functional education and practical work, or, in short, the ability to use knowledge gained through education in practical situations.

Altogether, the model includes information on 59 general competences, skill and abilities. The taxonomy of the suggested model is as follows:

1. **KNOWLEDGE:**
   - Expertise;
   - Specialist knowledge;
   - Computer literacy;
   - Knowledge of mother tongue;
   - Knowledge of a foreign language;

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\(^{16}\) The model has not being tested or approved yet, so it is presented as a potential option for the classification of general competences, skills and abilities.
2. ABILITIES:

• Physical abilities:
  – Health;
  – Resilience to the impacts of the environment (resilience to the impacts of climate change, resilience to chemical impacts);
  – Physical strength and conditioning (physical strength, physical conditioning);
  – Strength of senses (good vision, a sharp sense of hearing, smell or taste);
  – Skills (manual, general physical or motor skills);

• Mental abilities:
  – Intelligence;
  – Specific skills (numerical reasoning, spatial skills, verbal reasoning, analytical thinking);
  – Problem-solving skills;
  – Aesthetic sense;
  – Emotion management abilities;

• Social skills:
  – Communication abilities (communication skills, negotiation skills, communicativeness, attitude towards people, public speaking);
  – Conflict management;
  – Teamwork;
  – Organisational and leadership abilities;

3. GOAL ATTAINMENT

• Targeting;
• Motivation;
• Perseverance;
• Respect for rules;

4. PERSONAL TRAITS

• Flexibility:
  – General flexibility;
  – Time flexibility;
  – Mobility;
  – Learning and education;
  – Multitasking ability;

• Autonomy, self-organisation and decision-making:
  – Autonomy;
  – Self-organisation;
  – Decision-making;
• Development:
  − Development orientation;
  − Creativity;
• Integration into the organisation:
  − Business and market orientation;
  − Loyalty;
  − Participation;
  − Ambition;
• Tidiness and hygiene:
  − Tidiness;
  − Hygiene;
• Focus;

5. VALUES
• Confidentiality;
• Social responsibility;
• Integrity.

Each of the listed general competences has its own definition. The model of general competences also includes a draft evaluation of the relevance of selected key competences based on the reference occupation of each occupation working unit.

The ESS currently has an important task to consider how to implement ESCO taxonomies of knowledge, skills and competences into the planned digitalised system, which terminology to use, and what the added value would be if the proposed general competences model were combined with ESCO lists of essential skills, knowledge and competences for each occupation. As the ESS is on its way to making big changes that should correspond to the national labour market, the decision should follow the needs and knowledge of the final users – unemployed people, job-seekers and employers.

An Example of Competence and Skills Models: Toolmakers and Related Workers

This chapter aims to present practical examples of selected relevant competences and skills in the case of toolmakers and related workers. We will outline
a description of the occupation using the definition of work defined in the Slovenian Standard Classification of Occupations (SKP-08).

Toolmakers and related workers are classified in the Slovenian Standard Classification of Occupations (SKP-08) under the code 7222 (4-level ISCO-08).

According to the general description of the occupation, toolmakers and related workers make and fix tailored and special tools, sport tools, latches, dies, matrices and other metal objects for which they use hand or machine tools for fine metal treatment.

According to the Slovenian SKP-08, the tasks of a toolmaker include:

- Reading and explaining technical sketches and tool specifications, dies, prototypes or models;
- Preparing templates and sketches and determining working procedures;
- Visualising and specifying project needs-based calculations of dimensions, sizes, shapes and tolerances;
- Adjusting, protecting and measuring metal moulds for machining;
- Setting, managing and maintaining machines for the shaping of work elements according to the prescribed dimensions and final processing;
- Adjusting and assembling parts for making templates, measurement and other equipment;
- Fixing and modifying sporting weapons and other small weapons;
- Making, modifying, assembling and installing latches and their parts;
- Making and fixing metal dies for the preparation of casting models;
- Preparing lines and reference points on the metal materials as a preparation for workers that process metals;
- Checking the dimensions, measures and fit of final products according to the specifications regarding instrument use for precise measurements;
- Testing the final products for proper functioning.

The Institute of the Republic of Slovenia for Vocational Education and Training determines the following occupational competences of a toolmaker:

- Planning, implementing, and controlling their own work;
- Preparing the workplace and working tools;
- Using a rational approach to the use of energy, material and time;

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17 The ISCO was first adopted in Slovenia with the regulation in 1997. This first classification was updated in 2000 and replaced by the Standard Classification of Occupations 2008 (SKP-08).
• Carrying out work in a way that does not threaten themselves, other people or the environment;
• Communicating commercially with co-workers;
• Contracting authorities and clients;
• Using computer equipment and software tools;
• Managing operating tools in the factory;
• Compositing tools;
• Controlling and coordinating the independent process;
• Experimenting, testing and taking part in transferring the product to the buyer;
• Using a 2D and 3D CAD data viewer.

The listed competences are included in a scheme in which each of the competences is embedded into the working area and described with a list of skills and knowledge. For instance, the first competence, planning and controlling one’s own work, is included under the “Analysis, Planning and Organisation of Work” working area, and under this competence, the following skills and knowledge are listed:

• Analysing project and technological documentation;
• Checking material sheets;
• Planning work;
• Planning the necessary equipment, devices and resources for the work in compliance with documentation and other demands;
• Mastering technical drawing and descriptive geometry specific to the profession;
• Understanding working schemes for the elements of tools;
• Understanding and mastering working sequences, the organisation of the workshop and the principles of work organisation;
• Being acquainted with the norms related to material use and devices for implementing individual tasks.

Altogether, IRSVET defines over 80 types of skills and knowledge within the following fields of work: analysis, the planning and organisation of work, the preparation of work and the workplace, operative tasks, administrative work, quality assurance, maintenance and repairs, communication and health and environmental protection.

When a toolmaker goes to the Employment Service of Slovenia and registers as an unemployed person, the ESS counsellor for unemployment would usually collect data on education (completed or not), obtained National Occupational
Qualifications, past employment, knowledge of foreign languages, computer skills, whether that person has a driving license and the mobility range (the local area in which the unemployed person is willing to work). Within the concept of “knowledge” there are two types of knowledge that could hypothetically involve occupation-related knowledge: production technology knowledge and technical knowledge. The first problem is these categories of knowledge in the database are mainly designed to be filled when an unemployed person obtained these qualifications by participating in an ESS Active Policy Programme. Another difficulty is that even if this data is collected, the system does not allow users to search by competences or knowledge.

According to the draft model of general competences, the key competences of a toolmaker are: working experience, physical condition, manual skills, motor skills, spatial skills and effectivity.

If we check the ESCO list of knowledge, competences and skills for “toolmaker”, we get a comprehensive list of the numerous essential skills, competences and knowledge as well as many optional skills, competences, and knowledge. In addition to these two types, a list of transversal skills and competences applicable for all occupations is listed below:

- **Essential skills and competences:**
  - Adjusting properties of cut;
  - Applying precision metalworking techniques;
  - Consulting technical resources;
  - Cutting metal products;
  - Ensuring the availability of equipment;
  - Joining metals;
  - Maintaining edged hand tools;
  - Operating files for deburring;
  - Operating hand tools for grinding;
  - Operating metal polishing equipment;
  - Performing product testing and test runs;
  - Preparing pieces for joining;
  - Reading standard blueprints;
  - Smoothing burred surfaces;
  - Troubleshooting;
  - Wearing appropriate protective gear;

- **Essential knowledge:**
  - Dyes;
− Machine tools;
− Mechanical tools;
− Quality standards;
− Types of metal;

• **Optional skills and competences:**
  − Adjusting temperature gauges;
  − Applying polishing lubricants;
  − Ensuring the correct metal temperature;
  − Keeping records of work progress;
  − Monitoring automated machines;
  − Monitoring gauges;
  − Monitoring moving pieces in a machine;
  − Operating precision measuring equipment;
  − Performing machine maintenance;
  − Programming a CNC controller;
  − Recording production data for quality control;
  − Removing inadequate work pieces;
  − Removing processed work pieces;
  − Removing scales from metal work pieces;
  − Setting up the controllers of machines;
  − Supplying machines with appropriate tools;
  − Tending to the deburring machine;
  − Using cam software;

• **Optional knowledge:**
  − CAD software;
  − Characteristics of precious metals;
  − Cutting technologies;
  − Deburring processes;
  − Ferrous metal processing;
  − Forging processes;
  − Imitation jewellery;
  − The manufacturing of tools;
  − Metal forming technologies;
  − Metal joining technologies;
  − Quality and cycle time optimisation;
  − And types of metal manufacturing processes.

