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BUILDING BRIDGES BETWEEN UNIVERSITIES OF APPLIED SCIENCES AND THE JOB MARKET – ARTIFICIAL INTELLIGENCE BOOSTING HIGHER EDUCATION

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Abstract

Finland, the country famed for its education, aims to strengthen the transmission of knowledge and research based on open science to the world of work through lifelong learning, thereby contributing to the development of Finland´s economy and society. A substantial number of people are in need of further education and willing to upgrade their skills. According to survey made by STTK (2018), up to 87% of the working population is willing to take part in retraining. As many as 56% of the working population state a need for further training so as to maintain or develop their skills in the near future. About 36% of the workforce is considering a change in career and have a new profession.

The Ministry of the Education and Culture has recently renewed the funding model for Finnish universities and higher education institutions. In the funding model, the share of continuing education is rising as from 1 January 2021 up to 9% (currently 5%) for universities of applied sciences and up to 5% for universities (currently 2%). Continuous learning will include the credits for preparatory training for immigrants in open higher education, specialization courses, separate studies and polytechnics.

This paper aims to describe a development project between five Universities of Applied Sciences and the world of work as a response to the new situation. We have co-created a common artificial intelligence powered digital environment which is conceived as an ecosystem - a matching tool consisting of our study offering (courses, modules etc.) and the need for skills and labor in the world of work. In the system, people who would like to upgrade their own skills and knowledge have an option of taking studies from the five Finnish universities of applied sciences: Haaga-Helia, HAMK, Laurea, Metropolia, and XAMK. The "artificial intelligence in continuing education" (AICE) ecosystem gives these people a head start in their studies and efficiently helps to fill the skills gaps through lifelong learning.

The AICE ecosystem focuses more on learning rather than administration. The purpose of AICE has been to improve the match of the skills needed in the world of work and our training offering quickly and easily. The AICE model has shown that it is possible to integrate artificial intelligence to continuing education successfully.

This paper discusses ways of utilizing artificial intelligence to identify the skills needed in the world of work and meeting those needs in higher education institutions, using a digital learning ecosystem. In this paper, we will present a concrete model of AICE. This model is fast, ecological, economical, reachable, and student-centered. The initial findings of the project are promising, but there we are facing challenges in getting artificial intelligence and study offerings linguistically compatible (descriptions and contents of studies).

In the future, we aim to make the AICE available for all those who need to upgrade their skills or retrain.
We conclude that there are different ways to employ continuous learning, intensify studies between levels of different degrees, and to highlight the learning opportunities using artificial intelligence, such as the common digital matching ecosystem AICE.

Keywords: E-learning, higher education, work, study path, technology

1 INTRODUCTION

The transformation taking place in the occupational landscape, I.e. the world of work, was named as Finland's biggest challenge in 2017, when the Prime Minister's Office published the first part of a series of reports related to the future of work (Oksanen, 2017). The trends that relate to changes in the world of work are global while, of course, countries may develop at a different pace. In Finland, almost all jobs facing skills shortages are in occupations requiring high skills (OECD, 2018). This, in turn, relates to the fact that Finland has a highly advanced technology industry and services that link to global value chains.

The forces driving the transformation relate to technology – more specifically – to rapidly evolving digital technologies. The innovations that are borne out of this development are exponential, digital, and combinatory in nature (Brynjolfsson & McAfee, 2016). Innovations will follow each other at an increasing pace, more affordable than ever, and each innovation contains seeds for new ones.

This development leads to a substantial number of people in need of reskilling or upskilling. Finland acknowledges the rapid changes taking place in the world of work. Hence, it has set a bold goal of being the country with the most skilled labor force (Ministry of Education and Culture, 2019). According to the vision laid out by the ministry, this means raising the level of overall intellectual capital by increasing the share of people with a higher education degree and by providing quality reskilling and upskilling offering that is constantly updated according to changing needs. At the same time, Finland has set out to develop educational offering and guidance services that respond to people's varying needs flexibly.

According to a recent survey (n = 1086), 84% of the working population in Finland have upgraded their skills during their careers (Taloustutkimus, 2019). Yet, more is needed. By a popular estimate, approximately one million people, half of the working population, will need new skills. Asked if they would be willing to learn a new profession if faced with long-term unemployment, 87% of the survey respondents answered "yes" or "yes, with certain reserve".

