

THE IMPACT OF THE INFORMATION TECHNOLOGY INDUSTRY ON THE LABOR MARKET: THE CASE OF ROMANIA

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Abstract

This paper aims to investigate the influence of the information technology (IT) industry on several economic aspects related to the labor market, with a special focus on the case of Romania. The IT industry is considered the star industry worldwide in very recent economic history amid intense digitalization of any sector. Romania has strongly felt this global IT status, especially in recent years when it became a magnet for IT solutions producers who have found here highly-qualified, cost-effective labor. Romania became one of the fastest-growing IT markets in Central and Eastern Europe, ranking high in the number of certified IT workers. Against this background, the increase of IT jobs has been exceeded by the demand for qualified human resources in the field. As such, the IT market is shaping up as a very competitive one. By selecting a sample of IT employees from the largest centers in the Romanian IT sector, the research included in this paper reveals the multiple impact of the IT industry on employees, their motivation, and their interests. The findings from the research form useful recommendations for policy-makers, to keep the country attractive for investors in the IT field, with proper measures to be taken especially in the fiscal and the educational system.

Keywords: IT industry, labor market, employees, Romania

1. INTRODUCTION

The impact of information technology (IT) on the labor market is a hotly debated topic and has gained increased scientific interest in the literature lately. In a recent study, Herman (2020), assesses the effects of IT on the Romanian labor market, specifically on employment and skills, in a cross-country comparison at EU level. The study finds a strong positive correlation between the digitalization of an economy and labor productivity and reveals some gaps that still exist between Romania and other EU countries [1].

Also, the link between IT development and employment is a controversial one, since worrying reports on the negative consequences of modern information technologies on employment have started to emerge. From the past experience, even if technological progress has destroyed jobs in the beginning, at least in the long-run, through economic growth and development of the economy, it has usually spurred the net creation of jobs. However, IT favors a specific type of skills, which leads to a 'skill-biased technological change' [2]. As various researchers highlight, digitalization changes the rules of the labor market and employment, requiring new competences, modern skills, and proactive attitudes of employees [3].

An extensive review of the literature considering the impact of IT and the digitalization of the economy on employment, productivity and growth is to be found in Abadie et al. (2016) [4]. Also, as Oliner & Sichel (2003) document for the US economy, part of the productivity increase in the late 1990s can be attributed to widespread IT use. They find that the influence of IT investment contributes to efficiency gains, higher productivity and can lead to sustainable fast growth [5]. Findings by Dedrick et al. (2003) lead to similar conclusions [6].

The information technology industry is the star industry in very recent economic history amid intense digitalization of any sector. Romania has strongly felt this global IT status, especially in recent years when it became an oasis, economically speaking, for IT solutions producers who have found sufficient labor here, highly-qualified and at a much lower cost than in other EU countries. Thus, labor productivity is very high compared to other sectors in the Romanian economy, of around 50,000 euro per employee per year [7].

According to statistics, Romania is one of the leaders in the European Union in terms of the number of employees in information technology per capita and ranked inside the top 10 in the world. In 2019 Romania ranked third among Central and Eastern European countries for the overall number of IT employees, with 197,000, after Poland (511,000) and the Czech Republic (214,000) [8].

In the last decade, at least 50 big international companies from the technology sector have opened offices in Romania, including the giant players IBM, Microsoft, Oracle, Intel, etc. At the level of 2019, there were 12,000 IT companies present in Romania, totaling 159 million euro investments and generating 5.9% of GDP, more than the European average [9].

However, experts in the field warn that the current lack of specialized employees is a brake on the growth of the software and services industry. Also, the expectations of IT companies as employers, generally do not match the motivations of IT job seekers, as comprehensively documented in a study by Thatcher et al. (2012) [10] and in Ang & Slaughter (2004) [11]. Against this background, in recent years the growth of IT jobs has been exceeded by the demand for qualified human resources in the field. This situation is mainly found in cities with traditional technical universities. The IT market is shaping up as a very competitive one for Romania, especially as a source of revenue to the state budget, which raises unprecedented challenges to keep it as attractive as possible to investors. In particular, the fiscal apparatus and the education system are the two pillars that need to adapt and even anticipate the necessary measures to be taken.

