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REENGINEERING OF THE TEACHING PROCESSES FOR MANAGERS OF INDUSTRY 4.0

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Purpose: The aim of this article is to indicate a direction of teaching conditions under the technology development related to industries 4.0, 5.0 and successive N.0. Another dimension of this phenomenon is the change of educational paradigm from teaching to constant self-education. Examples of such activities, carried out at the Wroclaw University of Economics and Business, will be presented in the article.
Design/methodology/approach: The main method are case studies of different types of classes at the Wroclaw University of Economics and Business. The scope of research paper includes three key elements. First, a description of modern technologies supporting the educational and work-related processes. Second, the imperative of teaching processes change determined by technology development as well as new scientific achievements in business and management. Finally, the combination of two mentioned elements in the context of demand for industry 4.0 managers.
Findings: The article advocates the paradigm shift in education. Following methods and directions of this change are discussed: Design Thinking framework; redefinition of the lecturer role; moving away from lectures towards other forms of classes (e.g. workshops, laboratories, exercises, seminars) and withdrawal from grading; courses reorganization; switch from single courses to modules, educational paths or cycles.
Practical implications: Case studies from the author's home academy, the Wroclaw University of Economics and Business. Those studies can be considered good practices and valuable benchmark for other organizations.
Social implications: Changing the thinking paradigm of management, teaching conditions, and the lecturer role has the crucial meaning in the information society.
Originality/value: The article presents the need of teaching paradigm change across the business higher education. The research paper also discusses the change in work processes due to the usage of newest technologies. In addition, the author believes that popular tools like Teams, Zoom, Slack, Miro, Mural etc., are already outdated, and the new generation of technologies based on augmented reality opens up new perspectives for the organization of work and teaching-related processes. The article is dedicated to academic staff as well as to students, graduates and managers.

Keywords: industry 4.0 managers education, teaching processes reengineering, work processes innovations in industry 4.0.

Category of paper: Point of view/Case studies.

1. Introduction

The modern world has been facing another change in the way of work since the Industrial Revolution. The indications are:

1) The usage of new technologies in remote work (it is better to call it "delocalized" though).
2) A different way of gaining knowledge required to work processes execution.
3) A new way of product design thinking and work organization.

There are probably more indications, however, only those three will be discussed in this article in relation to the three key determinants of 90s reengineering. Those days, computers were a breakthrough technology. Although they have existed since the 50s and have been used in industries since the 70s, the emergence of cheap and popular PCs and user-friendly software made them work essential tools. Computerization impacted the organization of activities, where processes have become the basis for working techniques analysis. This was related to the technological factor. The work automation is based on the algorithmizing actions in the form of a procedure or process, which can be translated into a programming language, essential for machines functioning.

A new approach to work organization (related to processes, not functions) required an innovative thinking and indeed a faith in the new working method and the changes in business operations.

The Business Process Reengineering (BPR) philosophy propounded by M. Hammer and J. Champy (2006) has become a reason for many business implementation failures, and consequently it has resulted in decline of reengineering as either management concept or the way of implementing changes in education.

The history of rise and fall of BPR concept is only a background that provides analogy to the current situation of revolutionary changes the business is facing. Again, this change is driven by new technology development which enables the further overcoming of physical barriers in work processes. Analogically to the BPR, it is not about the creation of new devices or software, but about the widespread usage of already existing technologies. Conceptual assumptions for the usage of VR (Virtual Reality) and AR (Augmented Reality) have existed for a long while now. Devices such as VR and AR goggles, 3D printers and Chat GPT holograms are in use now. The world is slowly adopting the common usage of these technologies. For this reason, the academic world should be well prepared for the upcoming revolution.

The aim of this article is to indicate a direction of teaching conditions under the technology development related to industries 4.0, 5.0 and successive N.0. The second aspect is the change of educational paradigm from teaching to constant self-education. The article will also feature the examples of such activities and processes being carried out at the Wroclaw University of Economics and Business.

