Human Capital in Digital Age

Tim Langenstein, Martin Užík, Anna Ruščáková

Abstract

Within 10 years, the humanity digitalized nearly 97% of all Knowledge of the last centuries. The digital age has begun and we see its influence in every social and economic area. The main question we follow in this paper is: what kind of parameters do we have behind the production factor Labour in the digital age? Flexibility, individuality and mobility is the answer based on our research.

Keywords: digital age, human capital, employment

Introduction

The age of digitization is linked to increases in productivity, which are mainly due to the increase in speed. On the one hand, this can be expressed by Moore's Law. Which states that every 18 months, the performance of the microprocessors doubles at the same price. On the other hand, in the digital age this is confirmed by Gilder's Law. Thus, every six months, the data transmission rate is doubled while the network technology is the same. (Lemke & Brenner, 2015, p. 23ff.) The speed, however, affects only one dimension and that is efficiency. The effectiveness of the processes has so far been neglected in favor of speed, and true to the motto: "If we are fast enough, we can let the process go through twice." If we translate these findings into human capital, it becomes clear that the misallocation can have far-reaching consequences not only economically, but also socially and psychologically. As a result in this thesis, the question about the factors which influence the human capital or human work and thus the factor of production in the digital age is discussed. In addition, the concept of "digitization" from the perspective of the labor market is pointed out in this thesis.

To achieve the stated objectives, the term "digital age" is discussed in chapter 1. Chapter 2 introduces the term "human capital". In chapter 3, the question dealing with the factors which can describe the human capital or human work in the digital age is answered. This is followed by statistical overviews of the development of the labor market, which indirectly show the identified factors and their influence on human capital in the digital age. In

summary, besides the identified factors, which exert influence on the production factor of labour, this thesis also includes expectations regarding future development.

1. Digital Age

It is assumed that the first time humanity was able to store more information digitally than in analog format in 2002. This point can thus be seen as the beginning of the "digital age". The almost complete digitalization of the world-wide stored information was implemented in less than 10 years around the year 2000. According to the sources in 1993 only 3%, however, in 2007 up to 94% of all global information storage capacity was in digital format. The telecommunications sector followed a similar trend. In 1986, around 20%, two-thirds in 1993, and 98% of all telecommunication capacity in 2007 were digital. (Hilbert & López, 2011, p. 1) The digitization of communication and information processes resulted in an information avalanche. Compared to the annual growth of the world economy between 3% and 6%, the growth rates of the global telecommunication and information storage capacities per person are significantly higher in the two decades between 1986 and 2007 with 23% and 28%.The digitization is beginning to influence our processes and our lives and will significantly alter them in the upcoming decades. This development is shown in Figure 1. Thus, according to Lemke and Brenner (2015), we find ourselves at the end of the second and at the beginning of the third evolutionary stage of the digital age. Internet of Things is the motto of the upcoming fifteen-year periods, followed by the perfect fusion of the real and digital networked world. However, mankind also faces various and very complex challenges of an economic, social and psychological nature. On the basis of the expected developments in the area of technology and digitization, the labor market is faced with fundamental changes we must master. (Hornuf & Klöhn, 2013)

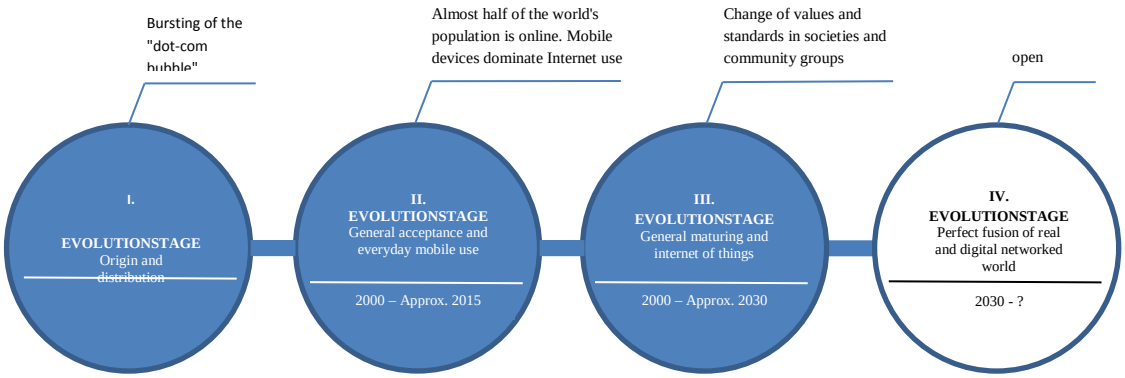

Figure 1: Evolution stages of the digital age

Source: In accordance with Lemke & Brenner (2015), p. 19.