In addition, the ESCO also implements transversal skills and competences, which are applicable for all occupations. These are:
• **Applying knowledge:** this competence is related to digital competences, health and safety, numeracy and mathematics, and the working environment. The contents of these skills and competences are:
  
  – Digital competences\(^{18}\): ICT safety, digital communication and collaboration, digital content creation, digital data processing, problem-solving with digital tools;
  
  – Health and safety: following hygienic, environmentally sustainable work practices and safety precautions at work;
  
  – Numeracy and mathematics: carrying out work-related calculations and measurements; communicating mathematical information; managing quantitative data; using mathematical tools and equipment; and working with shape and space;
  
  – Working environment: applying quality standards; supporting the company plan; and supporting cultural diversity and gender equality;

• **Attitudes and values:**
  
  – Attitudes: adapting to change, paying attention to detail, paying attention to hygiene, coping with pressure, dealing with uncertainty, demonstrating curiosity, enthusiasm and a willingness to learn, making an effort, managing frustration, managing quality, meeting commitments, persevering, working efficiently and independently;
  
  – Values: demonstrating consideration and good manners and following an ethical code of conduct;

• **Social interaction:** accepting constructive criticism, addressing an audience, demonstrating intercultural competence, giving advice to others, instructing others, interacting with others, leading others, motivating others, negotiating compromises, persuading others, reporting facts, supporting colleagues, using body language, using questioning techniques and working in teams;

• **Thinking:** developing strategies to solve problems, evaluating information, identifying opportunities, making decisions, managing time, memorising information, processing qualitative information, thinking creatively and using learning strategies.

\(^{18}\) List of digital competences reveals one of the lacks of the ESCO model, which lies in the incongruence of terminological use. Competences are named as verbs but sometimes also as nouns.
Conclusion

Discussions concerning competences and skills are far from being new. The terms “competences” and “skills” are sometimes understood as having strictly differentiated meanings, but other times are used as synonyms or as a smaller concept related to an overarching term. In this case, skills are usually regarded as a part of a given competence. In recent European approaches, we can recognise a growing trend towards using the term “skills” instead of “competences”, which is especially evident in expert papers on the labour market published by EU institutions (e.g. the European Commission, OECD).

Slovenian stakeholders that define and/or monitor competences and skills within the context of occupations or industrial sectors do not share a common terminology for these concepts either. The most common cause for this differentiation is the origin of the stakeholder’s motivation for determining crucial competences and/or skills. Motivations can be driven by the aim to list educational outcomes according to curricula, describe employer needs, or monitor work force characteristics and deficits in the labour force, to name a few. Although we can identify several interesting approaches among the current or planned efforts to monitor relevant competencies and skills, what we need at the national level is a comprehensive model for monitoring competences and skills that would respond to the needs of the labour market, employers, the education system and others. Common terminology can be regarded a prerequisite for such a model. In addition, terminology should also be user-friendly and simple enough for common use, not only by labour market experts, but also by employers, unemployed people and job-seekers. The common model would also require the possibility of consistently adding new competences and skills according to the developments of the labour market. In this regard, the ESS plans to create a digitalised platform for searching and matching data related to employer needs and the knowledge, skills and competences of job-seekers. The Chamber of Commerce and Industry also plans to launch a career platform that will allow for the assessment of holistic long-term competence needs and the identification of competences mismatch within the Slovenian population. Both of these projects present a great opportunity for the development of the efforts to monitor competence and skills needs in Slovenia. Both planned actions can only fully respond to current and future needs of all poten-
tial users if they are harmonised and comply with the principle of a bottom-up approach.

Finally, we need to stress that having data on current competences/skills needs, competence/skill mismatch and other foreseen needs is only the beginning of the endeavours necessary for the effective coordination of supply and demand in the labour market. As the future is uncertain, long-term plans are rarely useful. Instead, we need to be able to rapidly adjust to labour market needs. This goal can only be realised if crucial national stakeholders share common goals regarding this issue.

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An Open and Data-driven Taxonomy of Skills Extracted from Online Job Adverts

Jyldyz Djumalieva and Cath Sleeman

Introduction

In this work, we propose a data-driven taxonomy of skills mentioned by employers in online job adverts. We use the term “skills” to refer to all employer requirements including those relating to competences and knowledge. This is the first publicly available taxonomy we are aware of that does not rely on existing models and ontologies such as the Occupational Information Network (O*NET) and European Skills, Competences, Qualifications and Occupations (ESCO). It is also derived in an algorithmic way without expert elicitation, which means that it can be quickly updated to reflect changes in labour demand and provide timely insights to support labour market decision-making.

To generate the taxonomy we employ machine-learning methods, such as word embeddings and network community detection algorithms. We model skills as a graph with individual skills as vertices and their co-occurrences in job adverts as edges. The strength of the relationships between the skills is measured using both frequency of actual co-occurrences of the skills in the same advert as well as their shared context, based on a trained word embeddings model. Once skills are represented as a network, we hierarchically group them into clusters. To ensure the stability of the resulting clusters, we introduce bootstrapping and consensus clustering stages into the methodology. While we share initial results and describe the skill clusters, the main purpose of this paper is to outline the methodology for building the taxonomy.

The remainder of the paper is organised as follows. We start by describing the motivation for developing a new skills taxonomy and relevant research. In the Methods section, we provide a detailed description of the methodology used

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1 The authors are grateful for the thoughts of colleagues at Nesta, the Economic Statistics Centre of Excellence and the UK Office for National Statistics on this work. Particular thanks are due to Hasan Bakhshi for his comments on early drafts.
to generate the skills taxonomy, followed by an overview of the initial results. The limitations of the approach are reviewed in the Discussion section. We conclude with a summary of the contributions of the paper and suggestions for future research.

**Motivation**

A growing body of research predicts that the labour force will undergo substantial changes in the near future. Globalisation and technological developments, together with environmental and demographic trends, will reshape labour market structures. A recent study by Nesta and Pearson predicts with confidence that around 20% of occupations will shrink and 10% will grow, but for the remaining occupations the outlook is highly uncertain (Bakhshi et al. 2017). The nature of work and the requirements for effective job performance are also likely to change with new skills and emerging competence and knowledge areas, while other requirements become redundant (World Economic Forum 2018). In this context, policy-makers, educators, businesses and individuals need timely information on both how the labour market is changing and what the potential pathways are for upgrading workers’ skills and transitioning workers out of occupations at risk of decline. To generate such actionable insights we first, however, need a framework for measuring the similarity of skill requirements and grouping them in meaningful taxonomic groups. In this paper, we propose a methodology for discovering such a taxonomy in a data-driven way using non-traditional naturally occurring Big Data on the UK labour market.

Existing sources of information on occupational requirements have several limitations. Current publicly available models and taxonomies, such as O*NET (National Research Council 2010) and ESCO (Directorate-General for Employment, Social Affairs and Inclusion 2017) are expert-derived, which makes them expensive to update on an ongoing basis. As a result, there is a risk that information on skills might become outdated. Another limitation is that in their current state, the taxonomies do not fully capture the relationships between skills, competences and knowledge requirements. In ESCO, occupations are explicitly linked to skills, but the information on how the skills are connected to each other is only provided for transversal skills. “Transversal skills” refer to skills
that are not specific to particular occupations, but rather are relevant to a broad range of occupations.