2. Methodological issues

The radical nature of thesis regarding changes in education processes is manifested by a small number of research papers. As this articles is based rather on case studies, the literature review has not been significantly applied. Only the Scopus database was reviewed in terms of keywords: education ‘and’ industry.

The scope was limited to business articles published in English, German and Russian, resulted in 78 articles found. The initial selection to the most recent articles published in management journals in the 21st century, has narrowed the number articles to 42. The majority of analyzed articles focus on the business and higher education relationship (e.g. student entrepreneurship, knowledge synergies). Six out of forty-two articles are directly relating to the subject matter of this articles, and therefore were inspiration for the author:

1. Ehiobuche C., Okolie U.C., Nwali A.C., Igwe P.A. (2022) describe the areas of industry involvement in higher education – curriculum restructuring, renewed pedagogical approach, building connections between higher education and industries, including vocational trainings and mentoring sessions. The authors’ remarks are concurrent with the presented thesis.
2. Anttila J., Jussila K. (2018) present the challenges in expanding and strengthening the quality management practices at universities to meet the increased collaboration demand with other organizations for benefit of societies. They discuss the conceptual foundations, practical solutions and indications of the Forth Industrial Revolution and industry 4.0.
3. Rowland-Jones R. (2012) outlines the andragogical learning concept of problem solving and new knowledge development, as well as explores the conceptual basis of learning-by-doing method.
4. Laine K. (2008) discusses the e-collaboration which is something more than the technological replacement of traditional direct cooperation. The paper highlights the importance of balancing the electronic communication during e-collaboration (e.g. videoconferencing, e-mail, chat sessions, dispersed usage of group support system).
5. Durkee D., Brant S., Nevin P., Odell A., Williams G., Melomey D., Roberts H., Imafidon C., Perryman R., Lopes A. (2009) highlight the usage of e-learning and Web 2.0 in pedagogics (Facebook and Skype).
6. Rutkowski A.F., Vogel D.R., Van Genuchten M., Bemelmans T.M.A., Favier M. (2002) discuss the e-collaboration which they believe is more than the technological replacement of traditional direct collaboration. The paper highlights the importance of balancing the electronic communication during e-collaboration (e.g. videoconferencing, e-mail, chat sessions, dispersed usage of group support system). The authors present their experiences in supporting the effective virtual teaming in education and industry.

Interestingly, the latter three articles discuss the remote technology in the pre-pandemic era (published in 2002 and 2008 respectively). This affirms the author's views that the current tools used in remote work are old-fashioned originating from the beginning of the 21st century or even earlier. Other exploration strategies had also been adopted, however, without success.

The form was consciously reengineered in the articles. Instead of following today's convention of writing scientific articles, the author has returned to the roots where the substantive content mattered, not only its form. Therefore, the articles should not be considered research paper, but the study referring to the times of reflection, thought or idea, rather than the usage of sophisticated statistical methods to validate the abstract hypothesis or variables, which are usually highly aggregated in social sciences.

Of the same importance is sharing the experience of working with students – the case study from Wroclaw University of Economics and Business.

3. Technological potential

The COVID-19 pandemic has activated the methods and tools for remote work and learning. Overall, the asynchronous (e.g. Moodle) and synchronous (e.g. Teams, Zoom, Slack) solutions have become the most common. Moreover, worth mentioning are the tools enabling the virtual joint work, such as Miro, Mural, Forms. Remote learning in asynchronous format was practiced in pre-IT times in the form of letters, phone calls etc, while educational platforms have moved these capabilities from analogue to digital versions. However, the use of synchronous tools on massive scale was a sign of the times and changes. Earlier tools, such as chats and Skype, have been integrated and upgraded. This enabled a continuous learning despite imposed COVID-19 restrictions.

The massive usage of online working tools can be considered a certain quantitative breakthrough, yet not a qualitative revolution. These tools have popularized remote work, but did not significantly impacted its nature. It can be argued that despite some successes, like undisturbed working and learning online, the tools used for these purposes should be considered obsolete.