"We need capital and no banks" or "we do need mobility, no cars" has often been heard at recent scientific conferences on the subject of digitization. These are only two examples showing how digitalization will affect the financial sector and the automotive industry in the future. If we look at the growth rates in the area of crowdfunding in recent years, then this development confirms the above. The increasing heterogeneity caused by the new industries, which are financed by crowdfunding, also show the potential for future development (see Figure 2). Finally, it must be noted that digitization is unstoppable and will exert its influence in any economic sphere. Thus, our understanding of the human work of the future will have to change in the digital age.

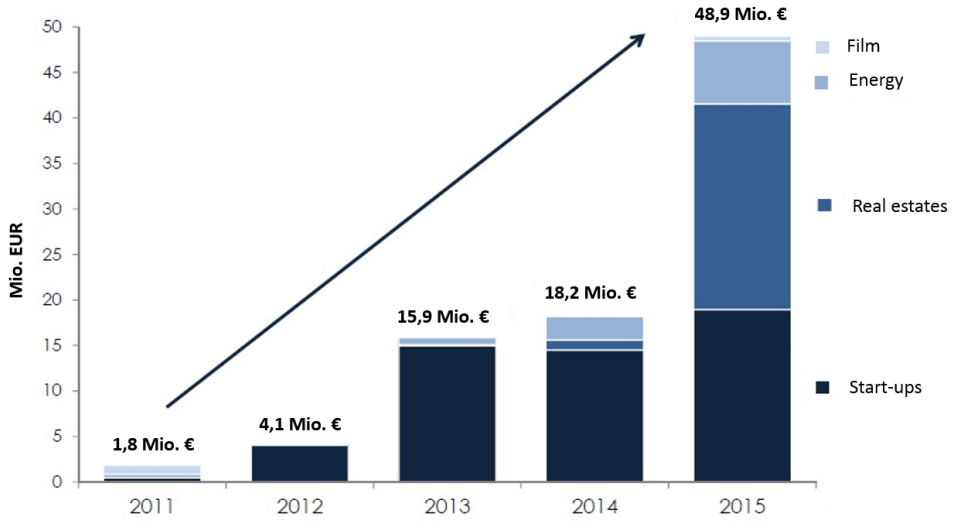

Figure 2: Volume by Crowdinvesting successfully financed projects in Germany 2011-2015

Source: Harms (2016), p. 4.

2. Definite demarcation of human capital

The three production factors on which each production is based in economy are the production (human capital), land (natural capital) and capital (equity). Thus, human labor is an essential function in economics. We understand from the economic viewpoint that the work is every human activity with the objective of generation of income. Indirectly, Adam Smith already recognized human labor as the source of prosperity and not the agricultural land (Smith, 1776, p. 3) in his 1776 standard work entitled "The Wealth of Nations", and this was a long time before the technologization and digitization which were based on human activity. With David Ricardo, John Stuart Mill, Karl Marx, a prominent list of scientists and authors, who have recognized and described the importance of human capital, continues. The work is measured as a homogeneous quantity in working hours, so that it could be

represented as a product of labor power and working time. (Various authors, 1988, p. 261) For example, if working time is reduced by technological progress with the same number of workers, the finished work is reduced and vice versa.

