

# Challenges of Human Resources Management with implementation of Industry 4.0

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## ABSTRACT

Fourth industrial (r)evolution demands radical changes in business model in various types of companies. Apart from physical investments and improvement of current physical machinery, new working environment demands changes in human resources management. Higher level of human knowledge will be essential. It lies in new technologies, mathematical models and innovative approaches to problem solving and decision-making process. The current educational system and professions aren't appropriate to adjust in the way needed for the new requirements of fourth industrial (r)evolution.

This paper deals with most demanding part of transformation within the company - change of the human labor. Possible new types of human professions will be presented with the solution to avoid or at least minimize resistance to change. Current staff has to be educated so that nobody feels endangered for the current job position. The biggest resistance to change is expected to happen within the elderly part of working force. The challenges of adaption to new working environment, communication with robots and position of the human role within the system will be explored. Also, the changes in organizational system will be noticed with needed steps to be taken in educational system in order to minimize negative effects of transition period, but also to build sustainable educational system for the future.

Keywords: Industry 4.0, Human Resources Management, Artificial Intelligence, Cyber Physical Systems

## INTRODUCTION

Industry 4.0 has become general trend at market ever since it was introduced [1]. Even today it has stayed at the peak position as main goal of the world's industry [2]. It is cause of many discussions, both constructive and deconstructive but the conclusion can be made that the change of some kind is very needed [3]. With development of hardware, software and human knowledge, but also with decrease of hardware price, changes by the rules of fourth industrial (r)evolution are more than obvious to happen [4]. This paper is part of the research project in which readiness of the companies for Industry 4.0 is being studied and calculated.

Apart from the physical readiness, the human has also be prepared for the change, so approach to human professions and behavior in the Industry 4.0 environment, but especially in the transitional era will be studied. In the first phase, state-of-art in the field of human resources in Industry 4.0 will be presented with the intentions and steps of the future research.

Initiators are human – no matter is it about making investment plans of overall change of business environment, they are the key factor in initiation of change [5]. That is why efficacy of the transition depends only on them. Of course, the first one to demand change has to be top management, but in order to finish the transition and make sure that the system is sustainable, every human worker within the company has to be included in process and believe in the positive effects of it [6]. The resistance to change is omnipresent and as the main obstacle somehow it must be avoided [7]. Human resources management must adapt to new challenges, like change of professions as we know them today. Human role within the company changes and transition can only be done successfully with proper education [8]. Apart from education of current workers, new educational system must be formed also in middle schools and universities.

## DECENTRALIZATION AND STANDARDIZATION

Current production systems usually aren't completely monitored at single, centralized place. Most of the companies have overall information about system and its parts in whole organization, but detailed information isn't yet available. This disables the possibility to have complete overlook at the processes that are going on within the organization [9]. No matter is it about logistic activities in manufacturing sector or administrative sector or overlook to processes and technology happening in the manufacturing, with digitalization, as essential part of Industry 4.0, the detailed overview of every process and sub process, every hardware and software with its usage and activities has to be controlled and has to be available at a single place [10]. This isn't centralized spot, but rather decentralized spot where multiple users are enabled to get information about every part of the process, organization and every other activity going on in the company [11]. Centralized should be the place where the input of the information from the customer should happen, which would then be transferred to other, decentralized parts where everyone should have insight in events at other parts of the system and the use of the information gathered and transferred.

Overall control of the system makes human role more complex, because human must process more important information in the real time [12]. Human also has to make right decisions from it, which means that traditional approach to work assignments won't be needed in the near future. Manual work and simple activities tend to be automatized, simplified so the human isn't needed anymore in that part of working sphere. But human remains very needed in the field of decision-making, control and R&D sector [13]. That is why human worker must take a step away from the physical process, to take place above single parts of the general system. New skills are needed, different way of thinking and more complex tasks must be solved [14]. Long-term plans aren't trend, short-term plans are needed to be defined more often, but also new ideas have to be created every day [15].

This will be a cause of resistance from current workers who must adapt to new working environment and to leave current working habits. Approach to education is very important in this case, the focus should be to enrichen the intrinsic motivation of the worker [16]. In transition process human must feel safe, without fear of losing his working position, but at the same time human has to be sure that new knowledge will have more benefit for in the near future. The knowledge gathered has to be used to increase the motivation of worker who has to feel self-confident and pleased with the current situation but also inspired for the future improvements.