Moreover, the inadequacy and incapacities for effective and educational usage of these tools have decreased the effectiveness of educational processes. Passive participation or even going through the motions during synchronous classes is the sad reality of such education.

The usage of new generation of IT tools could significantly influence the educational processes. Following technologies should be paid special attention:

1. VR (Virtual Reality) – goggles, pads, gloves, suits.
2. AR (Augmented Reality) – goggles, smartphones.
3. 3D Printers.

4. 3D Hologram generators.
5. Artificial intelligence, machine learning, voice control.
6. Faster and more stable internet connections.

This technology has already been used in educational processes, but on a limited scale. It is worth to mention a pioneering project in Poland, which is the Business Process Simulation Center at the Wroclaw University of Economics and Business[1]. Classes are run there based on the process models designed in FlexSim environment. Students can create and run gamification-based business processes. During the simulation, they learn about the operating models and might apply changes in order to improve the operations. In addition, they have the opportunity to interact in the virtual environment in so-called VR boxes with the usages of Oculus goggles and pads.

4. The learning and working processes

As can be seen in the previous point, the technology has already been developed and enables a different approach to learning and working than it is currently implemented. Also, it has also been developed conceptually. Instead of Teams, Zoom, Slack meetings, it would be possible to move to a virtual space, a classroom for instance. Instead of motionless pinpoint symbolizing a meeting participant, one could meet in a avatars group in 3D virtual space. It is now possible thanks to the fast and stable data transfer. Even if the data transfer is not sufficient enough to handle the dynamic world, the architecture of such meetings with avatars would be achievable in a simplified version. One could follow the example of Second Life, a virtual world designed since 2003 by Linden Research Inc.

The usage of such solutions would significantly reduce the flaws of remote learning such as alienation, lack of social interactions, performing other tasks in the background etc.

Another technological factor impacting the teaching and working processes is the network development. The Internet has become a medium that greatly affects the users' behaviors. Therefore, the educational processes must be redesigned. The existing methods commonly used in schools and universities, such as teachers' assistance in transferring the knowledge (e.g. via lectures) are not very effective. Additionally, the basic assumption of such processes that "teacher knows better" is eroding. A widespread and unlimited access to information means that the skills and knowledge are rather conditioned on willingness, commitment, talent, time and luck, than the teaching methods. In addition, incompleteness and knowledge uncertainties should be taken into account as well. These factors lead to the reorientation of the teacher's role from a lecturer to a guide, facilitator or patron of his mentees.

[1] More information about CSPB is available on the website: https://www.ue.wroc.pl/biznes/24559/centrum_symulacji_procesow_biznesowych.html.

This change is part of the trend discussed by J. Rifkin in the 90s as the age of access (Rifkin, 2001). The access to goods is more important than possession, and this also applies to the knowledge resources. More valuable and creative is not "how to do it" but rather "how to find it" – having the access to knowledge and being able to explore it. The speed of learning rather than well-established knowledge.

The above-characterized change in working and learning methods proves a permanent nature. Even subject matter experts or specialists are forced to constantly improve themselves and benefit from external knowledge sources because the world and knowledge are changing dynamically. In given situation, it is extremely important for managers to quickly receive and use the best current knowledge in various fields to be able to manage complex projects.

Out of the author's didactic experience, the change in thinking from "the teacher knows everything" through "the teacher does not know everything" to the desired stated of "teacher does not know everything, thank heavens!" is especially difficult to achieve among some… teachers. By the way, it should be highlighted how the language we use nowadays is old-fashioned. Archaic vocabulary emphasizes the importance of the old paradigm of education where the role of the "teacher" was just "teaching".

If one person is unable to master a broader knowledge of reality, a technical in particular, under the conditions of its increasing complexity (entropy), then a different problem solving strategy should be undertaken. According to the followers of the Agile concept, the strength lies rather with the small teams and network than with the individual (Denning, 2028). Small teams achieve the synergy effect from joint effort in searching and generating knowledge. This is reinforced by the usage of distributed network resources which team member have access to.