The term "human capital" received, inter alia, by the work of Becker (1975) and Schultz (1981) increasing popularity. The authors conducted studies in which it could be shown that the prosperity development of regions cannot be explained solely by the investment in property. Rather, a positive correlation between prosperity and the level of education could be established.Schultz summarizes the term of human capital on the one hand in terms of innate population quality and on the other hand the population quality acquired through investment and increased. (Schulz, 1986). He argues that "[...] investment to improve the quality of the population [...] can significantly increase economic prospects and welfare [...]" (Schulz, 1986, p. 9) Through Fritz-enz, the economic perspective of human capital experiences a transfer to companies and individuals. The short-term, professional and social potential of the employees and managers of a company make up the human capital. This definition also includes cultural knowledge, team and integration skills, moral character, loyalty, flexibility, communication skills, and employee integrity under the concept of human capital. (Fritz-enz, 2000) Other authors also add all the individual skills (intelligence, creativity, inventiveness, initiative, decision-making, responsibility, willingness to take risk, skill), knowledge, motivation and experience of employees and management of the company. (Renzl et al., 2006) Human capital is essentially the same as the accumulated capital of people. (Schultz, 1986) Edvinsson and Malone define the human capital as follows: The combined knowledge, skills, innovativeness, and ability of the company's individual employees to meet the task at hand. It also includes the company's values, culture, and philosophy. Human Capital cannot be owned by the company." (Edvinsson & Malone, 1997, p. 43) The human capital must also be able to control the dynamics of an intelligent organization in a constantly changing environment. (Edvinsson & Malone, 1997)

Human capital is often placed in close relation to intellectual capital in the literature. Intellectual capital is to be understood as the intangible assets of a company that remains in the company, even if employees leave the company. Human capital, on the other hand, is the intellectual property, which is only tied to the employees. If employees leave the company, the company loses its human capital. (Daum, 2003; Fritz-enz, 2000) It is therefore necessary to separate human capital from structural capital. Human capital is the source of innovation and innovation. The structural capital consists of innovations and innovations. At the same time, it should be noted that the human capital alone does not provide a guarantee of success. The key to success is further the structural capability, which means that the innovations and innovations are correctly recorded and implemented. (Stewart, 1998)

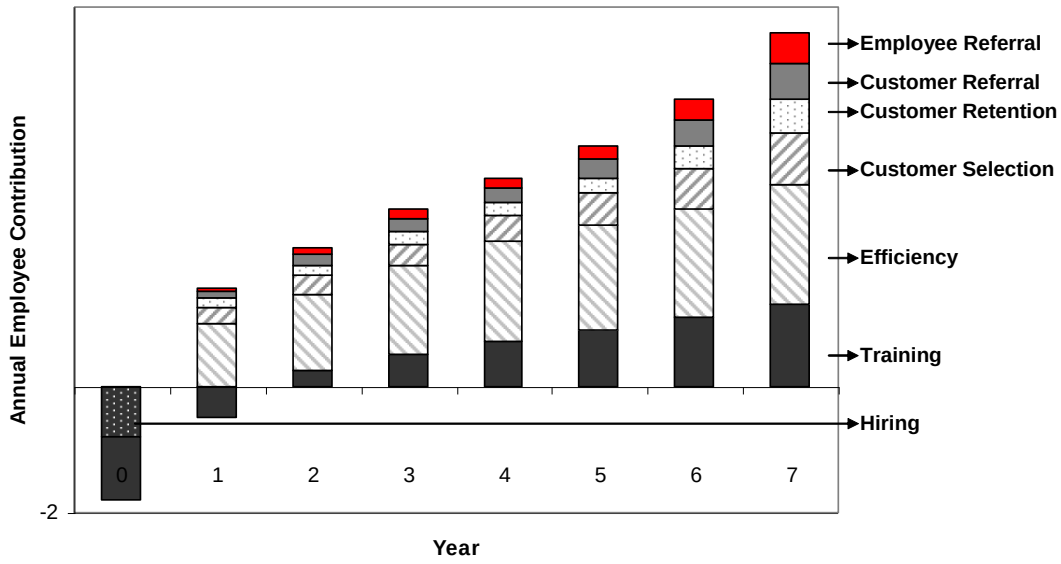

Figure 3: Long-term value added by employees

Source: Reichheld (1996), p. 100.

