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# THE FUTURE OF WORK IN THE LIGHT OF TECHNOLOGICAL CHANGE

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**Abstract:** *Technological unemployment, a phenomenon that has been relevant for decades, is now reaching a new dimension. There is a growing number of discussions about whether technology is the main culprit for the rising trend of unemployment rates around the world, therefore, the paper discusses the impact of technological changes on the labour market. We conducted a survey in Slovenian companies with more than 100 employees in order to find out their view on replacing workers with technology, as well as the reasons and consequences of new technology. We discussed the results of our research and the views, findings and suggestions of various authors. We have found that technological unemployment is not a simple problem, as this phenomenon is intertwined with various issues, and that technology presents various dangers which may at first seem less visible.*

**Keywords:** *Labour market, Impact of technology on the labour market, technological unemployment*

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## 1 INTRODUCTION

Increasingly demanding technology, automated production as well as new business and organizational concepts bring about changes that affect employment, economic growth and productivity in all areas. Technological changes contribute a number of positive effects that encourage employees to work more efficiently in order to get rid of boring routine tasks and perform much more creative and interesting tasks. In addition, new technology allows for the implementation of a wide range of harmful jobs that has been done by humans until recently. We should not forget, however, numerous negative influences which are the result of the fact that technology is increasingly displacing people from the workplace. Employees are thus replaced by machines that represent a cheaper workforce, as they do not need to be trained and do not need rest, food, etc. Rifkin (2004) points out that workers are also losing

their jobs in poorer countries to where many companies have moved their industry, as there are also an increasing number of automated work processes there which increase productivity and require less workforce. The author believes that the situation is further aggravated by population growth, as it would be necessary to create more than a billion new jobs worldwide, unfortunately, the number of jobs across the globe is shrinking. We mentioned that technological development is increasing productivity, but this brings with it the danger of hyperproduction – the In connection with new technologies and work, the following issues were highlighted:

- New technologies are developing so fast that businesses have problems with workers who are not sufficiently trained to work with new technologies. Arvanitis and Loukis (2015) have shown that technology has a positive effect on the demand for highly qualified personnel and a negative impact on the demand for low-skilled personnel. We should also not forget the fact that the retraining of employees (especially those with lower education) is increasingly difficult, as the changes are occurring very quickly.
- Digitalization has greatly facilitated work as it enables teleworking and introduces changes in forms and modes of work. Unfortunately, the number of jobs outside the employment relationship is increasing due to digitalization and hence also the number of precarious employments with fewer social rights. According to Standing (2014), these are less well paid and provide less social rights.
- Different modes of work appeared due to technological changes. For example, many jobs in the manufacturing industry are endangered due to 3D printers. One should be aware, however, that 3D printing technology also affects other areas, for example, in the field of medicine, architecture, automotive industry, etc.
- The field of nanotechnology is also becoming increasingly relevant, which can be an opportunity for new jobs. On the other hand, Ford (2009) believes that the number of these jobs may be questionable as companies will only need small groups of top experts.
- Technological changes do not just endanger workers who perform physical work. The capacity of processors is exponentially increasing, therefore mental work is also becoming increasingly threatened. According to some authors, we are relatively close to the point of creating artificial intelligence. Luckerson (2014) mentions that many believe technological singularity will cause robots to perform work instead of people, while people will rest with abundance of wealth. On the other hand, he also mentions a number of scientists who point out the danger. Artificial intelligence could erase all the creatures that would be seen as competitors for control of the earth, and human beings among them.
- The increasing use of technology both in industry and in everyday life has a great impact on the environment and the earth itself. Thus, we already face the lack of natural resources and the risk of pollution to the extent which could cause mass extinction.

The described issues led us to the study of the impact of technological changes on the labour market. In theoretical starting points, we have described the impact of new technologies on the future of work. In the following, we described a survey carried out among Slovenian companies. We were interested in what Slovenian companies think about replacing workers with technology, and about the consequences of new technology. We discussed the results of our research and intertwined them with the views and opinions of other authors.

