THE SPECIFICS OF THE INTEGRATION OF GENERATION Z INTO THE LABOR MARKET – THE ENGINEERING FIELD

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ABSTRACT: *The article aims to take an X-ray of the latest generation to enter the labor market – generation Z. First of all, the peculiarities of these young people are reflected, seeking to reveal what is common and what makes them different from previous generations. The fact that they do not know life outside the Internet has marked their way of thinking, communication and approaching different aspects of life, greatly marking their relationship with work. Studies show that they are the least concerned about making a career and are rather looking for a job that satisfies the need for affirmation, balance between private and professional life, the use of technology in the learning process, work and communication, a friendly environment. Special attention is paid to engineering students and the way in which they meet the expectations of employers. Studies reveal a mismatch between the demands of the labor market and the training of engineering graduates from generation Z. Managers are rather dissatisfied with the technical and professional skills, but also with the personality traits of these young people that make it difficult for them to fit into engineering positions. At the same time, the article points out several recommendations regarding the improvement of study programs that are required to be more closely aligned with the constantly changing requirements in this field.*

Keywords: *generation Z, career aspirations, engineering education, engineering graduates*

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1. INTRODUCTION

The year 2000 is often considered the turning point between the previous generation Y and Generation Z. Members of Generation Z were born into the digital age. They grew up in small families, with older parents who spent a considerable part of their lives studying. The character of Generation Z is formed primarily through the Internet. For them, the boundary between the online space and the real world is blurred, with success meaning recognition in the online space.

Some authors see Generation Z as the first truly cosmopolitan generation. Millennials were considered the first cosmopolitan generation with the development of the Internet, but as more individuals enter the online space, Generation Z will become more cosmopolitan in their thinking, interactions, and connections. Today's teenagers may have more in common with their peers around the world than with adults in their own country.

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They are practical and intelligent and like to take the lead because they feel more independent (Jiří, 2016). They are more impatient and agile than their predecessors and are constantly looking for new challenges. They are not afraid of continuous changes and, thanks to the Internet, they possess a lot of information, but only to a certain extent. To solve problems, they try to find solutions on the Internet.

Another characteristic is that they are constantly connected to social networks and communicate constantly in the virtual environment. Moreover, the activity on social networks negatively influences the writing skills of Generation Z, as they seem to need to improve their formal writing skills and face-to-face communication (Hovořáková & Pauknerová, 2023).

Schwieger and Ladwig (2018) in their article in which they review current research on the profile of "Generation Z" compile a compilation of characteristics of Generation Z:

• They value hard work that is properly rewarded.

• They are independent, resilient and realize that they have to work hard to achieve.

• They value trust, fairness, loyalty and respect from their employer.

• They are ambitious and have an entrepreneurial spirit. However, these students know they have a lot to learn about entrepreneurship, as nearly two-thirds believe that management skills should be taught in colleges and universities, according to the findings of the Northeastern University Innovation Study. (Seemiller & Grace, 2017)

• They are creative and value individuality.

• They plan for their future and are willing to learn on their own.

Market research firm Sparks and Honey, in Meet Gen Z: Forget Everything You Learned about Millennials, reported that 85% of Gen Zers have engaged in online research to complete a task, likely without interpersonal interaction. Not only are they used to learning independently, but these students prefer it because they can focus, set their own pace, and make sense of their learning before sharing it with others.

Seemiller & Grace (2017) found that community engagement opportunities that have a lasting impact on a social issue are more appealing to Gen Z students than short-term volunteer experiences that address the symptoms of that issue. For example, instead of volunteering five hours a week at the Social Canteen, Gen Z students would rather engage in a social change initiative aimed at eradicating hunger. This is highlighted in the qualitative study of over 1,300 Gen Z students from 50 institutions. As part of the Gen Z Stories Project, students shared examples of how their generation intends to change the world by solving complex problems. One student said, "Our generation is extremely innovative and will be able to find solutions to different problems that have been approached in ways that have not worked before."