The issue of structural imbalance between demand and supply, associated with the recent digitalization has been also recognized by researchers from Russia who raised awareness on the fact that there is a certain inertia in the adaptation process of public institutions, which extends the period for reaching an optimal institutional setup [12]. The same issue is highlighted in a paper considering the Ukrainian labor market. The active participation of the government is underlined in order to gain a true balance between the development of technology and the creation of proper conditions for market operation, along with the formation of a favorable regulatory environment, so as to transform labor content and character [13].

2. MATERIALS AND METHODS

The theme of the present research is to investigate the motivations and interests of Romanian employees in the IT industry. Its aim is to provide useful information on the perspectives of IT staff in the current context of the unbalanced demand vs. labor supply in Romania.

Coming from the fact that the research is based on a human resources topic, the author chose as methodology a qualitative type research, to reveal in a more profound way various aspects related to IT employees and their perceptions and viewpoints. The questionnaire was used as an instrument for collecting the data from the surveyed population members.

The surveyed population is represented by IT employees from four big cities with the most important IT hubs in Romania: Bucharest (the capital), Cluj-Napoca, Iasi and Brasov [14].

The research hypotheses are as follows.

General hypotheses:

1. The IT sector is a very attractive professional field for financial reasons.
2. IT workers are prone to radical changes regarding the country and the professional field.
3. Employees who consider the perspective of a career change react mainly to the negative effects of IT work on health.

Statistical hypotheses:

- Most IT employees consider the job offer, both in size and financial reward, as advantageous in relation to other areas.

- Most IT practitioners consider university studies in the field as not absolutely necessary.
- More than 30% of IT staff finds it attractive to emigrate in the near future.
- There is a link between the age of IT employees and the attractiveness of the emigration perspective for them.
- Most of the IT staff who are attracted by the emigration perspective in the near future would choose destinations in Europe.
- Sedentarism is the main harmful element of IT work.
- There is a link between professional experience and net income.
- There is a link between the age and the net income.

Basic aspects	Researcher's questions	Research objectives
1. Identifying the perception of IT staff about the sector in general: attractiveness, motivation, conditions, training.	1. Does the IT staff consider the sector attractive in terms of job offer and financial supply, locally? 2. What are the main motivations for IT employees to work in this sector? 3. How necessary does IT staff considers university-level studies to work in this sector? 4. Which is the most effective way of training from the point of view of IT staff?	1. Identify the perceptions of IT employees about local job offer in terms of available jobs. 2. Identify the IT staff perception of locally-based job provision from a financial point of view. 3. Identify the main motivations for which IT employees have chosen to work in this sector. 4. Identify the degree of necessity of specialized studies to work in the IT sector, from the employees' point of view. 5. Identify the most effective way of training from the point of view of IT staff.
2. Identifying the medium-term vision of IT staff	1. Does the IT staff consider the perspective of emigration in the medium term? 2. What are the main destination countries for IT employees who consider the medium-term migration perspective to be attractive? 3. Does IT staff consider the scenario of career change? 4. With regard to the previous question, what is the main reason for this option? 5. Taking into account the scenario of career change, which are the most attractive areas for IT employees?	1. Identify the attractiveness of the emigration perspective for IT employees in the medium term. 2. Identify the main destinations for IT employees who consider the medium-term emigration perspective attractive. 3. Identify the extent to which IT employees take into account the career change scenario. 4. Identify the main reason for IT employees who consider the career change scenario. 5. Identify the most attractive areas in which IT employees would change their career.
3. Identifying the IT sector risks from the employees' perspective	What are the most damaging elements for IT staff and what are the possible solutions from the perspective of employees in the sector?	1. Identify the most damaging elements of IT work from the employee perspective. 2. Identify solutions to counteract the damaging elements of IT work from an employee perspective.

