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INTRODUCTION

Christa Larsen and Sigrid Rand

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 digitalisation have scarcely been reflected upon systematically, especially in the case of labour markets. Concepts like the ‘fourth industrial revolution’ or ‘Connectedness through Cyber-Physical Systems (CPS)’ dominate the discussion in politics, among the wider public and partly also in empirical research. So far, they deliver only few points of reference to the direct effects of digitalisation on the labour markets, employees and the provision of education and training.

Against this background, the European Network on Regional Labour Market Monitoring (EN RLMM) has chosen digitalisation and its effects on labour as its guiding theme for 2016. We seek to capture the state of the current knowledge and specify first action requests and options, which arise from digitalisation and its effects on regional and local labour markets. On this basis, we can start reflecting on the relevance for regionally or locally directed labour market monitoring – the current anthology constitutes the first building block in this process.

How Does Digital Transformation Affect the Labour Market?

We assume that the impacts of digital (r)evolution are reflected in the transformation process, which can also be observed in the labour market. The empirical labour market and economic research points out the polarisation between the highest-skilled and lowest-skilled employees as the central phenomenon of this process (Autor et al. 2003, 1998, Goos et al. 2009). It is contended that as a result of digitalisation both these groups get bigger whilst the employees at the middle level have a much higher risk of losing their jobs, especially as many of them perform routine tasks, which can be automated or robotised in the process of

digitalisation. In contrast, the development and complex steering of the CPS as well as their further development will become more important for the group of highly skilled. Consequently, this group will become larger and gain in importance. The lowest skill segment will also increase, because there will be a demand for employees with basic training enabling them to supervise and operate some of the new technologies. Many of them are located in the field of simple services, which are expanding mainly there where services and products are marketed and distributed to private persons over the Internet. Moreover, it is assumed that the income structure will be spread apart as a result of these developments, i.e. the delivery of simple services, which are ever more often produced for those who are well-off, will generate only low incomes whilst the incomes of highly skilled specialists are ever more increasing. The growing unemployment and wage subsidies for low-paid workers are also named as phenomena characteristic to the future. This brings fundamental issues of allocation within the societies to the fore of the discussion (Asplund and Mångs, Bardak et al. in this anthology).

Furthermore, it is assumed that digitalisation also affects single sectors and occupations (Frey and Osborne 2013). First of all, qualitative effects can be identified in the form of job reductions and creations. There is a wide consensus that job reduction will be higher than job creation (Baruffini, Sobková in this anthology). However, there will be considerable differences between single countries depending on their sectoral structures, the skill levels of the employees and the forms of employment relationships. In the sectors with a high risk of job reduction automatisisation through ICT constitutes the main trend, as there are big potentials for routinisation. The examples would be transportation and storage, manufacturing, construction, mining and agriculture (Sobková in this anthology). In contrast, sectors such as health and social issues are less afflicted by job reduction, but do also not gain from growing employment.

In addition to the sectors, also occupations can be identified as risk areas for job loss. For example, this can concern numerical clerks, cashiers, secretaries, machine operators or electrical equipment assemblers (Sobková in this anthology). Like in the case of the mentioned sectors, routine tasks can be automated. In contrast, occupations such as process technician or cyber security specialist are the winners of these developments (Mezzanzanica et al. in this anthology). However, it has to be mentioned that it is highly probable that many occupations will

be initially little affected by digitalisation – there, the influence of trends like demographic change is partially stronger (quantitatively and qualitatively speaking). This is mainly true for occupations, which provide personal services such as doctors, nurses, childcare and social workers, teachers and university professors.