Figure 3 shows the value contribution of the human capital to the company success. This presentation seems to be contrary to the discussions and developments in management circles of the last decades, which are mostly driven by cost reductions through personnel reduction. Management used the so-called "downsizing" (Brown, 1997) or the "name-oriented restructuring" (Hamel & Prahalad, 1995) to generate the company's value. The target variable is a constant result which, however, is to be achieved by the use of ever smaller amounts of input resources. In the denominator, the productivity indicators have the variables such as number of employees as well as personnel expenses, which must be reduced according to the above-mentioned procedure. However, in the time of digitization, this approach does not seem to be completely conclusive. The market-dominating companies today are characterized by a very high level of personnel expenditure and a very low level of material expenditure. In an economic world that is increasingly influenced by intangible capital, the strategy of restructuring does not appear to be appropriate, unless the reduction in personnel expenses or the number of employees is due to the innovations and, in our case, to the consequences of technology and digitization. A decisive factor in this context seems to be the quality of human capital. Zemsky, Lynch and Cappelli were able to demonstrate a positive relationship between human capital and productivity in a 1995 study. According to their results, an increase in the level of education by 10% resulted in an increase in productivity in the amount of 8.6%. By contrast, a 10% increase in investments led to an increase in productivity only by 3.4%. (Stewart, 1998) The human capital can thus

be described as the actual bearer of knowledge, which can guarantee the corresponding innovations and hence the future viability of the company. Thus the human capital is the creative and innovative force for knowledge (Müller-Stingl & Neumann, 2006) and the decisive economic production factor of the digital age.

3. Human Capital and Digital Age

The economic production factor labor is available when income is targeted. However, there is no distinction between manual and intellectual employment. (Fischbach & Wollenberg, 2007, p. 28). The individual types of work are shown in the following figure.

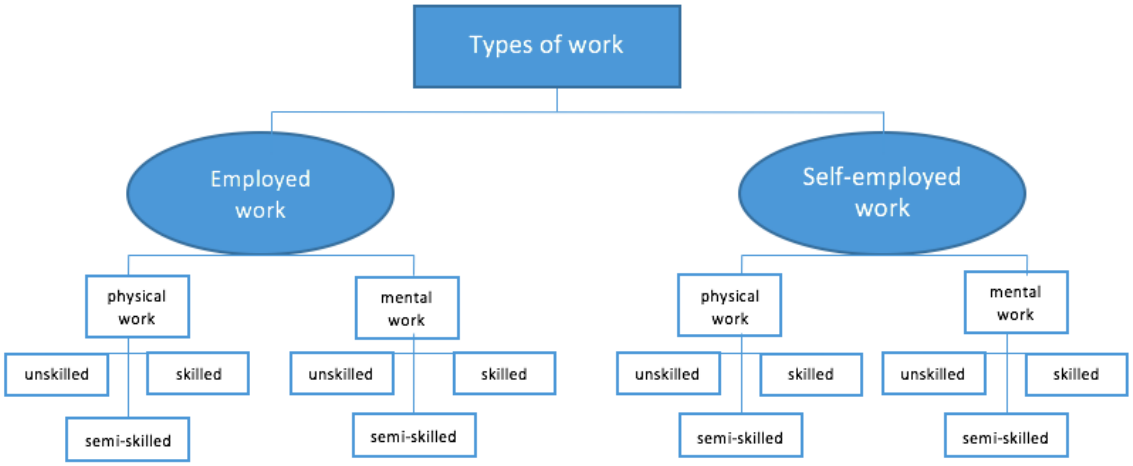

Figure 4: Types of work

Source: Fischbach & Wollenberg (2007), p. 29.

Bound by instructions in the execution of work is the criterion for the division of labor into self-employed and employed. While self-employment is not bound by any instructions, the employed work is the work of a worker, an employee, or an official, who is bound by the instructions of others. Physical work is accompanied by physical muscle work. Mental intellectual power and emotions are the expression of the mental work, however an exact separation is practically difficult. Based on the vocational training of a worker, a further separation of the work into unskilled, semi-skilled and skilled can be made. (Fischbach & Wollenberg, 2007, p. 29)

The transition from the industrial, to the knowledgeable and service society is the prerequisite and at the same time the consequence of the change of the working world. Likewise, the development and spread of new information and communication technologies,

globalization, structural change and a number of other factors are the driving force behind this constantly advancing change. The consequences are changed work processes, new company structures and thus new forms of work and organization. However, the work environment is currently subject to rapid change. By decoupling the work from the factors of time and place, the work becomes more and more mobile and flexible. (DGUV, 2016)