4. Characterization of respondents	1. How can respondents be classified according to different characteristics? 2. What are the links between the characteristics of the respondents and the different variables of the research?	1. Identify the criteria by which respondents can be classified. 2. Identify the links between the characteristics of the respondents and the various variables of the research.
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Table 1. Research objectives

Source: The author

The sample consists of 220 employees (55 from each of the four cities mentioned in the beginning of the section), randomly chosen with an online application used for this purpose. The group of persons selected for this research was based on the snowball sampling technique, by which participants referred to others with similar characteristics. In non-probability sampling, the attempt is not driven towards arriving to a representative sample. However, the number of respondents is large enough to generate some pertinent findings.

The implementation of the questionnaire was done online, using the Google application form. Respondents received a link in their email address and were asked to fill in and submit the questionnaire online. Prior to sending the access link, the respondents were approached by email and informed about the subject of the experience survey. Respondents were also asked to confirm after completing the questionnaire. So, the author was able to return to the sample representatives who did not confirm, and make sure that all the answers needed for each city were recorded.

Following the collection of data, the analysis and its results, as well as the testing of the general hypotheses formulated as a starting point of the research, are presented in the next sections.

3. RESULTS

The results of the research are presented in graphical form, comprising a sequence of figures that depict the answers of the respondents to the online questionnaire. The first aspect considers the attractiveness of the job offer in the IT sector, both from the point of view of its size, and the financial reward it conveys (Fig. 1 and Fig. 2).

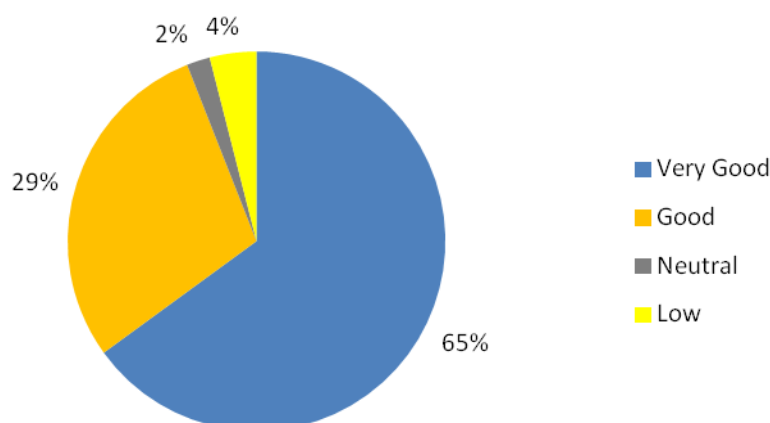


Fig. 1. Attractiveness of job offer, related to size

Source: The author

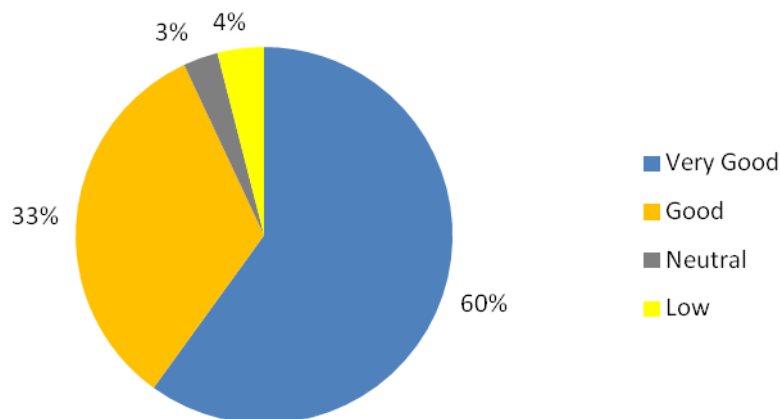


Fig. 2. Attractiveness of job offer, related to financial reward

Source: The author

Among practitioners in the IT sector there is an ongoing debate whether education and studies in the IT field is necessary to work in the sector or not. The answers on this topic are illustrated in Fig. 3.