## DECISION-MAKING

Decision making in the traditional working environment is centralized, usually done by the general management [17]. Due of higher amount of real-time information and many inquiries which have to be solved in as shorter time as possible, decision-making process has to go through radical change [18].

First change is decentralization. With data and information gathering from various parts of company, centralized decision-making becomes more complicated, but also useless. Decentralized decision-making enables optimization of the current processes and rapid answer to system demands [19]. No matter is this about customer demands, manufacturing technology or plan demands, decision has to be made as quickly and as accurate as possible. The data collected from the parts of the system is complex and criteria for every smaller subsystem have to be defined in order to make appropriate decision [20]. Special attention should be put on the smaller decisions that have been made with the amount of the information which were processed to avoid possibility of sub-optimum result. This is human work, which follows the story of increase of complexity of human tasks. After the criteria are formed, Industry 4.0 demands accurate data interpretation [21]. That is why decision support systems have to be use on everyday basis [22]. They have to be implemented in the system, so the decision can be made quickly and accurately. Decision support systems (DSS) should be very user-friendly so they simplify very complex task given to the human. Type of DSS has to be defined by the part of the system they are intended.

## LEARNING FACTORIES AS THE FUTURE OF EDUCATION

Decentralized decision making and every other task in the new working sphere requires more knowledge and new skills from the worker [23]. Conventional educational system doesn't fulfill requirements of the knowledge and skills level needed for the factories of the future. It provides more theoretical other than practical knowledge [24]. This is why most of the students, once they leave the educational institution, need certain time to adjust to working environment. Some companies provide a half to a yearlong educational period for the beginners. Since they require

special skills, this period is very important for getting to know how to function within their system. This gains extra cost – for educational organization, to define educational plan and to pay the beginners who won't be part of the working system until they pass the educational period. This also brings formal education in question – what was the point of the mass of theoretical knowledge people are getting at educational institutions when they will get proper and practical knowledge required for the job afterwards?

Radical changes in educational system are needed. The changes must be done in every aspect of educational system, most radically even in the beginning stage of human education. Emphasis should be made on the practical use of theoretical knowledge presented, creation of innovative and opened for changed mindset. This way of thinking is most important within Industry 4.0. First and foremost because worker has to be ready for constant changes of the procedures, of the working environment with the need of constant improvement [25]. Another thing is the life-long learning with which most human aren't familiar with. With constant changes, new ideas, trends on the market, in the field of technology, hardware and software; human has to be ready to adapt to new situations and gather new skills in every part of their career [26].

Focus on practical knowledge as the part of the educational system has already been solved with learning factories [27]. They are situated within the universities, research or educational institutes.

With simulation (both in software and physical way) of the manufacturing and organizational system person is been placed in the logical, everyday situations that are possible to happen within the company. They learn to react and make proper decisions by the requirements of the Industry 4.0 philosophy [28]. The lean (kaizen) skills are also to be learned, the lean way of thinking becomes „normal“ everyday activity to the user so the continuous improvement and constant change isn't a strange thing to them [29].

There are several examples of learning factories in the Europe, but also in the rest of the world. They are equipped with high-tech hardware and software, but also with knowledge that represents the real system built by the terms of Industry 4.0 [30]. There are various types of learning factories, each has another field of industrial management (engineering) as main goal. One of the first learning factories has been implemented in Darmstadt 2007 [31]. The accent was put on machining technologies, its research, development and education about its functionalities. Fraunhofer has implemented E3-Research (learning) Factory in Chemnitz is concentrated on

renewable energy resources and its use within the organization. Fraunhofer has also offered a Project Center to simplify cyber-physical systems within the Industry 4.0 [32]. LeanLab is part of The Institute of Innovation and Industrial Management in Graz, opened in 2014. The main activities are student education, company trainings and research in the field of industrial engineering. With hardware and software modularity, it is possible to recreate various situations from the reality and learn the users how to react in certain situations. The improvement and productivity of users is being monitored via Key Performance Indicators (KPI). Their main goal is to make transition from the lean learning factory to Industry 4.0 learning factory – recreation of Cyber Physical Systems (CPS), as this has been recognized as the main trend on the market [33].

The aim is to make learning factories flexible, very adaptive to changes so every trend and need from outside requests can be fulfilled. Besides the hardware and software, new professions are being created but also this can be used as research and experiment fields for actual companies whose R&D department isn't able to do such experiments within the company.