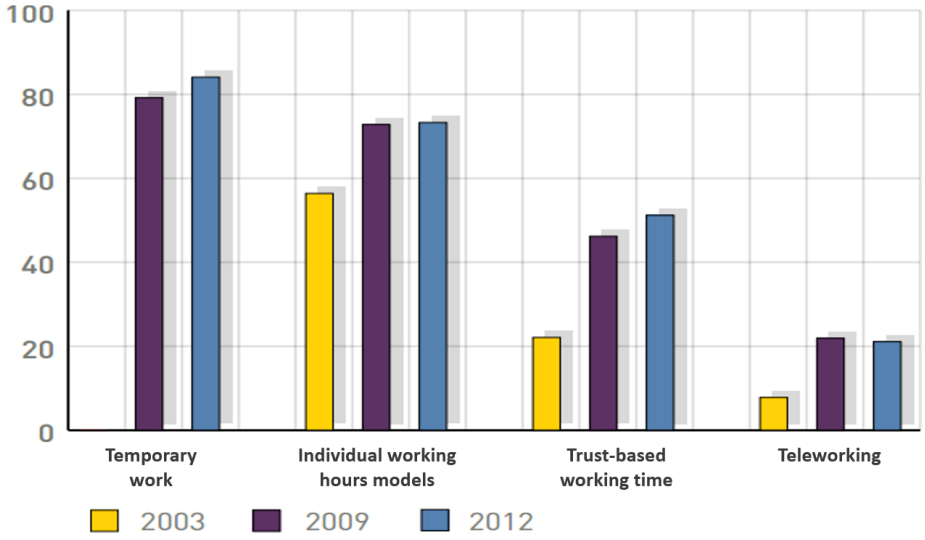

Figure 5: Modern working forms

Source: BDA Guidelines (2013), p.

With reference to the above, in the digital age, work is increasingly characterized by the factors of flexibility, individuality and mobility. In addition, the industry expects a high qualification of human capital, which is to be implemented in good quality in the production processes. With regard to the factors of flexibility, individuality and mobility, we consider the temporary employment in the further discussion, since it can map these factors.

Temporary employment is often depicted by the terms of personnel leasing and external work. The legislature regulates the temporary employment in the employee handover law (Gutmann & Kilian, 2015, p. 19).

Technologization and digitization are also reflected in the field of modern working methods. Figure 5 shows that, with regard to part-time work, individuality and flexibility, an increasing entitlement to workers is required. At the same time, it can be assumed that temporary work can best reflect factors of flexibility, individuality and mobility. This is also of

a great importance in the digital age. This development is shown in Figure 6.Thus between years 1980 and 2015 in Germany the temporary work on average grew 11% per year. However, several influencing factors such as the economic situation and changes in the law must be taken into account. In the course of the global economic and financial crisis in 2008/2009, the temporary employment agencies have experienced a significant slump in employment despite the temporary possibility of granting short-term economic benefits.In contrast, impulses could be recorded after corresponding legal changes. In 1993 the number of temporary employees in Germany was 114,000 on average and only five years later had it more than doubled. Later, in the course of the legal changes within the framework of the Hartz laws, there was a further significant expansion of the industry. According to the facts, there were already more than 951,000 temporary employees in Germany in December 2015. (Federal Office of Labor, 2016; Job offers Vergleich.de)