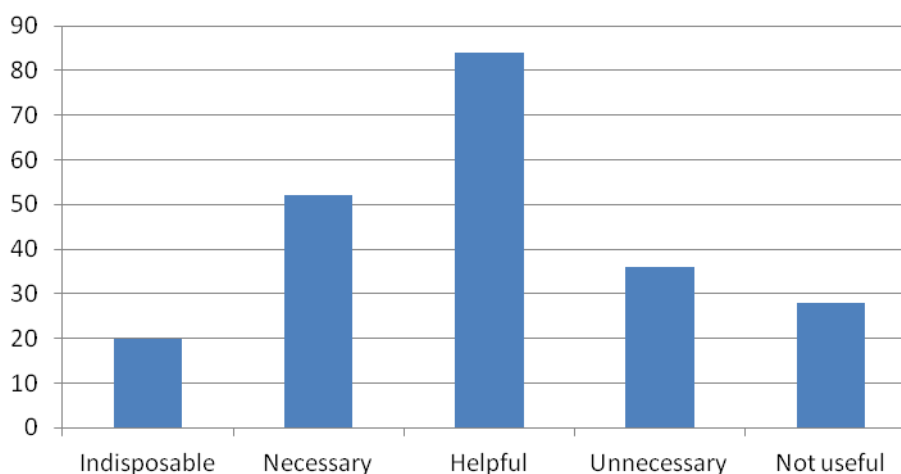


Fig. 3. Need of IT studies, to work in the sector

Source: The author

Many IT employees choose this career out of passion, or for a variety of reasons. The most important ones, as stated by respondents, are depicted in Fig. 4.

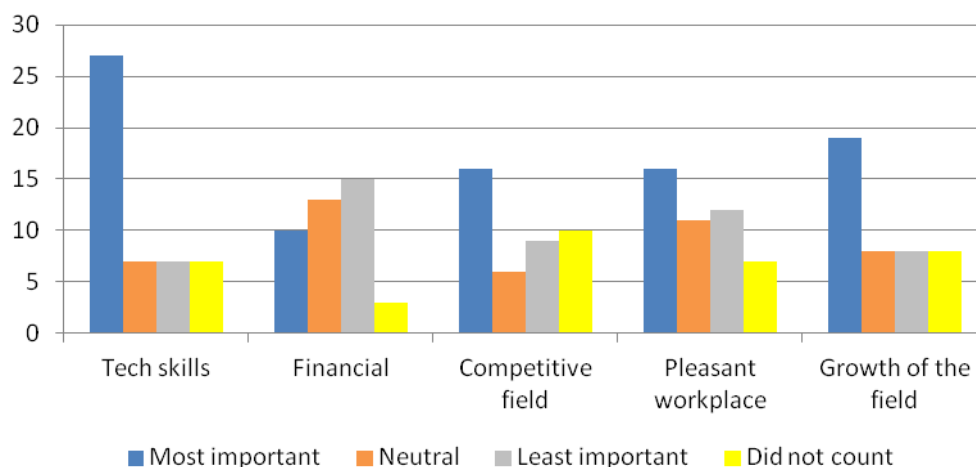


Fig. 4. Reasons for choosing to work in the IT sector

Source: The author

Due to the fact that on-the-job practice is very important in the IT sector and many officers start working at an early age, training methods may vary. The efficiency of different methods is assessed by respondents in Fig. 5.