Alongside taxonomies like O*NET and ESCO, researchers in the private sector have also developed skills taxonomies using vast amounts of data from online job adverts and job-seeker resumes. However, these are not open to the public. In addition, none of the existing taxonomies have been developed using UK data and therefore may be less suitable for the analysis and measurement of skill requirements in UK occupations. To fill the gap in the existing skills taxonomies and frameworks, we propose an empirically-driven taxonomy that is derived automatically from online job adverts. The proposed taxonomy offers a number of advantages over existing ones. First, it leverages naturally occurring data on millions of vacancies, which can be efficiently collected at scale and in real time. Using online job adverts also allows us to capture skills required by employers directly; in the adverts, employers are free to describe what they are looking for in candidates and are not constrained to select the requirements from a narrow number of skill groups. Another advantage of the taxonomy we propose is that we can enrich it with other information available in job adverts, such as offered salary and job title. Last, but not least, we are committed to making our taxonomy and methodology open to the public, which we think is important if the data are used to inform public policy.

We believe that our data-driven skills taxonomy can directly contribute to more responsive and evidence-based policy-making. Timely information on the demand for, and salaries associated with, particular skills, competences and knowledge areas can help policy-makers to prioritise investment in skill development. The proposed taxonomy, together with the occupational classification we developed in a previous paper (Djumalieva et al. 2017), can be combined to develop a recommender engine for identifying occupations that require similar skills. These insights could then inform policies for re-skilling and supporting job transitions from occupations at risk of decline.

**Related work**

The systematic analysis of the occupational requirements has been a prominent area of labour market research for the past two decades. One of the most widely used models of occupational characteristics and worker attributes is
O*NET, which was developed in late 1990s with support from the US Department of Labor and the Employment and Training Administration (Markowitsch and Plaimauer 2009). For each occupation, O*NET provides detailed descriptions of worker characteristics and requirements, necessary levels of training, education and experience, job characteristics and occupational outlooks. O*NET is periodically updated using information from occupational experts and job holders as well as from job postings. The European Commission’s ESCO represents another major public effort to systematise occupational information. ESCO is an ontology that maps relationships between skills, qualifications and occupations that are aligned with the International Standard Classification of Occupations (ISCO). Following several years of expert collaboration and public consultations, the first full version of ESCO was released in October 2017. Both O*NET and ESCO are open to the public.

With regards to data-driven skills taxonomies, research in this area has, of late, been concentrated in the private sector. In one such study, Zhao et al. (2015) used data from 100 million resumes on CareerBuilder to generate a taxonomy of skills. In processing the resumes, the authors disambiguated and normalised 46 million unique skill phrases. This resulted in a taxonomy of 50,000 skills. However, the content and structure of the taxonomy was not made public. To date, as far as we are aware, there are no purely data-driven skills taxonomies in the public domain.

Most researchers in this field use data-driven approaches to extend ESCO instead of developing new taxonomies. For example, Sibarani et al. (2017) propose SARO – an ontology that connects information from job postings to ESCO skills. Authors tested automatically implementing SARO for extracting data from online vacancies for data scientists and performed a trend analysis for selected skills (Dadzie et al. 2017). Boselli et al. (2017) also used relationships between ESCO occupations and skills to represent them in a bi-partite knowledge graph, which enriches skills identified by experts for a given occupation with data from actual job adverts. It is likely that ESCO was chosen by researchers as a foundation due to its rich multilingual vocabulary of 13,485 skills as well as the availability of links between skills and occupations.

A methodology for the data-driven analysis of online job adverts was offered by Turrell et al. (forthcoming). The authors pursued a similar approach to the one we propose and implemented a bottom-up classification of jobs using vacancy
descriptions in UK online job adverts. However, in their work Turrell et al. focused on identifying naturally existing occupational clusters and grouped individual jobs rather than employer requirements.

Within the context of the existing literature, our work contributes to the field in several ways. First, we offer a non-expert-driven taxonomy of skills required by employers that is independent of ESCO and O*NET. Since the taxonomy is created automatically, it is also easier to reproduce and keep up-to-date. And unlike taxonomies developed by the private sector, our taxonomy and methodology will be released to the public. Our proposed taxonomy also captures links between skills, aggregated job titles, and the salaries mentioned in the millions of UK job adverts used in this analysis.

Data

The online job advert dataset used in this paper was provided by Burning Glass Technologies, a labour market analytics company. Burning Glass collects data on active job postings from thousands of web-pages on a daily basis (Burning Glass Technologies 2017). For each job posting, in addition to extracting the job title, salary, education and experience requirements, Burning Glass identifies keywords from free text job descriptions. The full job descriptions are not available. We refer to the keywords as “skills”, which include skills, personal competences and knowledge required by employers. To develop the initial skills taxonomy we use data on over 41 million adverts collected over a five-year period from January 2012 to December 2017. It is important to note that in our dataset there are many adverts with missing information: only 61% of adverts contain data on offered salary, and substantially fewer mention education (19% of adverts) and experience requirements (13% of adverts).

Methods

We use two approaches to measure the relationships between skills mentioned in Burning Glass job adverts (Figure 1). The first approach is based on the pairwise frequency of two skills appearing in the same job advert. The second approach is based on the distributed representation of skills. We generate the
vector representations of skills by training a word2vec model, which learns the extent to which skills occur in the same context (i.e. together with other skills).

As a next step, we model the skills as a graph, where vertices represent individual skills. The vertices are joined by edges if they are mentioned in the same advert. The edges between vertices have attributes that describe the strength of the relationship, such as frequency (total number of pairwise skill mentions) and cosine similarity (similarity of the context in which the two skills occur across all adverts).

**Figure 1: Process of discovering hierarchical skills taxonomy**

Source: Djumalieva and Sleeman (2018).

**Data Preparation**

To prepare the data for the analysis, we first clean the skills removing any punctuation, special characters and numbers. We also exclude several groups of skills, which are: frequently inaccurate skills, phrases related to industry experience (that are not related to skills) and skills mentioned three or fewer times over the six-year period. The 14 frequently inaccurate skills were identified in previous analysis of Burning Glass adverts and include acronyms which can refer to different sets of words when expanded (e.g. “CPR”: Cardiopulmonary resuscitation or Civil procedures rules) and irrelevant phrases scraped accidentally from web-pages (e.g. “image processing”, “facebook”). In total, 891 skills are excluded. These account for 7.8% of all skills and comprise 3.1% of all skill mentions.
Building the Skills Graph

We use a graph approach to model the relationships between skills. Representing skills as a graph allows us to go beyond studying pairwise connections between skills and identify groups of skills that are densely connected to each other. To build the skills graph we traverse all job adverts and count the co-occurrences of skills. We then represent the counts as an \((N, N)\) adjacency matrix, where \(N\) is the number of unique skills and the elements in the matrix indicate the number of skill co-occurrences. We then use the adjacency matrix to generate an undirected graph, \(G = (V, E)\), where vertices, \(V\), are the skills, and edges, \(E\), are the co-occurrences of the skills in the same advert.

To capture the strength of relationships in the network, we use two parameters for network edges: \(f\), frequency and \(c\), cosine similarity. Frequency refers to the most intuitive measure of skill relationships, and for two skills connected by an edge, it represents the total number of unique adverts that mention both skills. Put simply, the higher the frequency of the edge, the higher the co-occurrence of the skills and the stronger the relationship between them. However, this measure is flawed, since it will amplify the strength of the relationships between frequently occurring skills, such as “sales management” or “mechanical engineering”. This will make it more difficult to detect substantive relationships between skills that are mentioned less frequently. The decision on which metric to use for measuring the strength of edges has important implications for the community detection stage, since many algorithms use the edge-strength property as weights when partitioning the graph. In the case of skills, we are also likely to have situations where a skill (e.g. “computer-aided design”, “predictive modelling”, etc.) is mentioned in more than one domain and using frequency would result in assigning the skill to the largest domain.