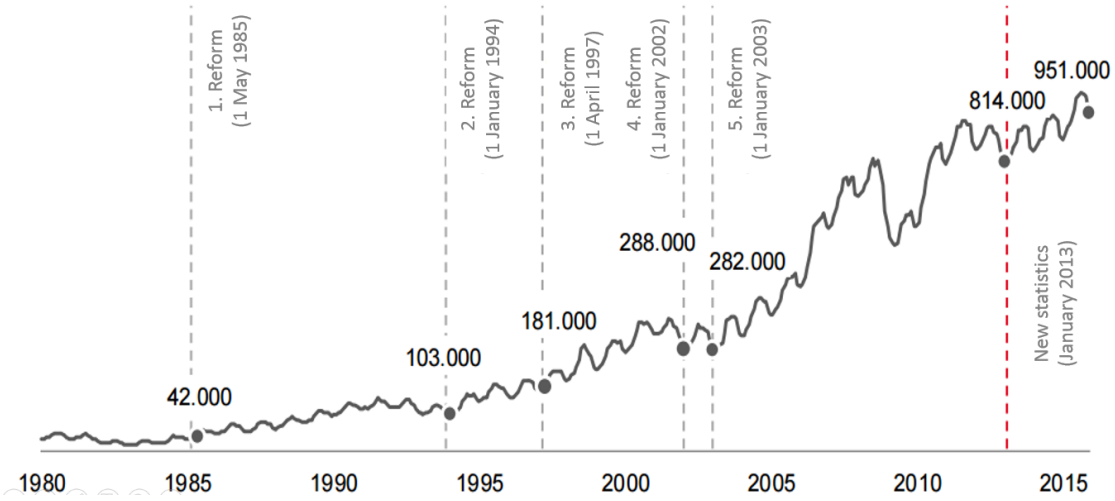

Figure 6: Development of temporary work in Germany from the perspective of the number of temporary workers 1980 - 2015

Source: Federal Labor Office (2016), p. 7.

In this case, the companies with the right to handover employees may be divided into two groups. On the one hand, in mix-companies, where the economic focus is in another industry, and on the other hand, in companies with a focus on the provision of workers. According to Figure 7, the number of lending companies in Germany as well as the proportion of temporary workers in the company increase every year. In general, there is also a steady growth in the proportion of enterprises with a focus on the transfer of workers in Germany. (Federal Labor Office, 2016)

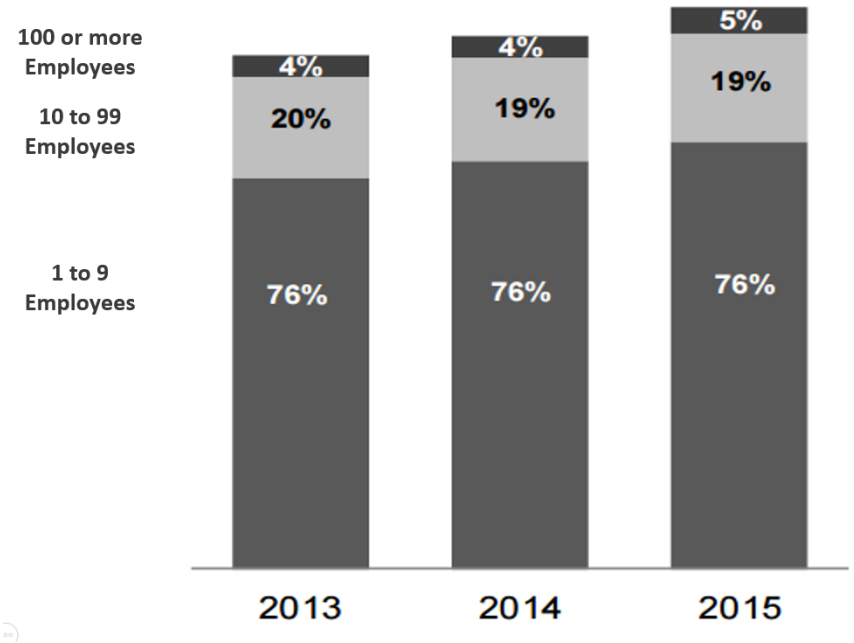

Figure 7: Number of hiring companies in Germany from the point of view of the number of employees

Source: Federal Labor Office (2016), p. 8.

Similar development and preference for the mobility and flexibility of workers from the point of view of enterprises is also confirmed by Figure 8, which illustrates the evolution of the number of workers with temporary contracts in the European Union.