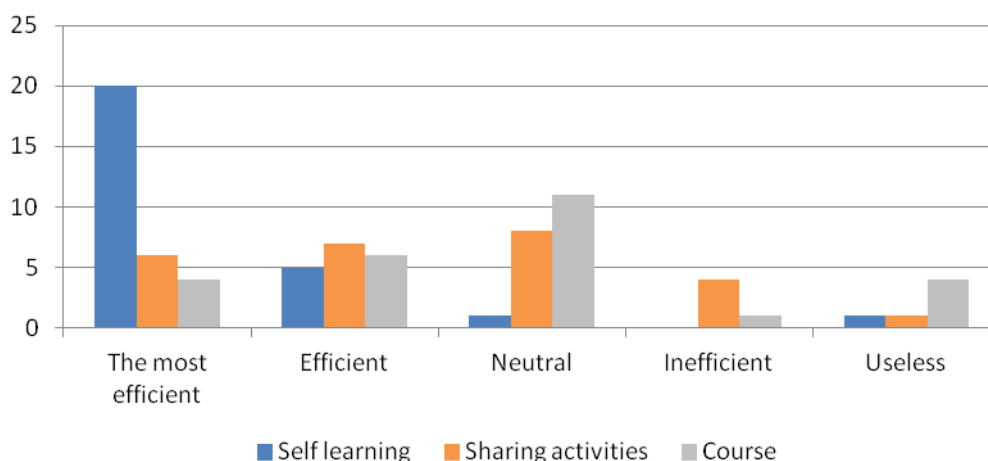


Fig. 5. Most efficient training methods in the IT field

Source: The author

Being such a competitive field, with high wages paid worldwide, and a huge demand for skilled IT workers, Romanian employees in the sector always have the looming perspective of emigration to another country in search for a better employment. This possibility is taken into account by 40% of respondents, while the majority of them prefer to remain in the home country (Fig. 6).

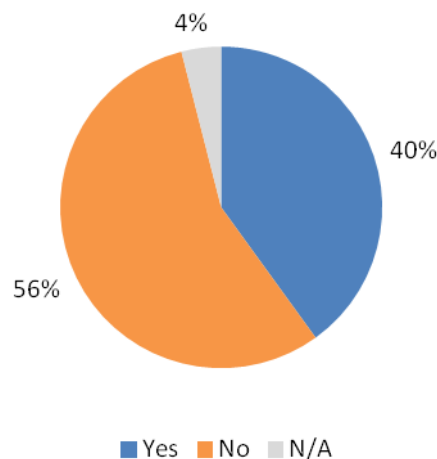


Fig. 6. Attractiveness of emigration perspective

Source: The author

For those who take the emigration perspective into consideration, there is a host of choices for their preferred country of destination, mostly European countries, but also some exotic options (Fig. 7).

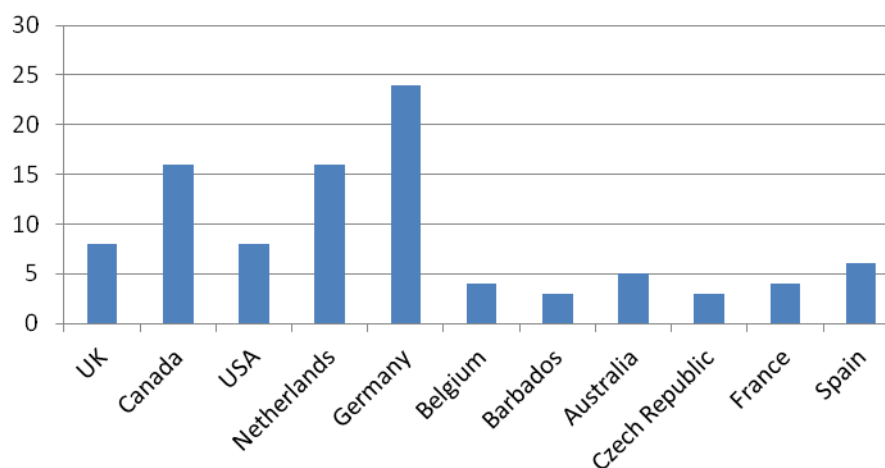


Fig. 7. Preferred country for emigration

Source: The author

Respondents were also asked about how long they intend to work in the IT sector, given the current satisfaction and dissatisfaction associated with this job. Their opinions are shown in Fig. 8.