## 2 THEORETICAL STARTING POINT FOR THE IMPACT OF NEW TECHNOLOGIES ON THE FUTURE OF WORK

The notion of technology, originating from the Greek word *téchnē* (art, crafts), draws attention to the rational ability to create and produce. Modern technology originated from the ancient “*téchnē*” with the development of reasoning and knowledge in science. In this sense, the technology is inalienable from human activities and does not only reside in high-tech products, but also in the field of scientific knowledge, human understanding, and the organization of social institutions. Among the positive effects brought about by technology one could mention greater productivity of work, contribution to the purpose of saving energy, enabling the reduction of environmental pollution in production (Eriksson, 2013). However, technology does not only have positive effects and aspects, as Marx stated (1867, p. 552): “From the perspective of a worker, the machine can only be a material manifestation of capitalist domination. In addition to lower wages and insecure survival the machine transforms a company into a world of suffering. The physical effort of work can be reduced, but workplace conditions worsen.” Due to new technologies and, consequently, competitiveness workers are nowadays increasingly exposed to “coercion” for maximum productivity. In connection with the above, we are more and more often faced with stress at work.

Throughout different historical periods, human survival was associated with the changing of seasons and the fertility of the earth, while climate, solar irradiance, and ecological heritage were conditioned by the economy of the earth. The pace of the economy determined the exploitation of natural raw materials, such as water, wind energy, animal and human force (Rifkin, 2004). To some extent this is true to this very day, for example, climate change can destroy entire industries, such as tourism, agriculture, leading to mass migrations, wars. With the invention of the steam engine the process of transferring economic activities from man to machine began, which continued with the introduction of electricity, oil, and other inventions. In the recent period, companies were faced with the information technology which allowed for a much faster development than predicted. Morley and Robins (1995) mentioned that new technologies have created new industries, for example, in recent decades the computer and information industry have instantly enabled the flow of media and information across the globe. In this regard, Novak and Šprajc (2012) argue that information technology has brought cheaper and easier access to data, as well as their processing, storage and transfer, while the volume of available information in itself generates huge and unimagined opportunities for their use in the development of new products and services. At the same time, it seems important to us to draw attention to the fact that people in this way can even more easily manipulate, censor, duplicate information.

In recent decades, technology has become known as the main force for international competitiveness, growth and creation of jobs, but at the same time a concern has emerged due to the rapid growth of unemployment and the persisting high unemployment rate in Europe. Rapid technological development and an accelerated process of globalization were exposed as key elements of the loss of employment. At the individual level, workers performing routine work are most affected (Petit & Soete, 2001). Modern technology replaces more and more tasks, not only undemanding routine procedures but also thinking, decision-making processes. To some extent, new technology also threatens demanding professions and areas such as art, education, medicine, science, etc. Thus, robots are successfully introduced in the

field of surgery while in literature, for example, a programmed computer can create almost three quarters of the text of a novel. The same is happening in the field of music and film, where it is now possible to capture every single movement and expression of an actor using new technology and then process it and use it after the actor's death (Rifkin, 2004).

Information technology has developed various flexible forms of work, such as, for example, teleworking which gives individual groups of people the opportunity to get involved in employment. Thus, information and communication technology can even bring jobs to areas with high unemployment, which is particularly important for geographically remote areas as in that way we can maintain harmonious regional and local development. We can also expect accelerated automation in the workplaces of the future, while smart technology will replace many of the tasks that were until now only within the domain of man. It is necessary to take into account the opportunities and chances for new, i.e. different jobs mentioned by Daugherty, Banerjee, Negm and Alter (2015).

On the one hand, organizations encounter job cuts and, on the other hand, they create new ones that contain different forms of organization of work to achieve a combination of productivity, performance and quality, in order to increase competitiveness. Technological changes also require changing staff structure, new knowledge, skills, and experience. We should therefore not forget the new profiles of the professions created by today's market as a result of Information technology has developed various flexible forms of work, such as, for example, teleworking which gives individual groups of people the opportunity to get involved in employment. Thus, information and communication technology can even bring jobs to areas with high unemployment, which is particularly important for geographically remote areas as in that way we can maintain harmonious regional and local development. We can also expect accelerated automation technological changes. If organizations want to be successful in ever-increasing competition, they will have to follow and adapt to change.