## HUMAN-ROBOT, ROBOT-ROBOT AND HUMAN-HUMAN INTERACTION

Many workers are concerned that robots will take over their work places because of which they could lose their job [34]. The reality is that human labor, manual work, that can be replaced with robots will be replaced, but people will not become useless, they are the ones who have to know how to interact with robots, control and optimize their work but also to discover the new fields and situations for their use in order to create best possible results. The interaction between human and robot to some might be unpleasant at first. The solution is in proper education. Getting to know how the robot works, their possibilities, tasks, requirements, limitations, advantages and position in the system is very important. Especially within the older workers who aren't as familiar with hi-tech hardware as younger workers are [35].

Worker has to be able to communicate with robots via special mobile devices, to plan and to predict the required behavior. That is enabled by special software and knowledge databases, specially made for a single company [36].

The communication with other employees is done via special social networks which are not only productively functional, but also give another, social aspect to the company. More people are connected, better social relationships can be formed, which can have positive effect on intrinsic motivation of the worker. Once happy with current workplace, motivated and socially satisfied worker won't feel useless and replaced by the machines in the highly automatized environment [37].

By the Industry 4.0 concept, the robot-robot interaction becomes very important. Via general software system, robots should be able to analyze current situation in the manufacturing process, make decisions independently, but also to plan the resources, or at least warn the human workers/controllers with the suggestion of the needed requirements. The robot-robot communication would enable the automatization of process planning within the company, but also the automatization of some logistic and planning activities [38]. With automatized process planning, manufacturing technologies for the product would be created with use of artificial intelligence, but the role of human in the process remains essential – they somehow have to control the system to make sure that the automatization of the work processes doesn't do more harm than benefit.

## SUSTAINABILITY OF THE EDUCATIONAL CONCEPT

Just like in the hardware and software, companies will at the very beginning of the implementation of Industry 4.0 concept within the company floor have to invest higher amount of money, which many may find too challenging and even avoid some optimized solutions given [39]. The proper and continuous education of the staff is most important step in implementing Industry 4.0. Also, change of the general educational system will result in generating the new professions, young, motivated people that will be able to cope with demanding working environment once they enter the job market. Therefore, no more extra education for the single company won't be needed, but also new mindset will enable to create increasing results in the future.

The acceptance of life-long learning is essential and has to be implemented inside every company. This kind of system also has to be sustainable and also part of the continuous improvement process. Not only the workers should be educated about new trends and innovations continuously, but also the teachers have to be the ones to gather advanced educational methods, so the new knowledge can be received and transferred as easily and efficiently as possible [40].

The sustainability of the overall system lies in the synergy of every person involved in it. Fourth industrial (r)evolution might seem as current trend that demands radical changes, but so far, the predictions for more distant future are going in the same way as current trend, but only with its upgraded variations. That is why new knowledge and new innovations should be received and implemented every day, so the radical changes won't be part of the company's future anymore. The changes will be easier to implement but also will require lower investments. Since the knowledge is the key for leading position at the market, collaboration between educators and working staff is very important, as well as their constant improvement in their respected fields [41].

## CONCLUSION AND FUTURE WORK

Human resources are the most important part of every company. With transformation by the rules of 4th Industrial (r)evolution (commercialized title Industry 4.0 in Germany and the rest of the Europe), human is more important than ever. Most of the public has an opinion that complete automatization of manufacturing process and other organizational tasks within the company might result in losing the jobs, but the reality is complete opposite. Jobs won't be lost but they will go through certain transformations which must be accepted. Resistance to change is the biggest obstacle within the company floor and, besides financial investments, it might slow or break the transformation process. New working positions will demand more complex tasks, while manual work will be completely automatized and simplified. Human takes the control of the process and improves it with knowledge available. Know-how will be the key factor of success at the market. Decision making will be decentralized with vertical and horizontal integration within the organizational system. Human must learn how to work, but also how to communicate in new working environment. The human-human, human-robot and robot-human relationships will be



normal everyday activity, but with overall automatization and „robotification“ of the process, human must feel safe and motivated. That will result in the new and innovative ideas, possibility of continuous improvement creates greater value. With great importance of educational system, not only within the company but also in the general educational system, expenses for extra education will be reduced and new professions are ready to face every challenge in the Industry 4.0 working environment.

For the future research, it is very important to see how the productivity of the worker could be measured. The productivity is important for the some sort of control, but also to optimize the process and increase the level of motivation which will have positive result in the near, but also in the distant future of the company. Also, the innovations within the company floor, as the main source of development, but also of the workers' motivation, their importance and management is another very interesting and important field of future research.

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