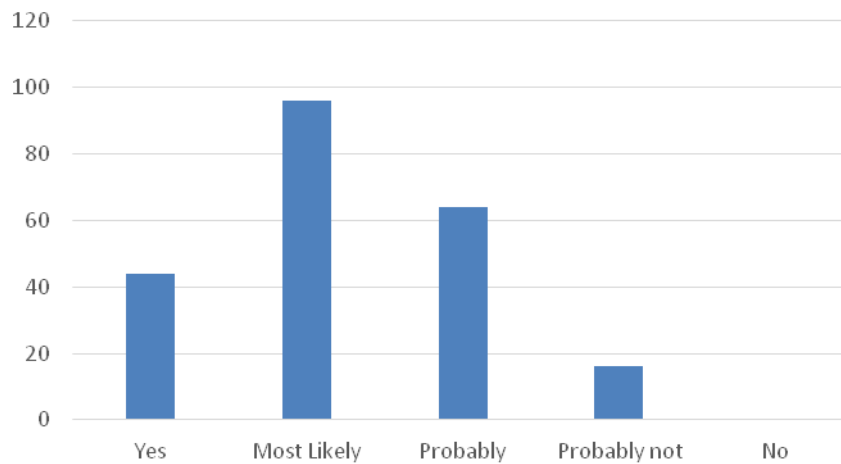


Fig. 8. Life-long length of IT career

Source: The author

For those employees who consider a career change at some point, the research wanted to investigate what would be the most important reasons behind this decision (see Fig. 9).

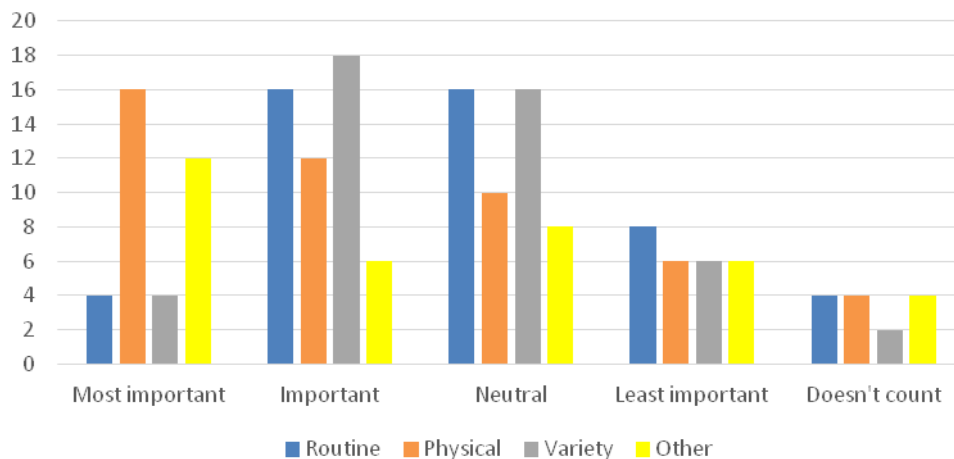


Fig. 9. Reasons for career change

Source: The author

Also, in the event of a career change, IT employees might consider various alternatives regarding their possible employment, which are depicted in Fig. 10.

