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Title: Skills Behind the Robotics : How to Re-educate Workers for the Future

Year: 2020

Version: Accepted version (Final draft)

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Please cite the original version:

Nygren, H., Nissinen, K., Rautopuro, J., Mäkitalo, K., & Ullakko, K. (2020). Skills Behind the Robotics : How to Re-educate Workers for the Future. In M. Moro, D. Alimisis, & L. Iocchi (Eds.), *Edurobotics 2018 : Educational Robotics in the Context of the Maker Movement* (pp. 197-200). Springer. *Advances in Intelligent Systems and Computing*, 946. https://doi.org/10.1007/978-3-030-18141-3_16

Skills behind the Robotics – How to Re-Educate Workers for the Future

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Abstract. The aim of this study is to respond to the educational needs of the future, considering automation and robotics. It is inevitable that automation and robotics are changing our lives and they create challenges for the future work life and education. In this study, we investigate what is the educational background of the unemployed people who are in danger of being replaced by automation and what is their educational resilience for adapting work life changes. The data of this study consist of the latest PIAAC data (The Programme for the International Assessment of Adult Competencies). Based on the research we develop a model for re-educating the people who have lost their jobs.

Keywords: robotics, 21st century skills, educational resilience, work life, adult education

1 Are robots replacing the human workforce?

Technology, automation, and robotics have already taken the place in our society. According to OECD Employment Outlook (2017) [1], the use of technology in the workplace has increased dramatically and the human workforce is replaced by the robots. The potential jobs that are at high risk of automation are transportation and storage, manufacturing, construction, administrative and support service [17].

There is a growing belief that technology innovations cause a reduction in work [2]. This means that automation and digitalisation create challenges for the work life and educational systems. It is undisputed that automation increases unemployment but it also creates new jobs and new professions [3]. Previous research opens up the effect of automation and digitalisation on employment. According to the OECD-report [1], automation will not “destroy a large number of jobs” though it is noted that low educated workers are those who will most likely suffer from the appearance of automation. “Therefore, the likely challenge for the future lies in coping with rising inequality and ensuring sufficient (re-)training especially for low qualified workers.” [4].

On the other hand, there is a lot of potential in automation, digitalisation, and robotics. In the medicine, the robotics makes diagnosing faster, easier, more reliable

and the operations safer [5]. In the dairy production, the health state of cows and the quality of milk can be effectively detected [6] which is safer for consumers, too. Manufacturing different items becomes easier and heavy, dangerous work executed by robots. These actions cause the reduction in work [2].

Gardner [9] compares the skills of the 20th and the 21st century and notes that the human of the 21st century has to achieve skills for using very sophisticated communication and information technologies (ICT). In general, 21st century skills include collaboration, digital literacy, citizenship, problem solving, critical thinking, creativity and productivity [10]. According to OECD [8], the 21st century skills are career and life skills, learning and innovation skills and information, media and technology skills. Strategic learning skills belong to the key skills in the 21st century due to lifelong learning, which is a necessity in working life, for individuals and organisations [11]. Further, people should possess a positive attitude and willingness to educate themselves for lifelong and width in the rapidly changing society. The idea of lifelong learning [11] also can be connected to educational resiliency, which has been used to refer to good, stable, and consistent adaption under challenging conditions [12]. Educational or academic resilience is referred to an indicator of school adjustment and a strong predictor of class participation and study motivation [13].

According to an OECD report [7], the fears of mass technological unemployment are exaggerated and they further note that there are large differences among the countries. The influence of automation is not the same everywhere and the main factor, which has the greatest equalising impact, is the skills and competencies of people. OECD [8] has published a research on the adult skills. According to report, adults who were highly proficient in the skills measured by the survey are likely to be able to make the most of the opportunities created by the technological and structural changes modern societies are going through. Still, the question is – how should we educate adults who have no previous experience of robotics.

2 Executing the study

The aim of this research is to respond to the educational needs in the continuously and rapidly changing work-life to re-educate people to work with technology, automation, and robotics. This study is executed through mining the latest PIAAC (Programme for the International Assessment of Adult Competencies) data, which is perhaps the most far-reaching survey of adult skills. 40 countries were involved in this assessment. The measured skills are the key cognitive and workplace skills needed for individuals to participate in society and for economies to prosper. PIAAC measured adults' proficiency in literacy, numeracy, and problem solving in technology-rich environments (TRE) and gathered information and data on how adults use their skills at home, at work and in the wider community [14]. "Problem solving in technology-rich environments involves using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks. The first PIAAC problem solving survey will focus on the abilities to

solve problems for personal, work and civic purposes by setting up appropriate goals and plans, accessing and making use of information through computers and computer networks” [15].

Altogether 5 464 adults (age 16–65 years) participated in the PIAAC 2011 research in Finland. The final participation rate was 66%. The research consisted of an interview dealing with respondents’ background and assignments of cognitive skills. All the participants did the assignments independently mainly by using computers. This study focuses on the group of participants (N=3783) who are in the labor market (full time or part time employed and unemployed). Those working at home (for example maternity leave), the students and the retired were left out of the analysis.

The target of this study is to get more information about the educational and working life backgrounds, the skills and the educational resilience of those adults, who had difficulties with problem solving in the technology-rich environment. In this study we investigate:

1. What are the skills in problem solving in technology-rich environments of the people challenged by automation?
2. What is their educational resilience for adapting work-life change?

3 Results and Discussion

- Group (N=3783) was divided in those who were not at big risk (n=2802) and in those who were at big risk (n=981) with their problem solving skills in technology-rich environments (TRE). Key background characteristics of these two groups were explored and compared.
- We compared these groups and the primary results indicate that every tenth Finn who is on the labor market is at big risk and their skills in TRE are poor.
- In the group with poor skills, the share of unemployed people was 15,3%, while the respective rate was 7,1% in the group with sufficient skills.
- 76,2% of those who had poor skills were low educated (primary school or less, lower secondary, upper secondary). 60,6% of people with the good skills had tertiary education
- Individuals with poor skills were mostly working with manufacturing and construction (35,6%), trade and services (28,0%) and health and social (15,7%)
- Age distribution reveals that people with poor skills are mostly 55-65 years old (44,9%) and 35-44 years old (30,2%).
- Every tenth person (10,8%) with poor TRE skills is non-native Finnish speaker.

Based on the primary results, we suggest that the group with poor skills should be more studied to find the right forms for educating them with problem solving skills in TRE. When designing the training, we should also pay attention to non-native speakers. Training for problem solving in TRE skills can bring educational equality and give people the more competence for the world of work but also for their personal lives.

There is an increasing demand for internet skills [16]. As for resilience, we need to reach people from the group of poor problem solving skills in the technology environment. Through the case study, we could get more information about the people who have defeated the challenges in this rapidly changing world of work.

Acknowledgements. This study is part of “Manufacturing 4.0 – strategies for technological, economic, educational, and social policy adoption” –project, which is funded by the Strategic Research Council (STN) of the Academy of Finland.

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