## 3 RESEARCH

### 3.1 Purpose and Course of the Research

The purpose of the research was to establish the opinions of companies about the possibility that in the future new technologies and machines will replace people in the workplace and to find out the opinions of companies about the possible benefits and negative impacts of the introduction of new technologies and machines in companies.

The survey was carried out in June 2015 with the help of a questionnaire sent to 526 companies in the Republic of Slovenia. All companies with 100 or more employees in 2014 were included. The survey was anonymous, sent to the human resources department, head of the technology department or addressed to a similar post. We received 124 completed questionnaires.

### 3.2 Results

The companies surveyed ( $N = 123$ ) for the most part agreed that the introduction of new technologies will replace their employees in the future. 40.7% of the companies surveyed responded that they agreed with the statement, while 11.4% agreed with the statement

completely. 31.7% of the companies surveyed were undecided, while 13.8% of the companies did not agree with the claim, and 2.4% did not agree at all. The average assessment of responses and the standard deviation is shown in Table 1.

**Table 1.** Descriptive statistics for agreeing with the assertion “In the future, the introduction of new technologies will replace some of your employees”.

	N	Mean	Std. deviation
In the future, the introduction of new technologies will replace some of your employees.	123	3.45	0.954

Table 2 presents the responses from the companies surveyed to questions about monitoring new technologies and the acquisition of appropriate personnel. It is clear that the majority of companies surveyed are inquiring about the accessibility and development of new technologies, while half of the companies surveyed have difficulty in obtaining the appropriate staff for managing new technologies.

**Table 2.** Respondents’ responses regarding company inquiries about new technologies on the market and acquisition of appropriate personnel

	N	Yes	No
Do you inquire about the availability and development of new technologies on the market?	123	83.7%	16.3%
Is it difficult to acquire personnel with the appropriate knowledge to manage new technologies due to these technologies?	124	50%	50%

Table 3 presents answers to the question: “Evaluate the extent of advantages from the listed consequences of introducing new technologies and machines.” Companies rated that the highest advantage, as a result of technology and machines, on a scale of 1 (very small advantage) to 5 (very big advantage) was greater accuracy ( $M= 4.08$ ), higher productivity ( $M= 3.90$ ) and unchanged quality of work ( $M= 3.74$ ), while the smallest advantage is that there is no need for a personnel department ( $M= 2.45$ ) and that machines do not need benefits and rights ( $M= 2.60$ ). On average, the companies surveyed rated the majority of the advantages as big.

**Table 3.** Descriptive statistics on the benefits of the consequences of the introduction of new technologies

	N	Min.	Max	Mean	Std. Deviation
Higher productivity	123	2	5	3.90	0.706
Lower cost of work	123	1	5	3.63	0.900

Less absenteeism	122	1	5	3.72	0.816
Greater accuracy	121	2	5	4.08	0.759
Unchanged quality of work	122	1	5	3.74	0.861
Machines do not need any benefits or rights	123	1	5	2.60	0.956
Machines do not need education	124	1	5	2.84	1.092
There is no need for human resources department	124	1	5	2.45	1.054

Table 4 presents answers to the question: “Evaluate how much the listed factors inhibit the introduction of new technologies and machines when replacing a person at workplace”. Companies assessed on the scale from 1 (not inhibited at all) to 5 (highly inhibited) how strongly these factors inhibited the introduction of technologies or machines into workplaces, and consequently the replacement of workers. The companies estimated as the greatest inhibition the cost of technology acquisition ( $M= 3.58$ ), the cost of introducing technology ( $M= 3.54$ ) and the lack of knowledge of technology ( $M= 3.47$ ); they were least inhibited by legislation ( $M= 2.70$ ) and moral restraint ( $M= 2.74$ ). According to the companies surveyed, none of the factors stood out as very inhibiting.