The quantitative effects are only half the truth. To a greater degree, we can assume that digitalisation has qualitative effects and that these will be more far-reaching. In most of the occupations, part of the core skills will be affected by changes (Frey and Osborne 2013). Estimations state that approximately 40% of all skills, which form the core of the tasks in single occupations, are affected by digitalisation (Sobková in this anthology). This mean value varies between single countries and surely also between regions, since the task profiles of the occupations differ according to the development and modernisation degrees as well as company size (Bardak et al. in this anthology). For Italy, a high impact of ICT for occupations such as web and multimedia developers, computer and systems technicians, software developers and system administrators has been identified. In contrast, a low level of ICT pervasion can be observed in the case of nurses, teachers, cleaners, waiters, lawyers and shoemakers. Also, for specific clusters of occupations/tasks certain ICT skills can be identified (Mezzanzanica et al. in this anthology). Simultaneously, new occupational profiles such as connectivity expert, business intelligence analyst, social media specialist or Big Data specialist arise (Mezzanzanica et al. in this anthology). In this context, there is already talk of digital skills gaps as there is not enough staff with such skills profiles available. This indicates that digitalisation is above all a phenomenon, which arises at workplace – often as a side effect of implementing ICT. However, it quickly becomes clear that other systems such as VET provision gain relevance in their supportive function ensuring that appropriately qualified staff are available. Only so can the introduction of ICT lead to economic success (Stevens in this anthology).

Which Development Requests Arise from Digitalisation and Which Approaches Are Suitable for Guiding the Actions?

Digital transformation strategies in companies need to go beyond the implementation of technology and include human resource management and corporate culture. In human resource management the focus is on quickly building up digital skills. These have to be continuously adapted and the newly arising skills gaps

need to be closed 'just-in-time'. This requires high agility from the employees and education providers: regular assessments, a continuous learning process at workplace and in work process, possibly creating possibilities for individual re-training and new creative work-based learning opportunities at workplace. Part of such a systematic human resources development is also the systematic development of leadership (see Stevens in this anthology). Leaders are needed who have digital competencies, provide trust and orientation to the employees and act as stabilisers in the development processes compensating the fragilities. At the same time, organisational culture needs to support digital developments by valuing risk openness, innovativeness, change and collaborative working as cultural norms.

Companies require support from education providers delivering very flexible, demand-oriented education and training which is tailored and just-in-time. This is contrary to the processes and activities in education systems in many European countries, which are rather static and still act in a supply-oriented manner. Here, there are enhanced needs for change. Moreover, it has to be ensured that already in (vocational) education and training the imparted competencies actually cover the needs of companies. There are examples of continuous co-operations between universities and companies where flexible development of curricula and practical experiences during the studies form the basis of a continuous bilateral exchange resulting in a highly targeted skills development oriented towards the needs of the companies (see Surdej in this anthology).

Digital transformation in companies leads to changing requirements towards other intermediaries in the labour market, be it recruitment companies, who have to make sure that the people recognise and use the chances of new job profiles, but also business associations such as the chambers of commerce or chambers of crafts and trade which need to build up support structures for their members going beyond the implementation of technology. In Europe, first examples for developing regional support structures for SMEs can be found with the aim of enabling companies whose resources are limited a sustainable participation in digital development processes (Kampe and Berezicki in this anthology). Furthermore, the basic framework conditions provided by states and nations need to ensure that the intermediaries and employees and the skills demand of the companies are appropriately aligned. Creating transparency and enabling competitions are two central key words (Bobkov et al., Oding in this anthology).

Approaches from different European regions, in which digital transformation is not primarily concentrated on the companies, but considers the whole region, are clearly more complex. The support for regional and local economic development is the perspective behind such approaches. There, the focus is on the development potentials of sectors, local and regional population, education providers and other actors and institutions. These are brought together in a strategy, which encompasses different components and bundles them to a digital transformation of a region (Dean and Neild, Holopainen and Jokikaarre in this anthology). Through such an approach the long-known interface problems between the companies and the education providers, which block the development of companies, are systematically resolved.

Excursus: Does the Shared Economy Create a New Type of Work – What Can We Learn from It on (Future) Working Conditions?

Personal services cannot be routinised well and do not follow the logic of digital transformation processes which has been applied so far. However, services change quickly if they are located in the area of shared economy. The so-called 'gig economy' is a peer-to-peer-economy in which market and non-market transaction costs are considerably reduced, the connections between the market actors are based on trust and the roles between the producers and consumers are fluid, which is expressed with the notion of 'prosumer'. In the shared economy the employer and employee come together for a short time in order to carry out single tasks. This process is supported through online platforms, which open up possibilities for this just-in-time labour. Uber and Airbnb are the most well-known platforms so far.