As an alternative to a frequency-based measure of strength between skills, we trial context-based vector representations. These distributed representations, also known as word embeddings, refer to a Natural Language Processing technique used to capture semantic similarities of terms based on their distribution in large text corpora (Jurafsky and Martin 2017). Word embeddings convert terms, or in our case skills, into vectors that reflect the context in which the skills occur. The context refers to the probability that given terms or skills will be found together in a sentence or job advert. There is evidence in support of the higher accuracy of distributed representations of terms over frequency-
based approaches (Zhao et al. 2015). One of the leading methods for generating word embeddings is word2vec, which is based on shallow neural network language models (Mikolov et al. 2013).

To compute distributed representations of skills in the online job adverts we use the “continuous bag of words” word2vec model as implemented in the python gensim library (Rehurek and Sojka 2010). We train the word2vec model on 41 million online job adverts, ignoring adverts that mention 20 or more requirements. This filter is applied because the exploratory analysis showed that adverts with over 20 keywords typically combine descriptions of more than one vacancy. As demonstrated in Table 1, the trained word2vec model is able to uncover meaningful patterns in job adverts.

Table 1: Examples of the five most similar skills returned by trained word2vec model for select skills

<table>
<thead>
<tr>
<th>Skill</th>
<th>Mechanical engineering</th>
<th>Machine learning</th>
<th>German</th>
<th>Google adwords</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Engineering support”</td>
<td>“Data science”</td>
<td>“Arabic”</td>
<td>“Keyword research”</td>
<td></td>
</tr>
<tr>
<td>“Process engineering”</td>
<td>“Artificial intelligence”</td>
<td>“Spanish”</td>
<td>“Search marketing”</td>
<td></td>
</tr>
<tr>
<td>“Manufacturing processes”</td>
<td>“Text mining”</td>
<td>“Dutch”</td>
<td>“Display campaigns”</td>
<td></td>
</tr>
<tr>
<td>“Equipment design”</td>
<td>“Natural language processing”</td>
<td>“Swedish”</td>
<td>“Link building”</td>
<td></td>
</tr>
<tr>
<td>“Technical drawings”</td>
<td>“Pattern recognition”</td>
<td>“Portuguese”</td>
<td>“Pay-per-click”</td>
<td></td>
</tr>
</tbody>
</table>

Source: Djumalieva and Sleeman (2018).

The resulting word2vec model outputs a set of unique skill vectors. The skills that occur in similar contexts (i.e. are often mentioned with the same skills in job adverts) will have similar vectors. We can then compute pairwise cosine similarity scores for all the skill vectors and use these to weight the edges in the skills graph.
Properties of the Skills Graph

The skills graph consists of 10,554 vertices and 4,015,549 edges. The properties of the graph resemble those of other real-life networks, where vertex degrees and centrality are very heterogeneous. From the highly positively skewed distributions of vertex degrees and eigenvector centrality shown in Figures 2 and 3, we can see that in the network there is a subset of highly central skills, which are connected to a large proportion of other skills in the network.

Figure 2: Distribution of skill degrees

![Distribution of skill degrees](image1)

Source: Djumalieva and Sleeman (2018).

Figure 3: Distribution of skills’ eigenvector centrality

![Distribution of eigenvector centrality](image2)

Source: Djumalieva and Sleeman (2018).
This observation reflects the fact that, in our dataset, skills vary in how specific they are: some of the skills are very broad, or transversal. Examples of these transversal skills are “communication skills”, “problem-solving” and “business management”. Other requirements are domain specific but still broad, such as “molecular biology”, “python” and “surgery”. Finally, there are very specific skills, such as “succession planning” and “visual merchandising”.

Identifying and Removing Transversal Skills

Our initial attempts to detect the naturally existing communities in the graph demonstrated that the presence of highly central skills engenders one giant community that contains most skills and very few specialised communities. This makes sense since we can imagine how transversal skills may connect vertices in the graph that have little else in common. To address this, we identify and remove highly transversal skills; we also use cosine similarity as the edge strength parameter.

In order to identify highly transversal skills, we consider two vertex properties: eigenvector centrality and the local clustering coefficient. Eigenvector centrality is a measure of vertex influence, so if a vertex is connected to vertices with a high number of degrees, its centrality will be high (Austin 2006). The local clustering coefficient reflects how embedded the vertex is in its neighbourhood. If one vertex has a lower local clustering coefficient than another, it implies that fewer of that vertex’s neighbours are connected to each other (Watts and Strogatz 1998). We argue that a highly transversal skill is likely to have a high eigenvector centrality and a low local clustering coefficient, since the vertices they connect have relatively few other connections in common.

We recognise that it is not simply the case that each skill is either transversal or not. Instead each skill will lie somewhere along a continuum with transversal skills at one end and specialist skills at the other. Similarly, in the ESCO taxonomy, skills are divided into transversal, cross-sector, sector-specific and occupation-specific categories. To explore whether the skill requirements in the Burning Glass data fall into similar categories, we fit a Gaussian mixture model (GMM) to skills’ eigenvector centrality scores to explore naturally occurring concentrations of skills. After initial exploration, we identify 19 groups with varying levels of specialisation (Table 2).
Table 2: Skill groups identified using GMM with eigenvector centrality

<table>
<thead>
<tr>
<th>Skill group</th>
<th>Number of skills</th>
<th>Local clustering coefficient</th>
<th>Eigenvector centrality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66</td>
<td>0.165</td>
<td>0.924</td>
</tr>
<tr>
<td>2</td>
<td>95</td>
<td>0.240</td>
<td>0.851</td>
</tr>
<tr>
<td>3</td>
<td>147</td>
<td>0.314</td>
<td>0.773</td>
</tr>
<tr>
<td>4</td>
<td>148</td>
<td>0.393</td>
<td>0.697</td>
</tr>
<tr>
<td>5</td>
<td>198</td>
<td>0.460</td>
<td>0.627</td>
</tr>
<tr>
<td>6</td>
<td>195</td>
<td>0.527</td>
<td>0.566</td>
</tr>
<tr>
<td>7</td>
<td>251</td>
<td>0.589</td>
<td>0.503</td>
</tr>
<tr>
<td>8</td>
<td>275</td>
<td>0.641</td>
<td>0.440</td>
</tr>
<tr>
<td>9</td>
<td>264</td>
<td>0.697</td>
<td>0.390</td>
</tr>
<tr>
<td>10</td>
<td>339</td>
<td>0.735</td>
<td>0.343</td>
</tr>
<tr>
<td>11</td>
<td>359</td>
<td>0.778</td>
<td>0.295</td>
</tr>
<tr>
<td>12</td>
<td>449</td>
<td>0.817</td>
<td>0.247</td>
</tr>
<tr>
<td>13</td>
<td>530</td>
<td>0.843</td>
<td>0.200</td>
</tr>
<tr>
<td>14</td>
<td>603</td>
<td>0.877</td>
<td>0.155</td>
</tr>
<tr>
<td>15</td>
<td>584</td>
<td>0.885</td>
<td>0.118</td>
</tr>
<tr>
<td>16</td>
<td>794</td>
<td>0.897</td>
<td>0.086</td>
</tr>
<tr>
<td>17</td>
<td>964</td>
<td>0.907</td>
<td>0.058</td>
</tr>
<tr>
<td>18</td>
<td>1,434</td>
<td>0.912</td>
<td>0.031</td>
</tr>
<tr>
<td>19</td>
<td>2,177</td>
<td>0.950</td>
<td>0.010</td>
</tr>
</tbody>
</table>

Source: Djumalieva and Sleeman (2018).