**Table 4.** Descriptive statistics on factors that inhibit the introduction of new technologies

	N	Min.	Max	Mean	Std. Deviation
Legislation	122	1	5	2.70	0.985
Cost of technology acquisition	124	1	5	3.58	0.903
Cost of introducing technology	122	1	5	3.54	0.919
Cost of maintenance and use of technology	123	1	5	3.29	0.885
Obtaining the right staff	123	1	5	3.13	0.905
Not knowing the technology	120	1	5	3.47	0.907
Lack of technology on the market	120	1	5	3.03	0.995
Moral constraints*	122	1	5	2.74	1.011
Underperformance	121	1	5	2.85	1.005

\* replacement of a person with a machine, environmental protection,...

Table 5 presents the answers to the question: “Evaluate how these actions would affect the labour market in case new technologies and machines would replace the majority of the employees.” Companies assessed on the scale from 1 (very negative) to 5 (very positive) the impact of these measures on the labour market in the event that new technology and machines would replace most of the employees. They estimated as the most positive measure

the “employment legislation more favourable to companies” ( $M= 3.64$ ), while the lowest score was given to the reduction of the minimum wage ( $M= 2.42$ ).

**Table 5.** Descriptive statistics on the impact of labour market measures if new technologies and machines would replace the majority of the employees

	N	Min.	Max	Mean	Std. Deviation
Increase in income tax	121	2	5	2.64	0.885
Increasing labour rights (higher wages, shorter working hours, greater power of trade unions, etc.)	122	1	5	3.22	0.858
Employment legislation that favours businesses	120	1	5	3.64	0.765
Introduction of universal basic income	119	1	5	3.06	0.806
Reducing the minimum wage	120	1	5	2.42	0.958

## 4 DISCUSSION

We have found that most companies agree that the introduction of new technologies will replace some of their employees in the future. The result is not surprising, as 83.7% of the companies surveyed are inquiring about the accessibility and development of new technologies. Therefore, businesses can reasonably expect that many jobs will be left to robots. Considering the fact that as many as 50% of companies surveyed already have difficulty finding the right staff for working with new technologies, we propose immediate action. According to the results, it can be assumed that the companies are not able to find the relevant personnel even in the external labour market. Therefore, we propose a more detailed analysis of the existing staff in companies, in order to identify potential personnel that would be adequately trained to work with new technology. It is also necessary to think more transparently and, if necessary, to adapt or change training programs or study. We believe that in the future it will definitely be necessary to think about new professions, as new technology will completely replace many existing ones. Frey and Osborne (2013) regard the following as the most endangered jobs in the next two decades: telemarketing, accountants, retailers, real estate agents, commercial pilots, economists. The least endangered are dentists, therapists and firemen.

We found that the companies surveyed regard greater accuracy as the greatest advantage of the introduction of new technologies ( $M= 4.08$ ). This is not surprising, as the advantages of new technologies in terms of precision are high. Thus, a robot that, for example, carries out surgery more precisely than a human, has no concentration problems and does not need training and practice. Kelly (2012) states that they have created a robot that can perform multiple tasks. He goes on to say that some jobs could not even be performed without robots, for example, search for cancer cells, fast computing, space exploration.

The companies regard higher productivity as the second biggest advantage of the introduction of new technologies ( $M= 3.90$ ). However, Rifkin (2004) points out that due to the desire to increase productivity, new technology and the ever-faster work pace bring with them stress. The International Labour Organization (in Rifkin, 2004) states that in the 20th

century stress became one of the greatest health problems. Already Marx (1867) predicted that machines dictate the pace of production and force the worker to the edge of his/her biological abilities. Machine takes away the joy of production from a worker, while at the same time leading to the monotony of work. In the EU, every fourth worker suffers from stress at work. It should be noted that stress is not only a consequence of technology but a consequence of dissatisfaction with working conditions, also due to “coercion” intended to maximize productivity. Also interesting is the Doctorow’s (in Wohlsen, 2014) pondering about increased productivity. He suggests that the benefit of increased productivity should be distributed among all, otherwise we will get to a point where there will not be enough people to buy everything that robots produce. He continues with the proposal for a peaceful abolition of private property, as robots could practically free us from work.