Finnish higher education institutions have strong traditions in developing further education solutions for businesses and the society overall. Some universities have created separate companies for the purpose operating on market terms. The educational system continues to have an important role in providing basic and learning skills. All-round education, learning and involvement in the society remain important tools in preventing inequality and social exclusion. Overall, they are also important components of a meaningful life.

According to a vision produced by the Finnish Innovation Fund Sitra (2019), future learning will be produced in a novel combination and collaboration between the educational system, employers, and unofficial networks. This is seen as a continuous learning reform that requires new types of activity of all the participants involved. It also means that the funding of continuous learning needs rethinking. When asked who should bear the burden of expenses, most respondents of the Taloustutkimus survey (2019) saw it as the responsibility of either employers or the societies. Regardless of who pays, there seems to be consensus on a model where money would follow the learner in some way or another.

As regards continuous learning, the role of higher education institutions has become clearer. The Ministry of Education and Culture is taking the continuous learning reform forward, and the changing legislation is bringing a new fourth task to universities and universities of applied sciences: continuous learning. Degrees continue to be important but designing continuous learning as part of universities' activities requires more flexibility and options.

As educators, we acknowledge the difference in clock speeds between the world of work and the world of higher education. Often, we have failed to meet the training needs of companies quickly enough. We have recognized the possibilities of modularizing degrees and using these parts in continuous learning offering.

However, building an entity that considers companies' operational environments and skills needs on the one hand, and individuals' development needs on the other hand is not a trivial exercise. It is also clear that higher education institutions, and indeed, the whole educational system must assess the skills development needs of the entire working population. This means we cannot ignore the unemployed or those who face imminent unemployment.

This paper aims to shed light on a project that is about to create a model/system (powered by AI) whereby people seeking new skills or career changes could make informed decisions about skills to acquire based on skills employers are looking for in their job advertisements. The system would not only point out skills in demand, but it would also indicate where people might find training and education that provides the needed skills.

2 ASSESSMENT OF THE DEVELOPMENT PROJECT

This section describes how we plan to use artificial intelligence to implement coding education at five universities of applied sciences. Coding is a competence that is in high demand in Finland. We acknowledge that it is a wide term and encompasses many specific skills. With the AICE model, we aim to offer personalised learning that is a match between the needs of learners and those of the labor market.

The planned coding education implementation model uses artificial intelligence in two ways: 1) in analysing the demand for and supply of talent/skills, and 2) in matching the learning offering to the needs of the job market and the learner.

The implementation model includes the following components/phases: First, the participant's existing competences and their identification. This phase involves both face-to-face and automated assessment. Second, an online platform that assesses the skills needs based on job market needs and the existing competences of the participant to produce a tailored learning plan. The third component is the learning offering which, in our first project, involves offering related to software engineering/coding and related topics. Finally, we also plan to provide continuous guidance for the learners. In the process, we produce a personalized competence-based learning map with a platform powered by artificial intelligence. The aim is, thus, to complete a competence profile, which evaluates the starting level and identifies the learner's current skills and competences as comprehensively as possible. The model then uses AI to reflect the individual's skills against the regional needs of the labor market. The last step involves combining the learning offering of each of the five universities of applied sciences for the participant to choose.

We will use AI to analyze the demand for education/learning and skills. In our first project, we plan to use AI to identify the coding skills needed based on job market data and compare them with the offerings of the universities of applied sciences. Analyzing the data will help us identify possible gaps between the job market skills in demand and the supply of higher education institutions. We will also use the information obtained to develop new courses and study modules that meet the demands of the job market.

We also plan to use AI in helping the learner choose appropriate courses. Once the learner has completed the competence profile, AI can compare the learner's skills with the regional needs of the job market. AI could then recognize any potential skills gaps between a person's existing skills and the job market competence needs. Based on those findings AI could suggest studies at different universities of applied sciences and thus guide the participant in choosing the right courses and study paths.