Studies show that Gen Zers value work-life balance. Organizations that promise and promote work-life balance are more likely to attract and retain Gen Z employees.

Articles documenting engineering students' perceptions of developing generic skills and competencies revealed that teamwork, communication, problem solving, navigating ambiguity, and self-directed learning were the most frequently mentioned topics. The next skills found in several articles were project management and time management, while creativity, critical thinking, and information literacy were mentioned much less frequently (Boelt et al., 2022).

2. GENERATION Z'S RELATIONSHIP WITH WORK

Baša et al. (2023) find in their study that the most important thing for Generation Z is to express creativity at work, and the response option of doing the job with minimal effort received a higher rate than the opportunity to learn and self-train. Generation Z considers salary and flexible work schedule very important, but in their case, expectations are often unrealistically high compared to their work experience. In the case of Generation Z, career is

only in fourth place. They consider material goods to be more important than friendships, and this is also reflected in the workplace. High salaries, recognition and a pleasant atmosphere at work are extremely motivating factors for Generation Z and for the previous generation.

Several authors have emphasized that work-life balance is very important for the youngest generations entering the labor market, who put money and reputation before intrinsic values.

In terms of motivation, research finds that Generation Z is intrinsically motivated when their team and, more importantly, their supervisor recognize their contributions and implement their ideas.

Generation Z values relationships at work. They want to form a friendly, cheerful team with their colleagues, helping each other in completing tasks.

Being digital natives, Generation Z uses technology to learn, socialize, and, of course, they expect to use technology at work.

Studies find that family members have a dominant influence on the career choices of young people in Generation Z. They tend to honor the values of their family of origin.

Young people in Generation Z are oriented towards jobs with friendly work environments, good salaries, flexible schedules. The fields they aspire to are IT, sales, manufacturing, finance.

Personal fulfillment is achieved through workplace benefits, including job security, vacations, benefits packages, and competitive pay.

Young people in Generation Z need mentors, which they seek in their family environment, in the media, and they also want them in the workplace. Generation Z expects their supervisors to provide them with leadership skills, guide their learning, and support their career development through meaningful mentoring.

Although research sheds light on the career aspirations of Generation Z, it is not sufficient to understand how Generation Z will behave in the workplace. All empirical research in the literature has as participants students with little exposure to the current labor market or completely lacking work experience, and therefore, once they enter the labor market, their perceptions may change. (Barhate & Dirani, 2021)

A survey of 81 entrepreneurs in the western region of Romania who have hired engineering graduates from Generation Z reveals the following results:

• Only half of the employers consider the young people recently hired to be good specialists, while more than a third consider them to be mediocre from a professional point of view, and 1 in 10 consider them to lack basic professional skills.

• One thing expressed by almost all employers was related to the difficulty of engineering graduates to understand aspects from fields related to their specialization, they mentioned rigidity and mechanistic thinking not adapted to working conditions as an important weak point.

• The main deficiency of a recent graduate is the lack of experience, almost non-existent practice – an aspect mentioned by 57% of respondents. It is followed by responsibility, low involvement - 26%.

• The most important thing for an entrepreneur is that a graduate he hires understands what he has to do and meets the organization's requirements, as stated in the job description. It matters very little that he has studied abroad, has received high grades in his undergraduate degree, has gained experience in other companies, is willing to work overtime or travel for work.

• Asked to write the main 3 responsibilities of a new employee who graduated from an engineering faculty, entrepreneurs most often mentioned seriousness, willingness to learn, to know and to improve. The authors of the study stated that the responsibilities required of a new

graduate are modest; they are not expected and are not required to perform, but elementary activities, performed conscientiously.

• The low expectations that employers have of recent graduates of technical faculties come from a history of relations with employees, whom they reproach for the superficial way of working, the need to be pushed from behind, to be led (26%), inconstancy, the temptation to leave for other companies or to other countries (21%), lack of creativity, imagination, passion (20%)

• Only a third of the company representatives have conveyed to the universities they collaborate with what they want from future employees who finish their studies. Of those who have had discussions with the university administration, only half have been involved in adapting the academic curriculum to meet the needs of specialized personnel.