The companies surveyed estimated as the biggest factor that inhibited the introduction of new technologies and machines the cost of technology acquisition ( $M= 3.58$ ), the cost of introducing technology ( $M= 3.54$ ) and the lack of knowledge of technology ( $M= 3.48$ ). They were least inhibited by legislation ( $M= 2.70$ ) and moral restraint ( $M= 2.74$ ). According to the companies surveyed, none of the factors stand out as very inhibiting. The cost of procurement and implementation of new technologies is currently too high for companies, which is confirmed by the rating of the undersized efficiency factor ( $M= 2.85$ ). Inaccessibility of technology on the market has been estimated by companies with  $M= 3.03$ , which can be attributed to globalization as today we can acquire products, final products, and production machines from around the world.

In the survey, we were also interested in how companies assessed the impact of individual measures if new technologies and machines would replace most employees. The survey showed that the companies surveyed estimated the introduction of the universal basic income (UBI) as neither a positive nor a negative measure ( $M= 3.06$ ). We believe that the right to adequate guaranteed minimum income for each citizen should be thoroughly discussed in the future, especially if the ownership of the means of production does not change. This is namely one of the few options that would provide citizens with survival, but also the purchasing power for purchasing products, however this is also not enough due to the surplus value crisis which is being accelerated by increased productivity. Rifkin (2004) states that the benefits of increased productivity should be shared among all members of society as fewer workers will be needed and, therefore, considers it sensible to introduce a universal basic income in return for carrying out a community service that would benefit the entire society. We believe that the introduction of the UBI should not be based on volunteering, as in this case it would represent performance of work in return for unfair pay and unfair competition to the employees. The meaning of the UBI is that of social security and survival, therefore we regard the UBI as a substitute for all social contributions which should be high enough to enable people to survive.

As the most positive measure on the labour market in the event that technology would replace the majority of employees, the companies estimated a more favourable employment legislation for the companies ( $M= 3.64$ ). Brynjolfsson and McAfee (2011) also call for the loosening of legislation for recruitment and dismissal, reduction in the tax on labour and tax relief for the employment of human workforce, as well as the reduction of social contributions. All of the above could be qualified as more favourable employment legislation. We

also need to consider the negative consequences of these measures on workers, the state and society.

## 5 CONCLUSION

The paper deals with technological changes and work in the future. We have found that new technology brings advantages for companies, but on the other hand it is associated with many problems in the labour market, for example, with increasing technological unemployment, overproduction of products and globalization.

It is almost impossible to stop technological development, therefore we believe that we will continue to face similar problems in the future. Although undoubtedly the technology also has positive effects, there is a danger that this development will come to the point of technological singularity and the appearance of artificial intelligence. This, however, does not only threaten the jobs that people know but also the very existence of mankind. We consider that in terms of terminology and understanding in the field of artificial intelligence the general public is not sufficiently informed about this issue, nor about the consequences that this development could have. Therefore, we believe that in the future we need to pay more attention to this problem.

We also discussed technological unemployment and the replacement of workers with technology, which is not a new phenomenon as people are facing it since the first machine was introduced. Throughout history, however, this trend is constantly increasing, therefore we should not ignore the fact that technology can destroy more jobs than it produces. Businesses usually have no reservations about replacing workers with machines and are not restricted in doing so if this is economically justified. One of the consequences of technological development is also globalization. On the one hand, this phenomenon has increased the market as we can obtain raw materials which are lacking in our region from the other end of the world. On the other hand, there is a problem of moving production to countries where the labour force is cheaper, thus increasing the unemployment in the home country.

We believe that large systemic changes are needed to solve the problems brought about by new technologies. New technology should not only become a tool in terms of increasing productivity, but should enable better interaction, reduce employee burden and positively affect the wellbeing of employees at the workplace. Therefore, it is necessary to discuss the mentioned problems that new technologies bring as widely as possible and to eliminate them in the shortest possible time.

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