The nature of work changes significantly, as a big share of entrepreneurial risk is transferred to the employees. Hence, the traditional employer-employee relationships erode as does the sustainable safeguarding of employment. Whether the phenomenon of shared economy denotes a fundamental shift from career orientation to a job and then to a task cannot be appropriately appraised at the moment, since it is not clear to what extent the whole economy is permeated through such processes (Davis 2015). This development is interesting insofar that also those groups can profit from employment who have often been subjected to long-term unemployment so far (e.g. the vulnerable groups of elderly, migrants and women). Furthermore, shared economy fascinates many prosumers,

as they can engage in new forms of wealth-sharing in the framework of digital solidarity.

The 'uberisation' of many service areas is still in its beginning, but is spreading quickly. So far, the shared and traditional economies are still strongly separated. However, the dissolving of these borders can be observed. The employees pay for their higher flexibility with legal and financial insecurity. For the company side the shared economy is interesting, as the start-up capital and the entrepreneurial risks are rather small whilst immense profits can be made in short period of time if a platform is successfully introduced (Fontana et al., Bardak et al. in this anthology). For social partnerships, which are well established in many European countries and regions, these developments mean new challenges, which in their scope have received little attention so far.

Which Implications Does Digitalisation Have for Regional and Local Labour Market Monitoring?

In the process of digitalisation intelligent technologies are deployed in companies, requiring from employees high networking and communication skills as well as comprehensive technical know-how and creative solution skills. In this situation, a functional relationship between the abilities of the employees and technology are essential success elements for smart enterprises. For the regional and local labour market this means that to a much higher degree than before there has to be a compatibility between labour demand and supply, which is coherent not just in terms of its quantitative dimension, but above all in terms of its qualitative orientation. Only then we can talk about a functional regional labour market.

The qualitative compatibility between demand and supply can only be achieved when there is a permanent multidirectional circuit of information between the labour market, the policy-makers and the educational institutions, as this was already implied in Section 1.2. Claudiu Brândaş and Ciprian Pânzaru argue in this anthology, that a so-called 'Smart Labour Market' (SLM) is needed, in which actors, technologies and information are connected in an integrated and intelligent way in a continuous bidirectional circuit. This interoperability generates real time capabilities that can react flexibly to the needs of labour market actors. The qual-

ity criteria of such a market are following: customised, adaptive, real time, meaningful. Thereby, both authors consider feeding into the communication processes also information that is generated through the activities of labour market actors. Through this, a very extensive, heterogeneous and continuously growing data stock emerges, which needs to be systematically processed. Also here, artificial intelligence can be used through feeding in labour market actors' modes of behaviour as Big Data which is processed through the algorithms of machine learning. The necessary technologies create an independent unit of Smart Labour Markets, which is denoted as the Labour Market Decision Support System and Analytics (LM-DSS & A).

This draft of a smart labour markets is used to consider how a smart regional and local labour market monitoring needs to be shaped. At its base is the approach of regional labour market monitoring, which has been developed by the members of the EN RLMM in the past ten years. This approach is based on three central analytically separate functions: information function, communication function and action function. How can they be turned into 'smart functions'?

Concerning the *information function*, digital technologies have development potentials in two directions. First of all, they can be used for building up, analysing and maintaining heterogeneous and complex data stocks. Through artificial intelligence, learning processes for improving available information can be implemented. Secondly, the technologies open up possibilities for generating real-time data, quickly analysing and communicating them. Real-time data close a big information gap, which has been here so far, because official statistical data have always a time lag and because of anonymisation are only available in a highly aggregated form. Furthermore, often they cannot be differentiated also for small territorial entities. However, there are still clear needs for action in regard to the clarification of legal and ethical issues as well as the quality criteria of these real-time data.

Also the *communication function* can be developed further in an innovative manner. Interactive technologies offer opportunities for systematically optimising the so far strongly person-oriented interaction between data producers, interpreters and users, at the same time taking into account their different needs. Criteria that were so far often difficult to implement such as inclusive, adaptive, real-time and reliable, can be deployed with the flexible possibilities offered by

new technologies. The technical possibilities for these transformations are certainly there and expedient, but the question remains in how far the framework conditions under which the observatories operate or the organisational frameworks for the actors are suitable and sufficient.