We can see that Groups 1 and 2 are highly transversal: the skills requirements in these groups have the highest eigenvector centrality and very low local clustering coefficients (Figure 4). The Top 10 skills in the first group are shown in Table 3.
Figure 4: Characteristics of skill groups identified using GMM with eigenvector centrality

We discovered that the more highly transversal skill groups we removed, the more fragmented the skills network became. It appears that some broad skills serve as a glue connecting more niche skill clusters. Because of this and to preserve as much information as possible, we only remove Group 1, which has the lowest specialisation and comprises 66 skills. While they represent only 0.6% of all vertices, the connections between these skills account for 11.15% of all edges in the graph.

Source: Djumalieva and Sleeman (2018).
### Table 3: Top 10 highly transversal skills

<table>
<thead>
<tr>
<th>Skill</th>
<th>Eigenvector centrality</th>
<th>Local clustering coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication skills</td>
<td>1.000</td>
<td>0.076</td>
</tr>
<tr>
<td>Organisational skills</td>
<td>0.994</td>
<td>0.087</td>
</tr>
<tr>
<td>Team work/collaboration</td>
<td>0.988</td>
<td>0.096</td>
</tr>
<tr>
<td>Writing</td>
<td>0.987</td>
<td>0.097</td>
</tr>
<tr>
<td>Planning</td>
<td>0.986</td>
<td>0.099</td>
</tr>
<tr>
<td>Research</td>
<td>0.982</td>
<td>0.093</td>
</tr>
<tr>
<td>English</td>
<td>0.979</td>
<td>0.107</td>
</tr>
<tr>
<td>Problem-solving</td>
<td>0.976</td>
<td>0.112</td>
</tr>
<tr>
<td>Project management</td>
<td>0.974</td>
<td>0.115</td>
</tr>
<tr>
<td>Microsoft Excel</td>
<td>0.971</td>
<td>0.118</td>
</tr>
</tbody>
</table>

Source: Djumalieva and Sleeman (2018).

### Detecting Communities

Prior to applying community detection algorithms, we reviewed the filtered graph and found that 38% of existing edges have cosine similarity of 0 or lower. This may be because some of the pairwise links reflect spurious co-occurrences and that even if two skills are mentioned together in a few adverts they are not mentioned frequently enough in the same context. With this in mind, we remove any edges where the cosine similarity is equal to 0 or lower.

We have considered three different approaches to detecting communities in a graph: a method based on statistical inference (Stochastic Block Model), a method based on optimising the clustering quality parameter (Louvain) and a method based on exploring dynamical processes on the graph (Infomap). A brief overview of algorithms is provided in Appendix 1. An initial comparative analysis of the three methods shows that they are all valid ways to partition the network. The non-hierarchical SBM identifies 283 communities, which appear to capture meaningful relationships between skills. However, the hierarchical
implementation of SBM turns out not to be suitable because the clusters are grouped into higher levels based on the similarity of their connections (i.e. a similar number of edges), but ignore the subject domains. For example, computing- and medicine-related skills are placed in the same higher-level group. The fact that only the non-hierarchical SBM clusters can be used for our purposes means that we need to identify a way to aggregate smaller clusters into broader groups.

We explore hierarchical clustering using the clusters’ representative word embedding vectors. However, determining the appropriate way to generate representative vectors and selecting cutoffs for splitting the hierarchy into layers adds considerable subjectivity to the methodology. This is why we do not use the SBM in this analysis.

The broad groups identified by the Louvain algorithm are similar to those found by Infomap. However, Infomap detects a larger number of small, specialised employer requirement clusters; the algorithm appears to be “peeling off” more peripheral clusters at each iteration. For both algorithms, the cosine similarity property of edges is used. The Normalised Mutual Information (NMI) score for the top level of Infomap and the 2\textsuperscript{nd} level of Louvain (chosen because they have a similar number of groups) is relatively high at 0.67, which indicates similar clustering (the maximum value of NMI is 1 for perfect correlation). Since Infomap identifies few large clusters and many very small clusters at each layer of the taxonomy, we decide to use Louvain as it produces more evenly distributed clusters.

**Increasing Robustness of Clustering**

We initially used the Louvain algorithm to detect communities with the highest corresponding modularity and iteratively split these communities if the new partition had a positive modularity value. However, some of the identified clusters, especially at the lower layers of the hierarchy, appeared to be driven by stochastic artefacts rather than meaningful differences. The fact that splitting a cluster improves graph modularity score does not mean that the resulting lower level clusters are well separated. The challenge is to identify an objective criterion for determining confidence in cluster partitioning. To ensure the stability of the resulting groups, we introduce bootstrapping and consensus clustering.
stages in the methodology. Bootstrapping refers to random sampling with replacement. This technique is used in machine learning to increase the robustness of models since it allows for better exploration of biases and variation in the underlying dataset. Typically, bootstrapping involves sampling of individual observations, which would be skills in our case. However, to preserve as many actual skills in the graph as possible, we follow an approach outlined by Rosvall and Bergstrom (2010) and instead of bootstrapping nodes we sample graph edges. We also assign to each edge a probability of being selected, which is proportional to the edge cosine similarity property. As a result, we are more likely to select edges between nodes that are strongly related and less likely to sample spurious edges. As shown in Figure 5, once a bootstrapped sample is formed, we build a new graph using the edges in our sample and then apply the Louvain algorithm to detect communities with highest modularity. We repeat these steps 500 times, record node membership in resulting clusters and reconcile results from these runs using the cluster ensemble technique. The cluster ensemble method produces a single consensus partition and is performed using Hyper-graph partitioning (HGPA) and Meta-clustering algorithms (MCLA) (Strehl and Ghosh 2002) as implemented in Cluster Ensemble python package (Giecold et al. 2016). The quality of clustering is determined based on the level of agreement, which is measured as a weighted average NMI between all the runs and the resulting consensus cluster membership. We select the solution with the highest level of agreement. Once the top layer membership is finalised, the approach is repeated for each cluster at layer 2 and 3.

**Figure 5: Process of generating consensus clustering across bootstrapped samples**

Source: Djumalieva and Sleeman (2018).
Results
As illustrated in Figure 6, using the Louvain algorithm with bootstrapping, we generate consensus cluster assignments at three layers. It is possible to explore finer layers of the hierarchy. However, for the convenience of profiling clusters we stop at depth three where we find 143 clusters. The cluster labels are assigned manually after reviewing the most prominent skills as well as the most common job titles and SOC codes. In future work, we will aim to develop an automatic way of labelling the clusters at all levels.

Figure 6: Number of clusters in each layer of the skills taxonomy

![Layer 1: 6 clusters, Layer 2: 35 clusters (2 leaves), Layer 3: 143 clusters](image)

Source: Djumalieva and Sleeman (2018).

There are six broad clusters (Figure 7) at the top layer of the skills taxonomy. These are “Education, sales and marketing” (six sub-clusters), “Information technology” (five sub-clusters), “Science and research” (seven sub-clusters), “Engineering, construction and transport” (five sub-clusters), “Health and social care” (seven sub-clusters) and “Business Administration” (five sub-clusters).
Figure 7: Distribution of skills and unique job adverts across top layer of taxonomy

There were some surprises in the skills groupings, such as education, languages and art skills being grouped together with marketing, design and sales. It is likely that this is explained by the connection between teaching foreign languages and using them in sales roles. Medical device sales skills were also assigned to a health related group rather than to a sales cluster. This may reflect that a certain level of clinical experience is required in medical sales jobs.

Source: Djumalieva and Sleeman (2018).
Figure 8: Screenshot of the interactive skills hierarchy showing sub-clusters for the marketing cluster

Source: Djumalieva and Sleeman (2018).

