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Analysis of the reports "Standards for future competence education" and "Empirical research report on competences and professions of the future".

Purpose of the study:

- To assess the methodological correctness of the research performed
- To identify further possible research directions

The analysis comprised two stages:

- Review of the literature on the professions of the future
- Review of the reports provided

Introduction

The problem of the professions and competences of the future is important, but also very difficult to unravel. In the past, it has repeatedly proved that the predictions made were unreliable. Which was probably due to several reasons. The first, are the limited knowledge resources and their quality. The second, is the enormous dynamics of development in the industrial and service sphere. The third, is the lack of an appropriate methodology (e.g. the failure to take into account the various factors and processes that influence the development of individual business areas).

It also happens that the forecasts made are limited to a single country - without taking into account the optimisation decisions made by individual companies. The demand for specific professions is hugely influenced by the process of globalisation and outsourcing. For example, in recent years there has been a significant decline in the demand for accountants in the USA. This decline can largely be explained by offshoring and the use of working and automated cognitive processes (Pasewark, 2022).

Nevertheless, from time to time, publications appear which attempt to answer the question of what will be the professions of the future?

A review of the publications (on the basis of relevance and keywords) indicates that only some of the forecasts were fully successful. For example, it was forecast that there would be an increase in demand for, among other things, specialists in risk management. In the 1990s, the problem was often reduced to personal risks, workplace accidents, hazardous situations (Manuele, 2022). Several years later, the problem of risk management took on a completely new understanding. Risks became present in almost all normative management systems.

A relatively large number of publications deal with the professions of the future in the area of health care or social work, therapeutics. In many countries, there are increasing problems with behavioural health (mental health and substance use). These negatively affect the overall growth and development of children and adolescents. Meanwhile, there are perceived shortages of behavioural health professionals, clinical social workers social workers (Agaskar, 2022). There is also discussion about the need for a different approach to the training of pharmacists. Indeed, it is important to ensure that, with an ageing population, the quality of medicines and to keep in mind the achievement of sustainable development goals, especially in low- and middle-income countries (Iqbal, et al., 2021).

The professions of the future and the need for new competences are mainly contributed to by the process of automating processes and entire factories. There are, of course, different data. Some sources indicate that jobs will be significantly reduced by 2025, especially in industry. Employees, even the most skilled, will no longer be needed,

as they will be replaced by various technical devices, programmes that are able to perform the absolute majority of their functions. It is assumed that in the near future, the most popular professions will be those that function in some way in the field of digital technologies. In addition, there will be an increase in demand for occupations related to analytical work in IT, design and development of computer programmes, maintenance and development of social networks (e.g. cf. Kulikovskaya, et.al, 2022). Therefore, research dedicated to the current problem of modernising the existing training model is gaining importance – in relation to the urgent need to implement a strategy of training of highly skilled professionals in the most sought-after and promising sectors of the future (Soboleva, et al., 2018). It is rightly assumed here that it is not feasible to address all the educational issues related to each profession, therefore it is rather necessary to set certain trends, directions of development (cf. e.g. Thibault, 2020).

The authors of the reports made a similar assumption.

The need for change is recognised by the teachers themselves. They are aware that the introduction of modern technologies requires corresponding changes in training processes, other professionals involved in education (Céspedes and Gutiérrez, 2017).

The development of modern technology means that new competences and training methods are needed - more broadly competence management. This observation applies not only to engineers, production workers, but to virtually any profession. Even in the performance of the legal profession, the influence of modern technologies is noticeable. Technological solutions have transformed the law from a completely individualised service to one that resembles an off-the-shelf commodity, and technology platforms will reduce the importance of law firms. In addition, artificial intelligence and machine learning systems will take over much of the work of lawyers (Hunter, 2020).

The two works analysed are embedded in the issue of professions and competences of the future.

I. Standards for training the competences of the future

Standards for training the competences of the future - is a work edited by: Paweł Strojny, Paweł Nowak, Mariusz Hetmańczyk, Julian Malaka and Kinga Skrzek.

The paper defines the concept of future competence and analyses the internal and external contexts (which is in line with the creation of various pro-quality solutions of a strategic nature). In addition, a description of the infrastructure needed was made and institutional standards and the so-called educator of the future were presented.

The pilot partners were Cracow University of Technology, Wroclaw University of Science and Technology, Bialystok University of Technology, West Pomeranian University of Technology. "The aim of the experts' work was to develop standards, i.e. a set of rules and good practices for innovative education and training, and to identify institutional requirements - in terms of e.g. programmes, available infrastructure or cooperation with the socio-economic environment, and individual - in terms of human resources, which should be met by higher education institutions and other educational organisations in order to apply for the Future Industry Platform quality seal in terms of the Standard for training the competences of the future".