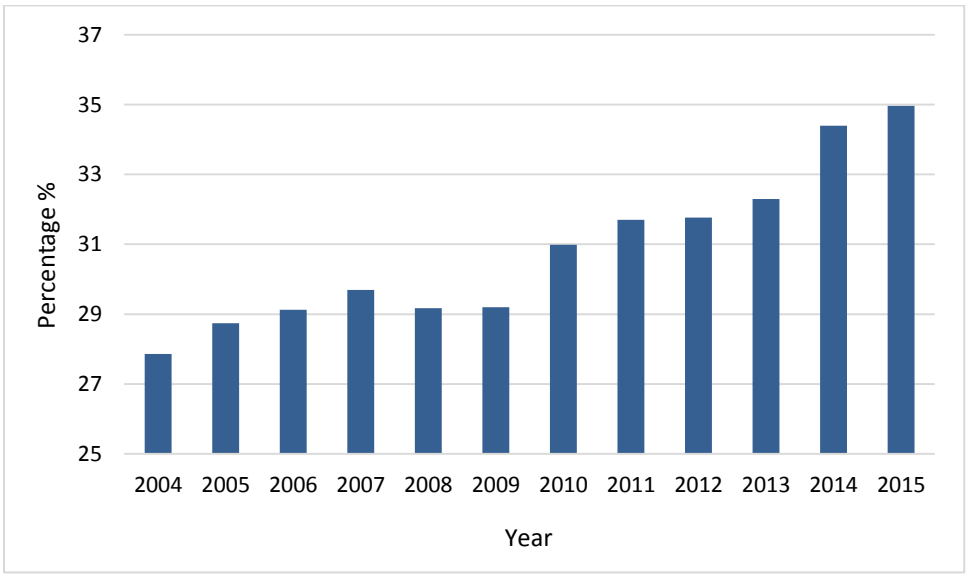

Figure 8: Average percentage of workers with a temporary contract in the European Union 2004-2015

Source: Eurostat (2016).

Conclusion

The Digital Age began without prior notice in 2002 and has only been accelerated by technological advances and the introduction of innovations such as smartphones. As a result, digitization poses a threat to the socio-economic structures in their known forms. However, it also provides opportunities for the development of new industries and the change in the work-life-balance style of a whole generation. The paper dealt with the question concerning the factors influencing the human capital or human working life and thus the production factor Labour in the digital age. Mobility, flexibility and individuality were listed as essential and relevant factors. In addition, the development of temporary work in Germany and Europe was considered historically. Here it can be stated that this has also increased with the growing digital age. At the same time, however, the qualification of the temporary workers remained out of the question, which could only partially explain the relationship between temporary work, the relevant factors of the production factor Labour and the digital age. Nevertheless, the trend seems unstoppable. Another factor that has not been dealt with in this paper is the allocation of human capital. As far as the allocation of human capital is concerned, we find that this does not meet the requirements of the digital age. This is primarily restricted to the simple search for jobs from the perspective of jobseekers and employees from the company's perspective. This is the focus of the generalist job portals like Stepstone.de, Kalaydo.de or Stellenanzeigen.de, on which vacancies and positions of all branches and levels can be found.However, specialization and individuality are becoming more and more popular, as specialized job exchanges are looking for matching for individual work areas and tasks. These are enjoying increasing popularity with job seekers. Specialists can now specifically search for jobs in their area and find jobs faster in niche sectors than in the large job portals. (Kenk, 2010, Brickwedde, 2013)

References

BDA-Leitfaden. (2013). *Moderne Arbeitsformen*. Retrieved September 20, 2016, from http://www.arbeitgeber.de/www/arbeitgeber.nsf/id/de_moderne-arbeitsformen.

Becker, G. S. (1975). *Human Capital: A theoretical and empirical analysis with special reference to education* (2nd ed.). New York: NBER.

Brickwedde, W. (2013*). Ist die Zukunft der klassischen Online-Jobbörsen bedroht*? Retrieved September 20, 2016, from https://www.jobnet.de/news/zukunft-der-klassischen-online-jobboersen.

Brown, M. (1997). *Kennzahlen: Harte und weiche Faktoren erkennen, messen und bewerten*. München: Hanser Fachbuchverlag.

Bundesamt für Arbeit. (2016). *Der Arbeitsmarkt in Deutschland – Zeitarbeit – Aktuelle Entwicklungen*. Retrieved October 20, 2016, from https://statistik.arbeitsagentur.de/Statischer-Content/Arbeitsmarktberichte/Branchen-Berufe/generische-Publikationen/Arbeitsmarkt-Deutschland-Zeitarbeit-Aktuelle-Entwicklung.pdf.

Daum, J. H. (2003). *Innovation Management and the Role of Controlling.* Retrieved September 28, 2016, from http://www.iioe.eu/fileadmin/files/publications/e_Controlling_Innovation _J_Daum_e.pdf.

DGUV. (2016). *Neue Formen der Arbeit.* Retrieved September 20, 2016, from http://www.dguv.de/fb-org/sachgebiete/neue-formen-der-arbeit/index.jsp.

Edvinsson, L., & Malone, M. S. (1997). *Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower*. New York: HarperBusiness.

Eurostat. (2016). *Database.* [Online].

Fischbach, R., & Wollenberg, K. (2007). *Volkswirtschaftslehre 1* (13th ed.).