To facilitate the exploration of the skills hierarchy, a prototype interactive data visualisation was developed (Figures 8 and 9). The visualisation shows the three layers of the hierarchy, but not the underlying individual skills. In the visualisation we also provide a brief description of each cluster, including average salary, the Top 5 skills, the most common job titles and the proportion of unique job adverts that mention skills in the cluster.
Cluster Robustness

The level of agreement varies for different layers of the skills taxonomy. At the top layer, across 500 bootstrapped samples, the weighted average NMI is equal to 0.85, which indicates a high level of agreement (weighted average NMI equals 1 for complete agreement). At the deeper layers, the level of agreement is lower for certain groups (Appendix 2). For instance, for “Science and research”, the average NMI is 0.60. This measure is also below 0.70 for “Engineering, construction and transport” and “Health and social care”. There are two possible explanations for the lower level of agreement on cluster membership between different iterations of the algorithm. First, it is likely that in some skill domains there is a substantial degree of complementarity between skills. So, in the “Health and social care” domain, skills related to nursing can be applied in primary care as well as in critical care. This means that during the bootstrapping and community detection stages, we may identify alternative combinations of skills that are often required together. The second explanation relates to the fact that certain skills are more transversal. While we remove the most prominent transversal skills early on, some remaining skills still demon-
strate higher than average centrality. It is possible that these skills keep moving between clusters and lead to a lower level of agreement between clustering iterations. One example of such a skill is “biology”, which refers to a general knowledge applicable in molecular biology, infectious disease research and other areas of life science research. In the future, we will aim to identify these domain-central skills to measure their impact on cluster robustness. But, more importantly, these skills might represent foundation-skills, which can widen the feasible set of job transitions for individuals.

Discussion

While the skills taxonomy is generated entirely automatically without expert input, it appears to perform reasonably well in identifying distinct groups of skills, competences and knowledge. The cluster profiles, especially at the first and second layers of the taxonomy, reflect established occupational domains, such as “Education”, “Health”, “Information Technology” and “Business Administration”. The metadata on skill clusters, such as salary and job titles, also appear to be generally aligned with the data from official statistics. For example, the clusters with the highest average salary are located in “Securities trading” and “Data engineering”, while the lowest paid skill clusters are in “Medical” and “Office administration” (all of these clusters reside in the third layer of hierarchy).

Initial results demonstrate that the data-driven approach to grouping skills, competences and knowledge areas has its merits. At the same time, in its current state, the methodology for deriving the hierarchical taxonomy has several limitations. The first limitation is that we do not allow skills to exist in multiple parts of the taxonomy. The current hierarchical structure places a skill in the cluster in which it is most strongly connected to other members. However, it is likely that certain skills, competences and knowledge such as “cooking” and “data science” will have lateral links to other clusters. For example, “cooking” resides in “Social work and caregiving”, but can also be connected to food service in retail. Similarly, “data science”, which is currently in “Marketing research”, could also sit in “Data engineering”. To address the limitations of hard partitioning, we propose complementing the provided hierarchical structure with a simplified graph of skill clusters. In this graph, all the vertices will be con-
tracted to their 3rd layer clusters. The links between the 143 clusters can then be aggregated and used to explore the lateral relationships between skill clusters.

The second limitation relates to the current lack of clarity on how to incorporate incoming information on job adverts. In future work, we would like to explore the advantages and disadvantages of running the analysis on the whole dataset updated with new information as opposed to generating the word embeddings and the taxonomy on temporal slices of the data. For further validation and to assess the extent to which the clusters are distinct, we will also collect text from Wikipedia articles on individual skills in each cluster. We will then analyse the extent to which article terms are associated with certain skill clusters using the mutual information method. Given the nested nature of the taxonomy, we expect the clusters at deeper hierarchy layers to be more similar and refer to the same subject domains. This is why the proposed analysis is likely to be more appropriate, as a validation method, if applied to first and second layers only.

While the data-driven approach used to generate the skills taxonomy offers significant advantages, the end users of the taxonomy might still perceive an expert-curated taxonomy to have a higher quality. This may be due to the fact that expert-curated taxonomies incorporate data from different sources and reflect input from relevant industry bodies. To increase the validity of the proposed skills taxonomy we intend to refine the resulting taxonomy using feedback from ONS occupational experts, career advice services, educators and professional associations. This will enable us to increase the utility of the taxonomy for users.

**Conclusion**

In this paper, we demonstrate how a taxonomy of employer skills, competence and knowledge requirements can be derived in a data-driven way. Using the initial results of the proposed method, we show that the automatically generated skills taxonomy performs reasonably well. The taxonomy contains three hierarchical layers, which are identified by applying a modularity optimisation community detection algorithm with bootstrapping and consensus clustering. The quality of the clustering is enhanced by using a word embeddings approach
to capture the strength of relationships between the skills as opposed to relying only on a frequency-based measure. In addition to generating the taxonomy, we also extract useful metadata on each skill cluster, mapping relationships between skill clusters and salary, occupations, and job titles. We also trial a method for determining the level of a skill specialisation by applying the Gaussian mixture model technique to the skill eigenvector centrality.

We make a number of contributions to the existing literature. The proposed skills taxonomy represents the first transparent non-expert-driven taxonomy that is independent from established frameworks such as ESCO or O*NET. The taxonomy is developed automatically and identifies meaningful patterns in the employer requirements without any pre-conditions for how requirements should be grouped. Because of this, the taxonomy minimises the risk that inter-relationships between skills are overlooked because they do not fit a traditional view of how skills should be organised. For example, “machine learning” and “pattern recognition” are usually grouped with computing skills, while in our taxonomy, these reside in the “Physics and math” cluster. Even though these skills are often applied together with programming, they are grounded in the knowledge of mathematics.

The resulting skills taxonomy as well as the algorithm for developing it and the interactive data visualisation will all be released to the public. We believe that these resources would benefit a wide audience and allow policy-makers, educators and individuals to better understand the skill sets needed by employers and the associated salaries and job titles. The taxonomy also provides a foundation for measuring the similarity of jobs/occupations based on skills, competences and knowledge. These insights could be directly applied to inform policy on re-skilling and identifying job transition opportunities for occupations at risk of decline.

In future research, we plan to extend the current hierarchical representation of the taxonomy into an ontology, where not just the direct, but also the lateral relationships between clusters are captured. The resulting ontology can then be implemented as a graph database accessible by the public. We would also like to study the evolution of employer requirements over time using the methodology described in Rosvall and Bergstrom (2010).
References


Appendices

Appendix 1: Overview of Community Detection Algorithms

Stochastic Block Modelling (SBM) involves fitting a generative model of a graph to data (Peixoto 2017). Under SBM, nonparametric statistical inference is applied to partition the graph in such a way as to maximise the explanatory power of a fitted model given the observed edges. From the candidates, the minimum description length model (i.e. the simplest model) is selected to prevent overfitting. SBMs have been found to produce some of the best results on real-life networks and are capable of identifying several types of network structures in addition to communities. SBMs can also detect hierarchical structures in networks and can be extended to overlapping communities. For the purposes of our analysis, we use a degree-corrected SBM that employs a Markov chain Monte Carlo (MCMC) algorithm (Peixoto 2014) as implemented in the python igraph library.

The Louvain multilevel community detection algorithm identifies communities in the network that maximise the quality of the partitioning (Blondel et al. 2008). The established metric used to measure the quality of communities is modularity. Modularity varies between [-1,1] and refers to the concentration of edges within communities as opposed to the distribution of edges that would be observed in a random graph with the same vertex degree distribution. The Louvain algorithm is hierarchical; it starts with individual vertices belonging to their own communities and then iteratively groups the vertices in such a way as to increase the overall modularity score. This algorithm is intuitive and one of the most commonly used for identifying network communities. Louvain was found to be the second best-performing method in the comparative analysis of algorithms conducted by Lancichinetti and Fortunato (Fortunato and Hric 2016). The criticism of the modularity optimisation algorithms focuses on the limitations of these methods in identifying an appropriate level of resolution. The algorithms may split large communities or merge smaller ones. They may also underperform as compared to other methods if the true number of clusters is not known.