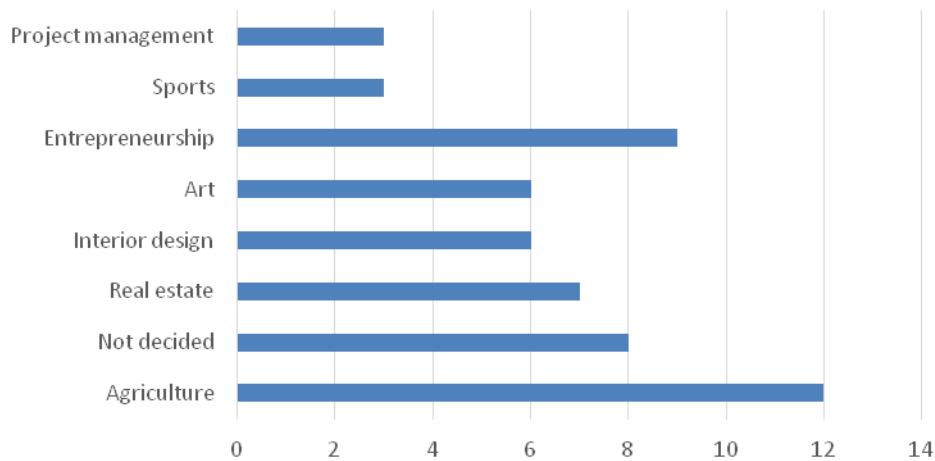


Fig. 10. Fields of interest when considering a career change

Source: The author

Besides its financial advantages, work in the IT sector is associated with several harmful aspects which arise from the nature of this type of work. The respondents were asked to indicate some of these aspects (Fig. 11).

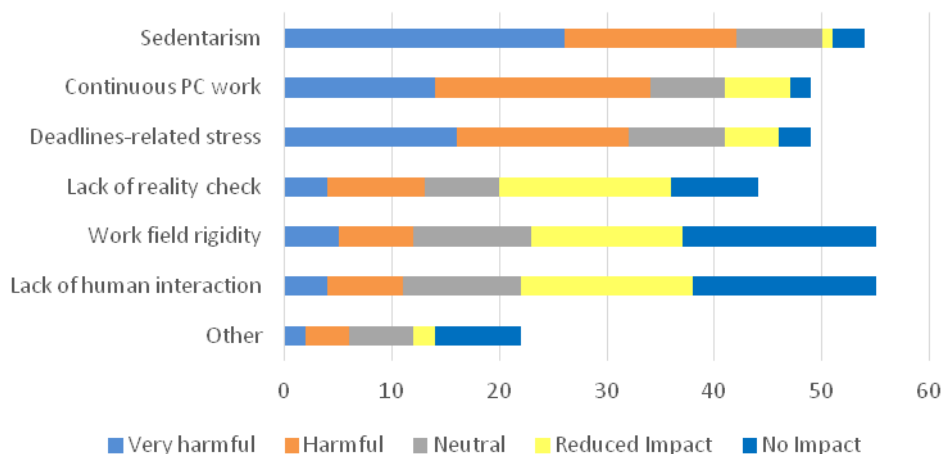


Fig. 11. Harmful aspects of IT work

Source: The author

Finally, respondents also suggested some possible solutions to mitigate and overcome the harmful factors that come along with work in the IT sector (Fig. 12).



Fig. 12. Solutions for avoiding the harmful aspects of IT work

Source: The author

A more detailed analysis and discussion of the results obtained from the research is presented in a compact manner in the next section.

4. DISCUSSION

Given the main theme of the paper, the impact of the IT industry on the labor market, the empirical research was conducted on topics that deal with the demand / supply ratio and various aspects pertaining to human resources, namely motivations and interests of IT workers. The first findings reveal that the majority of employees in the Romanian IT sector consider the attractiveness of the job offer to be “very good” or “good” in terms of size, i.e. number of jobs, and financial reward (a cumulated 94%, and 93% respectively). As such, the first general hypothesis, that the IT sector is a very attractive professional field for financial reasons, is validated.

In many countries, Romania included, a lot of IT officers gain self-experience from early ages and not all of them follow specialized studies until they are employed by IT companies. When asked about the importance of formal IT education, only 9% of respondents considered it “absolutely necessary”, while most of them (38%) just thought of it as “helpful”. On the contrary, 13% assessed it as “not useful”. Not surprisingly, when various training methods were put under scrutiny, self-learning was considered the most efficient way, while formal IT courses were mostly deemed “useless”.