The third dimension of regional labour market monitoring, the *action dimension*, could be developed towards smart action. Central to this dimension is the support for the decision-makers and other actors in the regional or local labour markets on different decision-making levels. The new technologies allow for multi-level communication and open up the necessary feedback loops. ICT can be used by everybody for ensuring that decision-making processes and action remain participatory and bottom-up developments can be systematically combined with top-down decision-making processes. Central to the action dimension are strategy development, implementation and evaluation. These co-ordinated processes build up on one another and can be observed and visualised through digital technologies, so that these are accessible to all participants at any time. A further advantage is that interventions can be tracked in real time. Through intelligent systems a quick customisation to a concrete situation is possible; also, it is imaginable that through the system suggestions for further measures and interventions are made. Consequently, decision-making processes and interventions are generally rendered more efficient and effective.

The value added which arises from these developments involves, above all, higher functionality of regional and local labour markets that results from optimised information, communication and decision-making in real time. Through this, the competitiveness of regions can be considerably ameliorated and at the same time the employment of regional or local population can be stabilised.

Whether the developments drafted above can be carried out does not depend just on digital technologies, but mainly on the European regions in which the regional or local labour market monitoring is carried out. These are the more than 550 regional and local labour market observatories. To start with, technical and financial resources are needed for using ICT. Furthermore, employees of the observatories need specific skills and know-how for a digital transformation. So far, it is not clear whether the users and customers of the observatories are ready for such processes as the new forms of interaction and participation require changes in the culture and self-understanding of the actors. The critical question

is if the users and decision-makers are ready and willing to allow for more transparency than before via real-time data.

These first considerations show that there are probably still marked deficits in the material, technical and socio-cultural resources as well as skills and know how that need to be addressed before Smart Regional and Local Labour Market Monitoring can be applied. Possibly a development process would make sense which goes about it step by step and is supported by the EN RLMM as well as single research and development projects, which focus on specific aspects in more detail. Furthermore, a discourse is needed at local, regional, national and European level in order to develop and strengthen the insight that investments in Smart Labour Market Monitoring can be very useful for ensuring sustainable economic development of Europe's regions.

Furthermore, the exchange between the observatories needs to be mentioned here as it will probably take on a decisive role in this development process. It is important to reflect on the own role and the changes thereof, as already in the past years it has changed from a producer of data and knowledge to a facilitating knowledge manager (Larsen et al. 2013). In the digital era it can develop to a co-knowledge manager/co-knowledge broker and a prosumer. Such a process should be supported through the manifold activities and discourses in the EN RLMM. These development processes will (as it has been the case so far) not take place in a simultaneous and uniform manner, because the regional and local political and socio-economic conditions, individual dispositions, relevant development paths, partnerships and competition between the regions as well as the incentives of the national and supranational actors result in different frameworks. However, it can be expected and wished for that there are observatories which will act as forerunners in developing their regional or local labour market to a Smart Labour Market. Possibly, the regional observatories at public labour administrations will profit from the digital transformation processes of these organisations like the contributions of Javier Ramos Salazar as well as Eugenia Atin, Raquel Serrano and Ibon Zugasti from the Basque Country demonstrate in this anthology.

Which Contributions Can Be Found in This Year's Anthology?

The contributions of *chapter 1* address the fundamental effects of digital transformation on the labour market and reflect our current knowledge concerning different territorial levels (national, regional, local), sectors, occupations and competencies. Julia Asplund and Andreas Mångs contend in their contribution on Sweden that digital transformation is a process that has been going on for several years already. They show that in this process the less skilled have to bear a higher risk of redundancy than the higher skilled. At the same time, it can be observed that simple jobs are increasing and that they are increasingly performed by persons from the middle skills segment. Marta Sobková reflects on similar processes for the Czech Republic and demonstrates besides the quantitative effects the qualitative ones, showing that the core areas of many occupations are affected. Furthermore, she points out in which sectors and occupations job losses and creation are to be expected. Mario Mezzanica, Silvia Dusi, Andrea Fioni and Claudia Graziani describe for the Lombardy Region in Italy similar tendencies by focusing their research on sectors and occupations, but they also demonstrate which new occupations are created drawing part of their information from real-time data. The article by Silvia Dusi, Matteo Fontana, Fabio Mercurio and Mario Mezzanica, focuses on ICT skills really needed by the companies. They can show it very clearly for different clusters on the basis of real-time data. The article by Moreno Baruffini from Switzerland is centred around industry 4.0 reflecting on the effects for regional labour markets and drawing attention to the requirements arising for qualification and corporate culture (these aspects are followed up in more detail in Chapter 2). Chapter 1 ends with a contribution to the discourse on the platforms of shared economy as a phenomenon of digitalisation. Renato Fontana, Vera D'Antonio, Martina Ferrucci and Carmine Piscopo discuss here whether it is really a new form of economy, which allocates and structures the risks and resources in a different way, giving us a glimpse of future developments. Furthermore, the authors consider whether the shared economy is not also about a cultural change of relationships between the market participants and come to the conclusion that an unequivocal answer is not possible at this point in time.