The authors of the study considered three types of skills: cognitive, transversal, professional (domain-specific). In addition, "the Future Competence Observatory team assumed that, according to the typology used by the European Centre for the Development of Vocational Training (CEDEFOP), competences consist of three interdependent competence areas:

- cognitive competence (theoretical knowledge related to the occupational specialisation),
- functional competence (practical skills related to the occupational specialisation and necessary to carry out tasks),
- social competence (attitudes and behaviour in interactions and the ability to acquire knowledge, new competences and for self-development)".

There are, of course, different definitions of competences. For example, the normative definitions that exist in most countries assume that it is possible to speak of elements of competence. These usually include training, education, experience and sometimes skills.

Defining what we are concerned with in research is one of the steps in the research process - often overlooked, and distinguishing competences from qualifications and learning outcomes is a correct procedure. It turns out that the syllabuses of education describe qualifications, social competences, skills in a rather free manner - which introduces conceptual chaos and makes both students and employees feel unsatisfied with the definition of what is to be included in the learning process, what is to result from it. It is unclear, why terms such as educational efficiency are used - which is a clear contradiction of economic definitions.

In the hitherto existing version, the syllabuses, which are supposed to have an informative but also a motivational function, do not fulfil their role. This is worth writing about in the context of the analysed studies conducted by the Observatory.

The authors of the study concluded that "the concept of future competences is most strongly associated with the part of industry referred to as the fourth generation industry".

Referring to the purpose of the study, a delineation of competences was made because of the criterion of time.

The study draws on previous opinions prepared by Platform experts (e.g. Ziemowit Socha and Paweł Strojny, Monitoring źródeł w zakresie analizy kompetencji dla przemysłu przyszłości – raport zbiorczy, Warsaw: Future Industry Platform Foundation, 2022).

When the context of the phenomena in question is analysed - which is also in line with normative requirements - the division of factors into cultural, technological, market, social is usually taken into account. Such a division would bring some order to the description of the context. However, the authors assumed that the description of the context is linked to the presentation of the vocational training projects which are already implemented. The objectives of the project RECAPHE (Enhancing Staff Research and Innovation Capacity in Professional Higher Education) were discussed, which is a project implemented as a part of the Erasmus Plus programme.

RECAPHE experts highlighted the problem of education taking into account current research. This issue has long been one of the most important if we want to improve the quality of education and educate the professionals the industry will need in the future. However, it is important to highlight the main obstacles. These include:

- lack of practical experience of a significant number of lecturers,

- poor contact with industry,

- teaching too many subjects (inability to combine teaching content with ongoing research),

- lack of access to research topics related to the development of modern technologies.

This remark, addressed not to the authors of the report, but to the universities themselves, is important because of the idea of an University based on future skills, contained in the next section.

Attention should also be drawn to other forms of education that are already in existence. This is because we are dealing with training in technological competence by various entities including private ones (e.g. General Assambley, courses from £8,000 to £10,000). These are short training courses (up to 1.5 years). Such a trend is already prevalent in the national market, where various private entities train programmers, IT specialists responsible for maintaining the infrastructure.

And this is where another barrier to promoting the idea of future competences comes in. A complete lack of preparation of public universities to start training in short time cycles.

Existing procedures for setting up new courses, postgraduate studies, which are based on taking action (often opinions) not creating any added value - this situation results in workers taking the initiative to provide training tailored to the specific needs of employees being demotivated.

When creating the competence standard of the future, the authors of the project drew attention to a very important problem, namely the absolute necessity of changing the ways in which universities are managed. It is important to promote such concepts as Lean HE and to fight against doing research for publication points alone – especially with spending huge amounts of money to publish insignificant research results. Assumptions of evaluations and existing staff appraisal systems are a serious barrier to the adoption of the ideas described. The biggest challenges faced by those attempting to improve management and learning processes in the higher education are related to overcoming organisational, technical and cultural barriers.

In organisational and technical terms, these are:

- lack of holistic approach (only selected processes, selected individuals are improved, locality of change, protecting individual and group self-interests),

- lack of balance between top-down and bottom-up approaches,

- lack of adequate understanding of the concepts of the process approach, excessive radicalism and immature support,

Failure to adapt to the specificity of processes, including creative, scientific, education.

Culturally, these include:

- bureaucratic leadership models in universities,

- lack of maturity assessment for Lean implementation,

- failure to adapt to the specific organisational culture of the higher education institution (Maciąg, Bugdol, Peter-Bombik, 2021).