The following concepts fit into the above characterized pattern:

1. The flipped classroom – a concept of student activation developed by J. Bergmann and A. Sams, based on assumption that students get familiar with the theoretical material at home (knowledge and understanding), so they join classes well-prepared and they run practical exercises to check and consolidate their knowledge (application, analysis and synthesis). What happens at schools is what students would have traditionally done alone at their homes (Bergmann, Sams, 2012).
2. The supporting control concept (Koziol, 2015, p. 27) – aimed primarily at identifying areas for improvement not in order to blame or punish subordinates, but rather to support and help them in these aspects. The term "evaluation" is increasingly used instead.
3. In his famous book, "The Age of Paradox", published at the end of 20th century, Charles Handy describes such activities as reverse delegation. The idea behind this solution is to enable the support from stronger units in the organizational hierarchy to the weaker ones (Handy, 1996, p. 114).

The concepts quoted above assume an increased involvement of a subordinate (student, pupil). Unfortunately, this requires overcoming the resistance of the majority of students who were infected in the earlies stages of education with the passiveness syndrome, as their own initiative was most often strangled.

Therefore, the paradigm change in education requires breaking the thinking partners in many groups – teachers, students, parents, educational officers, Ministry of Education and Science etc. It is fair to say that we are only at the beginning of this paradigm shift, even though the flaws of Bismarck school model were noticed much earlier by such education reformers as:

1. Maria Montessori – who developed the education method based on which more non-public kindergartens and schools are set up (Guzik, 2010).
2. Rudolg Steiner – the author of Waldorf education (term derives from the first school using the alternative education methods founded in 1919 next to the Waldorf-Astoria cigarettes manufactory in Stuttgart).
3. Currently, the flipped classroom is being popularized assuming students get prepared to classes at homes and later they do practical tasks and consolidating and checking exercises (application, analysis and synthesis). So what happens at school is what students would have traditionally done at home. Teacher has the ability to supervise their activities, check if students are coping with the curriculum, and can also introduce more active forms of learning – in pairs, groups, discussions, projects. Teacher becomes more of a guide, moderator and mentor for students than a lecturer. Students have the opportunity to take control over gaining the knowledge, they can practice self-education and evaluate each other. The problem of not understanding the course material is reduced to minimum, while the well-prepared students are gaining the self-confidence which is necessary to actively participate in classes. Bergmann and Sams, the precursors of this concept (Bergmann, Sams, 2012) assumed the thesis that students need a teacher the most when they are unable to solve a task, and not when they have to listen to a lecture – and the students' needs should determine the teaching method (Olszewska, 2018).

The ideas behind these alternative methods are quite consistent:

1. No grades. This means that it is necessary to develop individual incentives and inform both children and their parents about their progress. The lack of grades is intended to develop children's inner motivation to study. Teacher together with children are founding a relationship based on trust and respect, which positively impacts the student's self-confidence and readiness to try new things, while teacher enables self-learning for the students.

2. The integrated education (Steiner) and thematic pathways (Montessori). Teaching is conducted in the form of so-called "cycles". It means that for a few weeks (usually two to four) children focus on one subject only.
3. No student's books – teaching materials are developed by teacher to meet the current needs of students.

These concepts were developed for students attending primary and secondary schools in mind, but the idea should also work out in higher education.

Fossilized forms, incompatible with today's educational needs, such as lectures, written exams (tests in particular), grades system, curriculums, student's books are doing… fine! They are in the teaching mainstream at universities and strongly rooted in the awareness of the organizers of didactic processes. Sometimes, organizers find it difficult to understand that, for instance, a lecture on IT tools used in process management does not make any sense. It resembles teaching programming by writing C++ commands on the chalkboard (as it used to be in the 80s). It also worth to mention that relatively few students show up at the lecture sessions. It happens regardless of the subject matter or the way it is taught. The reasons for this could be found in voluntary participation in the lecture, the length of the lecture (90 minutes), while the listeners maintain their attention for several minutes.