Chapter 2 addresses the requirements and the development necessities arising from the effects of digitalisation on sectors, occupations and skills as discussed above and delivers examples for the possible shaping and structuring of these

developments. In her contribution, Hilary Stevens argues that digital transformation, which primarily takes place as a technical transformation in companies, will affect employees and their skills. Consequently, the requirements towards the VET system and for further labour market intermediaries who are engaged in mediating, communicating and qualifying, change. Furthermore, she stresses the importance of framework conditions in these processes, which need to be created by the politics at the regional and national level. Aleksander Surdej shows how universities can adjust to the changing conditions and which relevant role can be assumed by the universities and companies using the Cracow Economic University as an example. Carsten Kampe and Sandra Berezicki give an account for an approach in the region of Brandenburg in Germany how through networking and consulting structures especially SME can be sustainably supported in the necessary digital transformation. Andrew Dean and Ben Neild from Exeter in the United Kingdom explicate how a region can set itself up strategically to use the chances of digitalisation for regional economic development. They describe how challenging such a process can be and underline the necessity of a systematic plan for bringing together very different actors. Päivi Holopainen and Pirita Jokikaarre focus on their home region Lapland and advocate that future developments need to be systematically taken into account. In their article they show in a clear and impressive manner how such a plan can be devised. Chapter 2 is concluded by two contributions demonstrating the relevance of superordinate national framework conditions. Vyacheslav Bobkov, Oleg Neterebsky, Irina Novikova and Igor Shichkin show in their contribution on Russia that transparency is a necessary precondition for development options. They describe the building up and dissemination of different electronic information, which enable better decision-making. In this article, the ambivalence between control and capacitation becomes explicit, brought about by transparency. This is an important point especially in the case of transformation states. Nina Oding, also from Russia, supports the removing of barriers for the modernisation of economy and labour market so that the competition can be function more systematically as a driver of modernisation.

Chapter 3 is concerned with the consequences of digitalisation arising from developing further the regional and local labour market monitoring to a Smart Monitoring. These are multi-layered, since they involve the content of monitoring as well as the processes. Claudiu Brândaş and Ciprian Pânzaru from Romania sketch in their contribution the model of a Smart Labour Market. Central to this

model are bilateral connections between all participants, which are supported by digital technologies. The authors raise the question how such a 'fluid' labour market can be supported by labour market monitoring and develop first lines of thought which are based on data and processes. Along a similar line, Eugenia Atin, Raquel Serrano and Ibon Zugasti reflect against the background of global foresight processes which phenomena could be relevant for regional labour market monitoring and how to include them. Also the contribution by Ummuhan Bardak, Francesca Rosso, Timo Kuusela and Cristina Mereuta points in this direction: on the basis of two examples they demonstrate how the approaches of forecasting and foresight can be used. They point out that both prognostic approaches are important for capturing the effects of digitalisation and guiding actions and underline the necessity of tailored solutions Chapter 3 is concluded by the contribution of Javier Ramos Salazar who describes the principles directing the development of a public employment service based on an example of a foresight process.

We would like to thank all the authors for their excellent and fascinating contributions, often thinking out of the box. Their work enables the EN RLMM and its members to systematically reflect upon the relevance of digitalisation for the regional and local labour market monitoring, for which we are very grateful. This topic will surely stay with us also in the future and we look forward to the discussions at this year's Annual Meeting of the EN RLMM in Rovaniemi. There we can already take up important impulses from the Anthology and develop them further together.

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