It is therefore worth following up this report with further research devoted precisely to the barriers to implementing the concept of competences of the future - something I would urge the Board of the Future Industry Platform to do.

The study proposes a certification system for HEIs, which, given favourable conditions, will encourage the authorities of universities to make the necessary changes to their management processes. The paper also gives examples of successful cooperation between various business entities and universities.

In Poland, one of the problems is that some companies have more access to knowledge than the universities themselves. Major industrial organisations conduct their own research with great success. It is important to increase the scope for cooperation by, inter alia, developing postgraduate education that provides professional qualifications (postgraduate studies may take a little longer but guarantee a specific professional qualification). In the past in Polish industry, many specialists were trained in this way. One example is a project carried out by the Silesian University of Technology with the international company ZEW S.A (today COBEX).

The chapter presenting the educational and creative infrastructure deserves special attention.

The entire study should be obtained by university managers as soon as possible so that appropriate steps can be taken to prepare the relevant infrastructure.

The reader has an opportunity to familiarise themselves with examples of laboratories using technologies related

to Industry 4.0 (e.g. The Maker Spaces, Integrative Design, Arts and Technology Network, Multiplex, Fablab Nairobi).

The next section shows examples of universities that are currently implementing projects involving the adaptation of their Internet infrastructure to the needs of Education 4.0.

The authors proposed the introduction of a 'Quality Label for Future Skills Learning Centres', confirming the organisation's compliance with the "Future Skills Learning Standard".

It was assumed that an organisation applying for the Quality Seal would be assessed in five categories: curriculum, internal environment, cooperation with the environment, educators, infrastructure.

It is important that the criteria of the standard are taken into account in subsequent programmes, ways of evaluating universities. A surfeit of different approaches can be a source of organisational confusion. And that is why it is important that the developed standard, after implementation and verification (according to the PDCA cycle) will be at least partially taken into account by the Ministry, which announces changes in the evaluation system of HEIs.

A second approach could also be proposed - that of introducing a standard in the same way as universities are certified today for compliance with various quality standards.

Similar solutions exist in service and industrial companies, where assessment is carried out according to the so-called models of excellent management (MBQA, EFQM).

If such standards are implemented, it is worth considering the possibility of establishing benchmarking centres (within existing chairs or management departments of research universities).

The detailed evaluation procedures must be continuously improved. The most important task in any qualitative assessment is to objectivise the assessment criteria.

The authors also proposed the Educator of the Future Standard, which was designed to be complementary to the Institutional Standard. Detailed evaluation procedures were developed, including - a candidate evaluation sheet. Selected educational organisations were invited to the stage of testing the Quality Mark - including the Krakow University of Technology, Poznan and Wroclaw universities of technology.

I believe that the publication of the work discussed is needed primarily for two reasons.

Firstly, it makes university authorities, but also all employees, aware that educational processes - due to the technological revolution taking place - must be modified (if this has not already been done). For example, if we consider future management and production engineering specialists, they must receive much more technological knowledge, related to automation, process improvement. Education without this knowledge, without the basics of technology, is incomplete and does not guarantee that graduates will be able to cope with the real problems faced by those responsible for the smooth running of production processes.

Secondly, the study can have a very important educational, inspirational function, showing different solutions concerning modern educational infrastructure.

II. Report on empirical research on competences and professions of the future

The second publication prepared by the Observatory is the "Report on empirical research on competences and professions of the future". The authors of the report are dr. hab. Justyna Łapińska, dr. hab. Agata Sudolska and doc. Ing. Marek Zinecker, Ph.D.

This study adopts a slightly different definition of competence, which to a greater extent (apart from commitment) refers to normative definitions. As the authors themselves state: "Competences of the future are thus defined as a

specific combination of knowledge, experience, skills and commitment of employees, which importance for the development and success of companies will increase in the future" (p. 9). Competences were divided into social, technical and cognitive.

During the preparatory phase, national documents and EU sources were reviewed (e.g. the classification of ESCO - European Skills, Competences, Qualifications and Occupations, European Skills Agenda). In addition, a study entitled "Monitoring of Asian Sources on Competency Analysis for the Industry of the future" was used.

The technical competences developed on the basis of monitoring the recommendations of the European Union can form the basis for the construction of new educational programmes. In addition to commonly taught subjects (strategic, quality and risk management) there is an important category of curricular missing technical competences (including - big data analysis, business analysis, computer-aided design, process optimisation, scalability analysis). computer-aided design, process optimisation, scalability analysis).

By reviewing the background material, it was possible to identify sixteen competences that the experts considered to be the most important from the point of view of future industry needs.