The reengineering of educational processes should be based on the new generation of technologies, but also on the change in thinking about teaching. This requires fundamental, radical, and dramatic changes in the perception of teacher's role by the lectures themselves (another conceptual archaism applies).

1. Redefinition of the lecturer/teacher role – it is better to define him as the guide. Paradigm shift from teaching to supporting students' self-learning/development processes. The role of the teacher is to unleash the students' potential for their creative exploration, absorption, and creation of knowledge. The guide as a tutor, mentor, coach, facilitator. There is a slow but noticeable change in this field. Some universities have introduced tutoring and mentoring programs. In 2017, the BIPS (Individual Business Course Program) was founded at the Wroclaw University of Economics and Business where students can work with academic tutors and business practice mentors.
2. Walking away from lectures in favor of workshops, laboratories, exercises, seminars. At the same time, it is important to limit the size of student groups so they can work in small self-organized teams, once called brigades. On our own, we teach students about agile (Denning, 2018) or turquoise (Laloux, 2015) organizations based on self-foundation, lack of hierarchy etc. So why do we carry out it in an archaic way? Ex cathedra, to all anonymous students usually with the one-way message.

3. Moving away from the grading systems and assessment methods (tests, exams etc.). We ourselves teach students about the ineffectiveness of motivation with punishments and rewards. "The carrot and stick", as A. Blikle termed it, is fundamentally ineffective because people are desperately trying to avoid punishment and will fight piteously for rewards. Moreover, any system will lose to human creativity in finding a way around it. Each superior will be outplayed by his subordinates, because there are simply more of them (Blikle 2018). Exactly the same rules apply to the teacher – student relationship, where the syllabus or the teacher himself will impose the game rules, e.g. the assessment criteria.

   We experience how "points and grants madness" and set pattern killed the authenticity and the joy of research scientific publications. Why are we so fond of applying these mechanisms to students? Why does the Polish Accreditation Committee also verify the obtainment of competences by students based on the results of formally documented exam? The oddness thing becomes a forced notes attachment from oral exams to student files. Projects led by students (tangible activities, events, movies, experiments, simulations, modelling, performances, presentations) could be used instead of grades and assessments. The result could be assessed by the quality of the project product or the success in the project implementation (then it is worth to set the criteria, measures and reference values in advance, defining the term "project success").

   However, if the rating system is here to stay, the role of the facilitator could be redefine from a judge to trainer or coach. The task of the coach would be to lead as many students as possible to the highest achievable goals. Then, high grades could be given with satisfaction.
4. Resignation from conventional classes within the lessons schedule, from one isolated subject in top-down student groups with assigned rooms with a predominance of one-way communication from one facilitator to students sitting in desks. Currently, it is an increasingly common standard to present cliched Power Point presentations on projector both by teachers and students. Leaving the content with no comment, it is worth to focus on the form of presenting the slides. Unfortunately, these presentations are rather bringing anything but boredom than playing the interesting role during classes. Whom did the students learn such manners from?

Conducting classes in an unconventional way, alternative to the prevailing education paradigm is possible and desirable. The promising results are obtained with the usage of Design Thinking methodology to plan events, solve problems, design products and services. Whenever it is applicable to use this methodology during classes, e.g. in the management of projects, processes, innovations and logistics etc. it brings good results. The introduction of learning elements through play, being open to what is new and unexpected, is an immanent part of this methodology, in the empathizing, ideation and prototyping stages in particular**.**