• Half of the companies that participated in the study do not conduct research - they only implement or use the results of scientific research conducted elsewhere. Another 20% invest small amounts in research, ranging from 1-5% of annual revenues. Only 9% invest more than 10% of their income in research. (Ștefan, 2019)

According to an estimate regarding engineering graduates of the Polytechnic University of Bucharest, of the 6,000 graduates of the class of 2024, about 15% go abroad and work there, the rest stay in the country but not all work in the field of engineering. (Milea, 2024)

A study that sought to identify the aspirations and motivations of 2,330 engineering students at Imperial College London found the following:

In terms of curriculum suggestions, respondents reported an interest in transferable skills training, practical work and laboratory projects. When students were asked to rate the importance of specific transferable skills, training, communication, management, teamwork/negotiation and presentation skills featured prominently, with mean score ratings ranging from 63% to 67% for male respondents and 72% to 76% for female participants. Lower priority was given to skills/knowledge related to environmental awareness, language development, law/intellectual property and ethics, with mean ratings ranging from 45% to 50% for male respondents and 53% to 62% for female participants. The data suggest a greater bias among students toward developing interpersonal skills and perhaps a lack of recognition of any implicit skill development through team projects and laboratory work.

After the first year of study, there is a significant decline in the average level of self-rated motivation toward studies for engineering students. This decline continues for male participants in subsequent years. In addition, students increasingly feel that their education is not a priority for the teaching staff as they progress through the course. Interestingly, however, those students who expressed a desire to make a difference in the world, to invent something new, or to travel as key priorities were found to have marginally higher levels of motivation than other students ($p < 0.05$). For example, the level of motivation corresponding to these three aspirations ranged from 73% to 75%, compared to 69% for students who expressed financial security as their key life priority. However, students' intention to work as engineers after graduation decreases as they approach the time of completion of their studies, with the most significant decrease in the second and third years of study.

The discouraging factors mentioned by respondents were low financial remuneration and limited opportunities compared to other fields, for example finance. Intrinsic factors such as boredom and loss of interest were found in the list of impediments to pursuing a career in engineering. Another series of demotivating factors mentioned were the location of companies on the outskirts of large cities, demanding work, recruitment practices, gender, ethnicity.

The results of this paper support the views that many engineering students want to be involved in real-life problems and prepared for careers that will have a significant impact on global issues. Many students are eager to develop the skills necessary for effective career progression. However, where such aspirations are not promoted and supported, concerns such

as financial security, job location and travel opportunities can seriously reduce their motivations. (Alpay et al., 2008)

3. RECOMMENDATIONS FOR ENGINEERING EDUCATION

The context of engineering education is changing. Markets are transcending national borders. Technological chains are connecting more and more companies around the world, requiring a wide range of communication and cultural skills. High quality at low production and service costs is becoming a competitive advantage. In some countries, highly qualified engineers are available at a cost five times lower than those trained in other countries. Engineering work from concept development to production is increasingly oriented towards countries with lower costs. The speed of change dictates the rapid obsolescence of any set of technical skills.

Experts in the field from EU countries note that in recent years there has been a serious underfunding of engineering study programs, and university engineering courses have not had a clear practical content that would ensure the training of graduates capable of meeting the real demands of industry and the corporate sector.

In order to enter the race for innovation, it is imperative that universities implement research programs. Today, in order to be a generator of innovation, an engineer, in addition to the fundamental technical knowledge and skills that he must possess, must also do research work (researcher), be able to organize teamwork (manager), and last but not least, demonstrate leadership qualities. The integrity of engineering education would imply a process of its "humanization". A good specialist should have cutting-edge scientific and technical knowledge combined with cultural training, including artistic training. Technical-artistic training constitutes the foundation of a competent engineer.