Infomap is a dynamics-based community detection algorithm, which identifies communities in the network by measuring the flow of information through the
network using random walks (Rosvall and Bergstrom 2008). The rationale behind the method is that due to the higher density of edges within communities, the random walkers will be trapped and spend a longer time inside communities. Infomap further improved the early implementations of the dynamics-based algorithms by using information theory to define the most parsimonious way to describe graph community structure. Infomap is especially effective when applied to directed networks, where it can identify communities that would not be detected by modularity optimisation algorithms.

Stochastic Block Modelling (SBM) involves fitting a generative model of a graph to data (Peixoto 2017). Under SBM nonparametric statistical inference is applied to partition the graph in such a way as to maximise the explanatory power of a fitted model given the observed edges. From the candidates the minimum description length model (i.e. the simplest model) is selected to prevent overfitting. SBMs have been found to produce some of the best results on real-life networks and are capable of identifying several types of network structures in addition to communities. SBMs can also detect hierarchical structures in networks and can be extended to overlapping communities. For the purposes of our analysis, we use a degree corrected SBM that employs a Markov chain Monte Carlo (MCMC) algorithm (Peixoto 2014) as implemented in python igraph library.
## Appendix 2: Consensus-clustering Level of Agreement

<table>
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<th>Level</th>
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<th>Cluster label</th>
<th>Number of clusters below</th>
<th>Weighted average NMI</th>
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Source: Djumalieva and Sleeman (2018).
Changing Need for Qualifications and Competencies: Assessment in Mazovian Regional Labour Market Monitoring

Anna Grochowska

Introduction

People are more likely than ever to consider alternative solutions for professional development, building up “in-store” skills through multidimensional and multidirectional skills development, but, at the same time, many find it harder to find the right educational path and follow changes in the labour market.

Nowadays, new, unique qualifications and competencies can be acquired in a relatively short time using technology. It is also interesting that this happens at the intersection of private and professional life, which allows people to combine their passions with a source of income. Analyses of the content of job advertisements confirm that employers are increasingly looking for candidates with a variety of competencies such as the ability to find comprehensive solutions to complex problems, anticipate change and adapt to it, think critically and creatively and co-operate with others in addition to skills for analysis, negotiating and decision-making. Changes related to digitalisation concern all sectors of the labour market. By 2025, 90% of vocational tasks will require digital skills, including several different levels of competency (from basic to highly specialised) (Drlalova 2016).

The New Meanings of Professions and Competencies from the Perspective of a Fluid Reality

Professional careers have become more and more complex over the past 30 years. Peter Drucker (2008) named this period “the age of discontinuity”. The changes experienced by participants in the labour market are nothing new, but the current speed of these transformations is different. We live in the world of VUCA (denoting the volatility, uncertainty, complexity and ambiguity of general

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conditions and situations), where the effects of globalisation, virtualisation and the demographic revolution have caused and continue to cause changes in the organisation of the professional lives of individuals. We are observing the development of post-organisational careers outside of organisational structures (Peiperl and Baruch 1997, Iellatchitch et al. 2003, Kotler and Caslione 2009). There are no clear markers of competencies allowing for the implementation of a stable career in the blurred realities of specialties, occupations and local and global labour markets (Kotler and Caslione 2009).

Diversified paths for the transition from education to the labour market (Bynner and Joshi 2007) are manifested in the chaotic combination of qualifications and competencies with employment opportunities in the subjective, geographical and cultural dimensions. This is accompanied by a lifestyle discontinuity, the signs of which are, among others, frequent changes in employment, job loss, organisational acculturation and spatial mobility. As a consequence, changes that occur in the organisation of work systems affect the way competencies are understood as well as the possibility of acquiring and approving them. Jean Guichard and Michael Huteau (2005), developing the concepts first defined by Alaine Touraine, argue that systems of work organisation have evolved throughout the 20th century, moving from the professional model through Fordism to the technical (competence) model. In the professional model, where the production method is close to the craft, the individual acquires a certain base amount of knowledge and skills during the long learning process, which becomes an element constituting their identity. The Fordist system only requires the employee to master some simple activities necessary for performing tasks at a given position on the production line and the ability to adapt to the working group, which makes training received at the workplace sufficient. In the technical (competence) model, it has become important for the individual to have different specific skills that do not apply to only one profession but with the interactions that create the working situation, such as teamwork skills with other people, activities under time pressure, skills communication, flexibility, responsibility for results (Guichard and Huteau 2005). Competencies understood in this way constitute the “career capital”, that is the subjectively perceived value of personnel resources, enabling the establishment and maintenance of the employment capacity of the individual (Bańka 2007).
Competencies: Theoretical and Practical Features of the Labour Market

Competencies are a useful measure of human capital as a source of market value for an organisation. They are the most important resource of the organisation and play the main role in creating the value of the organisation. The type and scope of the competencies held by employees will determine their ability to perform a specific job. They also determine the tasks and functions that a person will perform in a professional environment and their social and professional status. Organisations strive to acquire the portfolio of competencies that will enable them to achieve strategic goals. As a consequence, competencies become the leading category and reference point for the area of human resource management.

The subject of competence is dealt with in various disciplines of science using an interdisciplinary approach. This concept derives from the Latin word *competentia*, meaning suitability and compatibility. This word stems from the term *competere*, which means to come down, agree, be fit or compete (with someone). Competence is more than just skills\(^1\) acquired through learning. The concept of competence takes the form of a construct to describe knowledge, skills and abilities in a specific field that allow one to properly and effectively perform activities required for the workplace as well as more broadly professional tasks. In addition, many authors add personality traits as the fourth element (Whiddett and Hollyforde 2003). Kwiatkowski (2005) defines “competence” as knowledge, skills, personality conditioning and the ability to learn. The notion of competence increases its semantic capacity in the definitions of Szczęsna and Rostkowski (2004), who theorise that they are “all the characteristics of an employee (knowledge, experience, abilities, ambitions, professed values, styles of action) whose ownership, development and use by employees makes it possible to implement the strategy of the company in which they are employed”.

Extending the meaning of the term “competence” results from the role they play in the context of achieving business objectives of enterprises.

Competencies do not reveal themselves directly, but they manifest themselves through an individual’s way of thinking, acting and expressing themselves. Competencies as a multidimensional concept are analysed not only from the

\(^1\) The identification of competencies with skills refers to the original version of competency management, i.e. systems based on skills implemented in the 1960s.
perspective of the individual personal characteristics of the employee but also at the level of groups of employees and entire organisations. Therefore, it is possible to talk about objective and relative competencies and combine these two aspects in the understanding of a work-oriented as well as an employee-oriented approach. The most frequently cited competencies, which are also the most important in the realities of the modern economy, can be described by opposing dimensions: objective and subjective competencies, professional and non-professional competencies, specific and transferable competencies, soft and hard competencies and personal and social competencies (Jeruszka 2016).

In the model of the Polish Qualifications Framework, developed in accordance with the European Parliament and Council Recommendations on the Establishment of a European Qualifications Framework for Lifelong Learning, the term competence means everything that a person knows, understands and can do in a given situation. The last dimension of this definition is particularly important because it concerns the overall attitude of the employee, which is reflected in the way he or she performs the organisation’s goals in contact with associates, partners and clients of the organisation, which means that the individual attitude of each employee is reflected in the way the entire organisation works.

Qualifications and Competencies: Assessment in Mazovian Regional Labour Market Monitoring

Competencies are the factors around which modern enterprises organise themselves and are acquired depending on the needs and business conditions anticipated in the short-term. Therefore, studies containing analyses, explanations, and forecasts of new phenomena in the labour market are of particular importance.