One of the major challenges will be the formation of social skills. These depend on many factors - biological, environmental, educational, etc., but they require established principles and content of education implemented at each level.

The report describes the survey procedure in detail. The first survey was quantitative, and the second was qualitative.

The authors constructed a research tool that addressed four research questions. Prior to the proper research a pilot study was conducted. The study was implemented between 25.10.2021 and 19.11.2021.

Representatives of small companies (53%) and micro-enterprises (30%) mainly participated in the survey.

According to the people surveyed, important skills are the ability to think outside the box and undertake creative adaptation of solutions, analytical skills using technology and analysing and assessing risks and responsible decision-making.

The outcome of the research therefore points to the need for content and forms of education that teach independent out-of-the-box thinking and the need to train employees in the use of methods and techniques for solving qualitative problems. A serious barrier to this legitimate demand may be one of the formed elements of competence, which is experience. Well, employees moving from corporations to industrial companies may have serious problems related to independent, creative conduct. Of course, this observation cannot apply to all corporations, to all employees. However, the fundamental problem today is the introduction of the principle - work according to a formalised procedure. Moreover, most mystery shopping methods are oriented towards making the employee follow top-down procedures.

In the group of technical competences and in the use and management of knowledge and information, respondents considered the ability to manage information overload to be the most important. This is a very valuable observation, but it only points to the already perceived problems in process management. There are often too many different procedures, databases, there is an excess of information - including superfluous information. Huge costs are generated by a system of decisions, approvals and arrangements made only through the e-mail system. Hence the great need to educate specialists in Lean and to introduce IT studies oriented towards the application of the process approach. This is because all too often product realisation processes are described without first improving them. As a consequence, costs increase and a problem arises, which was signalled by survey respondents.

Within the group of social competences, lifelong learning is the most important. The same ability also appears in the subsequent research results - related to the formulated problems.

The authors write: "based on the results of the survey conducted, it can be concluded that the entities represented by the respondents undertake activities that are part of a broadly understood activity aimed at improving the situation in the sphere of creating and implementing innovations" (p. 45).

Further research would need to establish what the training policy of companies is, to what extent employees are supported in the process of competence improvement. It is important - with reference to innovation processes - whether employee suggestion programmes are in place in the surveyed organisations, whether as part of management systems corrective and improvement actions are taken, and whether employees are rewarded for their ideas.

These two issues - training and conducting innovation activities - are directly linked. Most literature points to the need to link innovation with learning processes (e.g. Smith, 2017). It is obvious that if we want to obtain some innovative solutions, the organisation must become a learning organisation. People must want to share knowledge, there must be an inflow of new knowledge.

The development of the competences of the future cannot only be the responsibility of educators, universities, but to the same (or even to a greater extent) companies. They must be the place for continuous learning.

The report also includes the results of qualitative research on the perception and development of green competences in companies. This concept is associated by respondents with environmental protection, the environmental awareness of the organisation and with the circular economy.

It is interesting to note that there is an economic thread in the perceptions of the concept that green competence is. Respondents perceive many financial benefits to be gained by developing green competences (e.g. significant savings, improved image). For this to happen, however, it is necessary to introduce into the curricula teaching content concerning pro-environmental behaviour, environmental management systems, energy efficiency and sustainable development.

Just as we teach employees to behave safely, they should also be taught to proactively exhibit pro-environmental behaviour (this consideration should be included in the designed educational standards).

It is important to bear in mind the numerous limitations of the report, which stem from the research methods adopted and the selection of the research sample. The results presented are the opinions of executives. At the quantitative research stage, information was obtained from top management and other people managing employee teams. A second limitation is the quality of the objectives introduced by those involved in human resource management. The authors did not have the opportunity as part of the study to check their reality, or to verify the data on which they were based. Nor did they have the time to establish what the level of technological sophistication of the companies surveyed is. This factor may have influenced the opinions formulated.

It was rightly pointed out that: "due to the exploratory nature of the survey and the non-random sampling, the results obtained cannot be treated as representative in relation to the entire population of industrial enterprises operating in clusters" (p. 26).

In spite of these limitations, the results obtained from the study allow us to conclude what will the demand for specific specialists in the near future be. They are therefore a valuable source of knowledge for those designing new fields of study and specialisations - not only vocational ones.

The research in question provides very valuable material from which it is possible not only to identify the proclaimed views of managers, but also the problems they face. For this reason - if possible - the authors should conduct further research, this time aimed at identifying internal barriers to efficient management.

Both the established standards and the presented research report must be presented to all rectors of universities and colleges - and especially those training engineers, IT specialists, specialists in management and process engineering.

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