3 DESCRIPTION OF THE AI FUNCTIONALITY

The ecosystem AICE stands for "artificial intelligence in continuing education" - focused more on learning rather than administration. The purpose of AICE has been to improve the match of the skills needed in the world of work and our study offering. AI operates as a tool to make sense of the skills needed at work today. AI platform collects online job adverts from various sources continuously to gain understanding of the competences needed in workplaces today. The five universities operate partly in different geographical areas, which all have their own local features when it comes to demanded competencies. To display the educational offering of the five universities, AI platform also collects curricula with course descriptions of all five universities. AI compares these two data sets – job adverts and course descriptions - against each other to see which competences gained at universities are most relevant for the workplaces and which competences needed at workplaces are not present in current curricula. The amount of data in these two data sets is enormous and insurmountable for a human. AI builds visual maps for a competence gap analysis, which humans can apply in their decision-making (Ketamo et al., 2019).

4 THE EDUCATIONAL AND SOCIETAL FUNCTION OF THE AICE

In today's education and learning, one size does not fit all. Our students are nowadays more heterogeneous and come from different backgrounds. This means their needs in terms of studies and opportunities to study vary a lot. We see a rising demand for more tailored and personalized studies in the future.

For educational organizations, this introduces a need to develop new ways of teaching and learning. Institutions and organizations, who are involved in education, must cater for a wider audience: Companies and their employees, people wishing to change their jobs and embark on a new career, and people wanting to update their competencies to find new opportunities in the world of work. It may even be likely that people updating their skills and competencies will do it many times during their careers. This is why introducing models such as AICE is vital; we simply do not have enough hands to provide the services new learning needs require.

4.1 Transformation of the traditional concept of education to new career-oriented models

In the traditional concept of education, studies are usually teacher centred and in the new work -oriented models studies should be more student centred. Students are owners of their own learning, and teachers act as instructors and enablers of learning. It also means changing from small courses to competence-based curricula, which include work-orientation and phenomena from the world of work. Teachers have many new roles, too: Coach/director, co-producer of learning material, project leader or contact person to the world of work. It means changes in the whole learning architecture.

4.2 AICE and co-creation

Co-creation is one of the ways to introduce solutions for new competence needs from the world of work. It also means that we change our way of working from individual work towards communal ways of working. Businesses, the public sector and the third sector are important partners in the planning and implementation of our curricula. Work-based projects, for example, are an essential link between the enterprises and our students and teachers. It also means a diverse range of appropriate pedagogical solutions and practical arrangements. That is how we can generate and support knowledge-intensive business activities.

The five Finnish universities of applied sciences have promised to develop new modules, module parts and courses according to the needs of the world of work. We build modules like Lego bricks, which all fit together,

and those smaller module parts include different competence areas or skills. We have begun in the area of software engineering, or, more specifically, coding, which is one of the top skills sought after in Finland. We introduced the first modules in the spring of 2019, and hundreds of students, all with highly varying backgrounds, began their studies in August.

4.3 AICE and educational offering

Artificial intelligence in continuing education is a very good tool for offering the right studies at the right time to people according to their reskilling or upskilling needs. The five Finnish universities of applied sciences are also creating an artificial intelligence tutor, who/which could help students find and collect the right modules according to their motivation and interests. The tutor can make different suggestions and create alternative study paths. In essence, this is artificial intelligence career guidance as a support for professional growth. Employers also benefit from the solution: it will become easier to find the right, competent candidates for the jobs they have available in the areas where they have shortage of skills.

Soon artificial intelligence will find the actual competence needs of the companies, make beneficial study plans, and study paths for the students. Artificial intelligence will also help those five Finnish universities of applied sciences to develop the most suitable module supply. One challenging area in this project is to write and describe those competence areas in an identical way. In the end, modules and module parts are a good way to enhance lifelong learning. Especially, if those modules and module parts are also offered online.

5 CONCLUSIONS AND FUTURE PLANS

In the future, we aim to make the AICE available for all those who need to upgrade their skills or retrain. We conclude that there are different ways to employ continuous learning, intensify studies between levels of different degrees, and to empower highlight the possibility of higher educational studies learning opportunities using artificial intelligence, such as the common digital matching ecosystem AICE.

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