Monitoring the demand for qualifications and competencies in the Mazovian regional labour market includes periodic surveys (using quantitative and qualitative methods) regarding, among other things: the employer demand for qualifications and competencies (including an analysis of job offers), the diagnosis of competencies of youth in the NEET group, the diagnosis of qualifications and competencies necessary to transform vocational tasks for green jobs, the fate of graduates, the scope of qualifications and competencies of vocational school
graduates from the perspective of employers, audits of competencies and qualifications as well as the demand for lifelong learning among the working population. At the same time, analyses investigating the mid-term forecast of the number of employed people in the sub-regions of the Mazovian Voivodeship are being conducted in a cross-section of economic sectors and occupational groups in the years 2016-2022. This is the first and only published analytical work in Poland that presents employment forecasts for sub-regions (NUTS3) in the sectoral and occupational sectors. A regional perspective with regard to the diagnosis of changes in the area of competencies was also used in a recent study on the working conditions of people aged 18-29 in Mazovia.

**Methodology**

The survey was conducted using Computer Assisted Personal Interviewing on a representative sample of households in the sub-regions of the Mazovian Voivodeship with at least one working person between the ages of 18 and 29 in accordance with the applicable Classification of Territorial Units for Statistical Purposes (NUTS 3). The study used the methodological assumptions adopted in the European Eurofound Working Conditions Study, and then compared the results of the two studies. The diagnosis of working conditions among people aged 18-29 is based on an analysis of indicators such as physical working environment, work intensity, working time, social environment, skills, decision-making, prospects and earnings. Areas related to employee competencies are included in the definition of indicators: skills, decision-making and prospects. The first indicator combines the cognitive skills required for a given job and employee autonomy. In addition to the set of specific skills and intellectual abilities used as part of the work, this study also measured the impact of this indicator on the way of performing professional tasks, as well as access to opportunities for improving qualifications and skills through training. The higher the value of the indicator, the more demanding the work in cognitive terms, which allows for greater autonomy and provides opportunities for further training. The second indicator belonging to the competency dimension refers to those elements that are connected with the certainty of maintaining work and professional development opportunities. The higher the value of the indicator, the

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2 The Nomenclature of Territorial Units for Statistics (NUTS) is a geocoding standard developed in the European Union for the purpose of identifying statistical territorial units.
better the prospects for future professional development. The study also used a triangulation of research methods and conducted a focus group interview with employers and human resource specialists whose aim was to verify indicators related to the competencies of employees.

Main Findings

In the quantitative survey, respondents were people in-between the stages of exploration and career stabilisation. This is a time of first experiences during transition from education to the labour market and employment, which is often characterised by a period of transition from one workplace to another (Super 1953). Research shows that compared to those working elsewhere in Poland or Europe, employees in Mazovia rarely have the opportunity to use their own creativity in their work and are rarely able to decide how they perform their work (Figure 1).

Figure 1: Work quality index values for the European Union and Poland in 2015 and the Mazovian Voivodeship in 2017


This indicator is correlated with profession, age and level of education. The higher the qualifications required by a given profession, the more frequently that cognitive skills are expected to be used by the employee performing it and the greater the autonomy achieved at work. The highest values in the skill and decision-making index are adopted for specialist groups and technicians. More than half of the young employees surveyed have autonomy in deciding how they perform specific activities during their work (e.g. the order of tasks or the way they are performed), although at the same time the majority of young employees have no influence on how their work is organised from a broader per-
spective (e.g. influence on decisions, the selection of colleagues and the organisation of processes). The lower value of the skills and decision index among young employees from the Mazovian Voivodeship compared to the value of the indicator at the European level is also due to the limited access to training among respondents. In the last twelve months, only 28% (compared to 37% at the EU level) received training paid for or provided by the employer. About half of young employees use information technology in their paid work. The level of interaction with technology depends on the nature of the work – over 80% of specialists, technicians and office workers use this type of equipment.

A comparison of the value of the prospects indicator between the results of the Eurofound Working Conditions Survey and this study proves that the situation of young workers from the Mazovia area is more favourable than that in the whole of Poland and Europe. The reason for this is the high percentage of respondents who are convinced that their work offers good prospects for professional development and an extremely low percentage of people working in entities where employment has been reduced in recent years.

In the project in question, the technique of latent classes was used, based on the following variables: income, occupation, and six indices defining working conditions (physical environment, work intensity, working time, social environment, skills used at work and discretion, and prospects). The model obtained through segmentation assumes the existence of four segments, qualitatively different in terms of character and working conditions: “Workers who are overworked” (30%), “Workers who are well-paid” (26%), “Workers who are underburdened” (25%) and “Workers who are with prospects” (19%). In the first segment (“Workers who are overworked”) there were people characterised by a low level of skills utilisation and a low level of decision-making ability as well as the lowest potential for development among all segments. Those in the second segment (“Workers who are well-paid”), despite working relatively intensively, use their skills at work, are skilled in decision-making and have professional perspectives. The highest percentage of self-employed people was recorded in this group (26%, compared to 9% of the total survey population). Another segment (“Workers who are underburdened”), includes people who are in jobs beneath their qualifications, have little say in their jobs, and also rate their prospects poorly. The last segment, “Workers who are with pro-
spects”, is defined by people working in the most favourable conditions, at workplaces of the highest quality.

The professional state of the surveyed population is strongly related to age. The older they are, the more stable they become, i.e. they are more likely to work in specialised professions (specialists, technicians) and at the level commensurate with the qualifications and competencies they possess. Within both objective and subjective dimensions, the Prospect and Skills indicators at work and decision-making ability have the highest positive impact on job satisfaction, both of which relate to professional development to a large extent.

**Conclusion**

Nowadays, market development has induced organisations to be more flexible, which has resulted in the reorganisation of the work structure (despecialisation and deregulation) and a transition from management based on the notion of occupation and position to competency-based systems (Juchnowicz and Sienkiewicz 2006), including the concept of employment based on competencies. Civelli (1998) illustrates this by presenting the thesis: “New forms of work organization, the way work is treated, the knowledge economy era, the market – which is changing from the labour market to the competence market – all this requires new tools, sensitivity, time planning and flexibility different from previous solutions”.

The variety of terms and expressions referring to competencies and their typology, which contains blurred, fluent boundaries between one competence and the next means that researchers encounter difficulties at the concept operationalisation stage. In empirical work, the definition and division of competencies result from research goals in addition to application goals and implementation needs. Different understandings of competencies, however, causes difficulties in comparing the results of research obtained in various research projects. Referring to the literature on this subject and relying on methodological recommendations from research, it is necessary to take into account instrumental features and personality traits in the general definition of competencies, because quality of work and quality of life are linked to human personality traits.
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Information resulting from the monitoring of labour markets is an important source for evidence-based policy-making. However, local and regional labour market observatories often find it difficult to impart their information and knowledge to decision-makers so that it can be incorporated into the policy-making process. This anthology explores the mechanisms, which ensure the relevance of labour market information for policy-makers on the regional and local level. It presents cases of regional and local labour market observatories that have been successful in transferring their monitoring information into policy-making. In the descriptions of the cases, concepts from governance research are used to analyse how the successful connections between data provision and evidence-based policy-making are implemented.

**Key words:** governance, evidence-based policy-making, regional and local labour markets, labour market monitoring, applied labour market research

Megatrends such as demographic change, globalisation and digitalisation influence all societal spheres, be it the economy, labour market, education or culture. Consequently, it is important to estimate how strong these effects are and collect qualitative information on the nature of their impact. Whilst the effects of demographic change and globalisation have already been broadly discussed, changes resulting from digital transformation have scarcely been reflected upon systematically, especially in the case of labour markets. Against this background, the European Network on Regional Labour Market Monitoring (EN RLMM) has chosen the digital transformation of societies and economies and its effects on labour as its guiding theme for 2016. Together with the members of the network, we seek to present the state of the current knowledge, specify first action requests and options and capture the relevance of digital transformation for regional and local labour market monitoring.

The current anthology of the EN RLMM constitutes the first building block in this process: it brings together contributions discussing the effects of digital transformation on specific sectors and occupations as well as labour market target groups. Furthermore, it contains regional good practice examples describing and analysing the digital transformations of regions.

**Key words:** digitalisation, digital transformation, smart regional and local labour markets, smart labour market monitoring, applied labour market research, smart regional development