In 2022, the Wroclaw University of Economics and Business held its first DTthon, a marathon of designing innovative solutions with the usage of Design Thinking methodology. It follows popular programming marathons. This two-day event has taken place thrice and its popularity is still growing both among students-participants and companies which provide challenges to the competition, offer support, and are eventually the recipients of generated solutions during the DTthon[2]. In 2014, the virtual student's consulting firm "V-Student Consulting" was founded in the branch of Wroclaw University of Economics and Business in Jelenia Góra, where students are running projects for such companies as Auchan, Warsaw Stock Exchange, Jelenia Góra City Council, etc[3]. Other promising results are observed with the use of thinking tools proposed by E. Goldratt, such as conflict diagram, goal tree, current state, future state, etc. (Goldratt, 2008). Nevertheless, the question arises: how to enrich and change the teaching methods in such subjects as statistics, operational research, or accounting where it is difficult to imagine the application of Design Thinking methodology. In the case of typically tool-based subjects, such as statistics classes, starting with the real problem works well. To solve this problem, it is necessary to use the tool offered by statistics, as it was developed in response to practice demand. Then, students understand the sense of learning and using this tool. Unfortunately, subjects such as statistics are taught in the early studies years, and thus students are detached from the practical applications of these tools, which will be discussed at later stages. This usually discourages students as inserting numbers into formula, making calculations and presenting results with no wider interpretation are not exciting activities most often. Hence, statistics classes are usually not the favorite ones in students' opinions. The views are changing when project or process management classes take place, where such statistical terms are applicable, like distribution function, expected value, variables, and are essential to perform the process simulation successfully. Only then, students realize that statistical tools make sense. Unfortunately, they often do not remember much from the statistics classes they had a year earlier.

Therefore, it is postulated to group classes rather around problematic issues than according to subjects. So that students could use their statistical knowledge, mathematical analysis, or accounting, while working on complex projects or case studies. This solution resembles the postulates of M. Montessori and R. Steiner regarding the issues grouping into thematic pathways or cycles.

All suggestions for the teaching process reengineering are aimed at the key problem of overcoming students' resistance to be involved in the didactic processes. Stepping them outside their comfort zone where they settled in the earlier education stages.

[2] More information about CSPB is available on the website: https://www.ue.wroc.pl/biznes/25521/dtthon_maraton_projektowania_innowacyjnych_rozwiazan.html.

[3] More information about CSPB is available on the website: https://jg.ue.wroc.pl/p/rozwoj/prezentacja_firmy_vsc.pdf.

5. The context of industry 4.0

This article formulates the recommendations for industry 4.0 managers as a specific form of production, based on the use of technical solutions, e.g. the Internet of Things or SOA (Service Oriented Architecture) systems, setting up smart factories (Schlechtendahl et al., 2015, p. 143). The proposals in this article are also applicable for the next generation of managers, the so-called industry 5.0 and probably the succeeding one – N.0. However, due to vague definition of industry 5.0 determinants, the title refers to the Forth Industrial Revolution which is the fact. Examples of its differentiators will be intelligent value chains based on dynamically self-organizing and optimizing sociotechnical and biotechnical systems known as smart economic units which create smart factories and will connect them with the needs of prosumers. This another civilization leap (Zarychta, 2018, p. 64) will probably be compatible with the development of the whole society in accordance with holistic behavior principle within integrated systems, etc. (Chen et al., 2018, pp. 1-13; De Jonge et al., 2012, pp. 169-188; Xu et al., 2021, pp. 530-535).

The combination of the two latter points i.e. the technology potential and the education paradigm shift (the ability to use these technological capabilities) results in synergy effect for the processes of future managers education. It's just that managers' work processes increasingly include an element of continuous learning. It is worth to pay attention to two antinomies, while educating the industry 4.0 managers. First, it is the paradox of specialization versus complexity. On the one hand, the specialization gives an advantage in efficiency and effectiveness of action, on the other hand, the comprehensiveness enables the skills combination and facilitates more holistic view which are necessary to solve complex problems.

This paradox could be overcome with the fast learning abilities with the usage of modern technologies. Each of us can use the Internet resources to quickly gain necessary skills. This makes possible to manage complex projects where each of the executive teams has the knowledge and experience advantage over the project manager. Anyone who has built a house in the economic system is aware of the difficulties in assessing and coordinating construction teams. During project management classes, students find out how quickly they can gain a necessary knowledge from Google and YouTube and use it in a mock construction project (case study).