Engineering education must be based on a thorough physical-mathematical and scientific preparation. This tradition is specific to French, Russian, but also German engineering education. England was the founder and promoter of purely technical education, focusing especially on the practical training of the "craftsman", the "technician". This type of approach was profitable in the short term, for a long time, the practical technician went ahead of the engineer, but the situation changed dramatically when science gained a fundamental role in the development of technology. The engineer must now have the ability (and the opportunity) to creatively develop his field of activity. Creativity based on science should go ahead of the practical experience of technicians.

An engineer must be simultaneously a scientist, a technical specialist and an organizer of industrial production. An engineer who lacks the ability to manage the activity of an enterprise, in fact, cannot be considered an engineer in the full sense of the word, he remains only a “technician”, “an assistant engineer”.

Providing a holistic education that would include scientific and technical knowledge, the cultivation of managerial and interpersonal skills is difficult within the framework of university studies. If the 20th century was the century of the creation of a mass, universal education system, when each generation possessed a large amount of “formal knowledge” acquired in school and university, now the situation has changed significantly. The new generation has not become more educated than its predecessors (rather the opposite), and the education system itself has begun to degrade everywhere. In this sense, the oldest and most powerful educational institution - the family - with its capacity for holistic education and transfer of "informal knowledge" acquires a major importance. Consequently, engineering training at a university, in a small company or undertaking a complementary education program acquires a holistic personal character. It is particularly important to transmit the vocation within the family. Thus, engineering dynasties make a considerable contribution in this direction.

In the current 20th century, a sufficient amount of knowledge has been accumulated, so that university curricula should be designed in such a way that they acquire the peculiarity of "knowledge in action". The theoretical material proposed to students should have a direct and immediate correspondence with the practical activity that they will carry out as specialists. Familiarization with factory activity should be a direct component of the curriculum, even from the first year of college. This possibility would be advisable to be offered by the faculty through collaboration agreements with companies in the field.

The curriculum in engineering education institutions must be periodically revised, so that the contents that have proven their value over time are preserved and included in the category of classical engineering education contents. It is also required to eliminate outdated contents and replace them with innovative contents in the field of science and technology.

The holistic training of students should include the development of a responsible conscience towards society, the environment, sustainable development. The creation of an engineering product from the formulation of the concept to the issuance of the final product, should follow the principle of friendly inclusion in the environment, pursuing various benefits brought to the environment, society, economy and minimizing any damage that cannot be avoided.

Ideally, education should be designed in two directions: either to solve a pressing problem in society, or to develop an innovative product or system that satisfies the need for efficiency (lower costs, less effort, efficiency, precision, performance). In this case, education will be self-directed, in which the student will be the main actor in the process, and the teacher will support the creative process of each student, offering them theoretical and practical guidelines in the creative process.

The creative focus of engineering education is particularly important because it is in line with the evolution of artificial intelligence and the digitalization of the field, an educational approach that will result in various benefits. On the one hand, students will be able to create innovative products and services at a global level, and on the other hand, they will allow the automation of routine jobs. Such jobs are qualified on the labor market as "bad jobs", which are usually targeted at young people without work experience.

4. CONCLUSIONS

Studies show that young people from the last generation are particularly vulnerable in their insertion into the labor market. Access to good jobs is hindered by the older generation that continues to remain employed even after retirement, thanks to financial insecurity. The transition from studies to work is postponed by generation Z due to the lack of job offers that respond to their interests, preferences and skills. And countries like Germany have managed to facilitate this process through apprenticeship programs. Apprenticeship or mentoring programs should be a component of the curricula in educational institutions

Institutions contribute to keeping young people in a state of uncertainty through the deficient offer of jobs, inadequate opportunities for education and training, retrograde jobs (temporary jobs, underemployment, overqualification, informal work).

Educational institutions and companies in the field should focus on research activity, so as to support the inventiveness and creativity of students. This goal achieved through the collaboration of the two parties will contribute to the reduction of jobs that do not contribute to the professional development of young people and to the emergence of challenging, intellectually stimulating jobs, in line with technological and digital progress.

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