Fritz-enz, J. (2000). *Renditefaktor Personal: So messen und erhöhen Sie den ROI Ihrer Mitarbeiter*. Frankfurt: Campus Verlag.

Gutmann, J., & Kilian, S. (2015). *Zeitarbeit* (4th ed.).

Hamel, G., & Prahalad, C. K. (1995). *Wettlauf um die Zukunft: Wie Sie mit bahnbrechenden Strategien die Kontrolle über die Branche gewinnen und die Märkte von morgen schaffen.* Wien: Ueberreuter Wirt.

Harms, M. (2016). *Crowdinvesting Marktreport 2015.* Retrieved September 20, 2016, from http://www.crowdfunding.de/crowdinvesting-marktreport-2015/.

Hilbert,, M., & López, P. (2011). *The World's Technological Capacity to Store*, Communicate, and Compute. Retrieved October 15, 2016, from http://www.ris.org/uploadi/editor/1304938275129769729 4Science-2011-Hilbert-science.1200970.pdf.

Hornuf, L., & Klöhn, L. (2013). Crowdinvesting und Portfoliodiversifizierung. *Venture Capital Magazin*, (2), 34-35.

Kenk, G. (2010). *Die aktuelle Lage der Jobbörsen in Deutschland: Jobbörsen erfreuen sich wieder eines Zuwachses bei den Stellenanzeigen. Doch der Wettbewerb durch die Suchmaschinen nimmt zu.* Retrieved September 20, 2016, from http://crosswater-job-guide.com/archives/9050.

Lemke, C., & Brenner, W. (2015). *Einführung in die Wirtschaftsinformatik, Band 1: Verstehen des digitalen Zeitalters* (2nd ed.). Berlin: Springer.

Müller-Stingl, A., & Neumann, R. (2006). Ausgewählte Methoden der Bewertung von intangible Assets: Entwicklung eines Business Excellence Navigatorsn. In: Matzler, K. & Hinterhuber, H. H. & Renzl, B.: *Rothenbergermögenswerte: Handbuch Der Intangible Assets*. Berlin: Erich Schmidt Verlag, 43-61.

Reichheld, F. F. (1996). *The Loyalty Effect: Growth, Profits, and Lasting Value.* Boston: Harvard Business School Press.

Renzl, B., Matzler, K., Huemer, E., & Rothenberger, S. (2006). Wissensbilanzierung an Universitäten. In: Matzler, K. & Hinterhuber, H. H. & Renzl, B.: *Rothenbergermögenswerte: Handbuch Der Intangible Assets.* Berlin: Erich Schmidt Verlag, 231 – 249.

Schultz, T. W. (1981*). Investment in Human Capital.* New York: Free Press.

Schultz, T. W. (1986). *In Menschen investieren: Die Ökonomik der Bevölkerungsqualität.* Tübingen: Mohr Siebeck Verlag.

Smith, A. (1776). *An Inquiry into the Nature and Causes of Wealth of Nations.* Übersetzung Claus Recktenwald, 1995.

Stellenanzeigen Vergleich.de. (2016). Retrieved September 20, 2016, from http://stellenanzeigen-vergleich.de/jobboersen-vergleich-2015/#.

Stewart, T. A. (1998). *Der Vierte Produktionsfaktor: Wachstum und Wettbewerbsvorteile.* München: Hanser Fachbuch.

Užík, M. (2008). *Immaterielles Kapital – Werttreiberfunktion und Bewertung*. Dissertation. Retrieved September 20, 2016, from http://d-nb.info/1006184570/34.

Various authors (1988). Gablers Wirtschaftslexikon (12. Auflage).

Author's address

prof. Dr. Martin Užík
Department of Business and Economics
Berlin School of Economics and Law
Badensche Straße 52
10825 Berlin, Germany
E-mail: martin.uzik@hwr-berlin.de

Ing. Anna Ruščáková
Technická univerzita v Košiciach
Ekonomická fakulta
Denná doktorandka na Katedre ekonomických teórií
Němcovej 32, 040 01 Košice
E-mail: Anna.Ruscakova@tuke.sk

Ing. Tim Langenstein
Technical University of Kosice
External PhD student
Department of Regional Science and Management
E-mail:tim.langenstein@ebootis.de