The consequence of such working approach is the change of teacher perception from omniscient (an ancient educational paradigm) to the knowledge and competences limited individual. This is not a pejorative observation, it makes students aware of the everlasting rule that a person is unilaterally wise and multilaterally… unwise. This attitude is a norm that should be included in the work processes. There is no option to be wiser than all executive teams, and yet be in charge of such projects. Nowadays, the role of the teacher is the facilitation, mentoring, or coaching in order to bring out willingness, commitment to search for knowledge by students.

The second paradox is the asymmetrical relationship between technology and work processes. There is a noticeable use of modern technology in work processes, however, the working approach is changed less often to use the full potential technology. This phenomenon has already been noticed in the 90s by the authors of reengineering – M. Hammer and J. Champy. Technology has been developed at fast pace, while habits, routines, work organization processes are characterized by greater inertia.

This can be illustrated on the example of AR. The logic behind the augmented reality has been known for a long time. For instance, the usage of smartphones in car navigation, routes planning and optimization. Searching for solutions in the Internet or watching video tutorials on YouTube is nothing but supporting activities in the real world with additional information retrieved from the virtual reality. The usage of smart AR glasses products (Google Glass 2, Apple AR Glasses, Vuzix blade etc.) or holograms (e.g. Head Up Display) would be more convenient, however, the real revolution will happen only if the possibility of modern technologies usage is taken into account at the product design stage. The example is such product design that the end-user can manually configure, modify, maintain and repair. In order to make it possible with such product as a fridge, it would be necessary to design this product taking into account modularity, flexibility and user-friendly service etc. Let's take as the example the situation when a fridge malfunctions. In a current model, user has to call the service center which will repair faults (fees included or not) by using original spare parts. In the new customer service paradigm, user should be able to fix issues on his own. As a layman, unfamiliar with household appliances, a client should receive a tutorial on his AR glasses, e.g. in video-format which shows the step-by-step process of identifying the problem and solving it eventually. Such user becomes a prosumer, as A. Tofler defined clients who take over the production process (customer service in this point) (Tofler, 2021). The user is able to dismantle the product himself with the support of instructional materials. If he fails, the user can always rely on the online support. The expert will remotely guide the user as he sees the malfunctioned fridge through the AR glasses. If the fixing will require spare parts, the user will download a script from producer's website based on which the 3D printer will generate a replacement part. Then, with the help of instructional materials and the expert, the user will repair the fridge. To make this scenario happen, the change to product design is needed, so the products are repairable, the services is simple, and spare parts can be printed on 3D printers. Such direction of products development and work processes would fit into the current sustainable development requirements and zero waste, therefore, it would be in line with the idea of industry 5.0.

6. The Final Conclusions

The articles focuses on the three main drivers of change in teaching processes. Undoubtedly, the role of the technology development cannot be overestimated. However, technology itself will not be the catalyst for teaching or working processes change, since the currently used tools such as Teams, Zoom, Slack, Miro, Mural, etc., are already outdated. It is necessary to change the education paradigm from teaching to constant self-development. Only the combination of these two factors will enable the emergence of synergy effect in the form of pro-effective reengineering of educational and working processes. The author highlights the approaches of implementing these changes, illustrates them with examples of activities undertaken at the Wroclaw University of Economics and Business, as well as shows redesigned working processes on examples (prosumer reconfiguration of services and products produced by industry 4.0 or 5.0).

The effective methods of stimulating the creativity and students' involvement include the use of the Design Thinking methodology, redefinition of the lecturer/teacher roles, moving away from lectures and embracing other classes' forms (workshops, laboratories, seminars, exercises), resignation from grading, reorganization of classes – shift from individual subjects to modules, learning paths or cycles.

An interesting area for further research would be such challenges as:

- Students' ability to generate knowledge that does not exist – the new one, not imitative.
- The ability to design and conduct non-standard scientific research.
- The ability and openness to generate knowledge in other ways than the scientific method.

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