IT work is a highly-skilled, demanding, but passionate work. Also, IT jobs are some of the best-paid jobs inside the country. Interestingly enough, participants in the survey considered the financial aspect to be the least important for choosing a career in the IT sector. As the most important for reasons for embarking on a IT career, tech skills were cited as the main rationale (16%), followed by the solid growth of the IT sector (9%), the competitive nature of the field (7%), and the pleasant workplace, alongside interesting colleagues (7%). Overall, IT employees seem to display a high loyalty towards their work. A consistent 44% of them envisage a life-long career in IT, 29% consider it probable, while at the opposite end, there was not a single respondent determined to quit.

Emigration is usually an alluring option for IT workers in Romania, as demand in developed countries for such skills is high and better-paid jobs are relatively easy to find. However, only 40% of the respondents in the survey took this option as a real alternative to working in the home country. Accordingly, the second general hypothesis, that IT employees are prone to radical changes regarding the country and the professional field, is not validated by the findings of the research. Most of those interested to emigrate (80%) fall into the category of age ranged between 26 and 35 years. For those inclined to continue their career abroad, 11% indicated they would opt for emigration to Germany, followed by 7% to Canada and The Netherlands respectively, and smaller percentages to the United Kingdom, the United States, and other destination countries (mostly European countries).

Even if most of IT employees prefer to stay in the home country, if given the opportunity to switch their career, participants rated "physical reasons" as the most important factor (7%), while "variety" and "routine" were cited as important by 8% and 7% of respondents, respectively. For the few ones inclined to switch, their preferred field of choice after giving up their IT career, comprises agriculture (5% of answers), entrepreneurship (4%), real estate (3%), interior design (3%) and art (3%). Also, half of the respondents attracted by the emigration idea, are also inclined toward long-term career change.

Despite being an intelligent and creative activity, IT work is also competitive and challenging. As the most harmful aspects of employment in the IT sector, participants in the survey indicated sedentarism (19% of answers), followed by continuous PC work (15%), and deadlines-related stress (14%). Thus, the third general hypothesis, that employees who consider the perspective of a career change react mainly to the negative effects of IT work on health, is validated. Possible solutions to combat the harmful aspects of IT work suggested by respondents include: sports and outside activities (13% of answers), more breaks during the work program (6%), some of the work to be done in standing position (6%), a reduced work schedule (5%), more variety (4%) and a gym subscription as part of the social benefits (4%).

Participants in the experience survey were also classified according to several typical criteria, such as age range, experience, city where they live and work, education profile, and income. When relating the findings of the research to these variables, some links became obvious, for instance a positive relationship between age and income, and another one between experience and income.

5. CONCLUSIONS

By carrying out a research on the motivations and interests of the Romanian employees in the IT sector, the author tried to deepen at an empirical level the understanding of the workings of the labor market and the impact of IT on it.

From the point of view of human resources, the satisfaction of the IT employees who participated in the experience survey is very high. One of the topics that aroused a special interest in the research was the attractiveness of the emigration perspective for IT workers. As can be seen from the findings of the research, the two perspectives (emigration vs. home country) are relatively balanced, with a higher percentage of those inclined to stay at home (in Romania). Maintaining a competitive environment, both quantitatively and qualitatively, in the field of IT for human resources must be a concern both at national level and at the level of each individual company.

Thus, the recommendations at company level are as follows:

- to study the reasons for dissatisfaction of young employees, who are most attracted to emigration;
- to stimulate 'self-learning' as a method of professional training, which is the most effective from the point of view of the respondents;
- to combat the main negative effects of IT work, as highlighted by the research, and to implement the solutions suggested by employees to counteract such harmful aspects.

From the point of view of the general IT sector, it generates the following benefits for the economy: creation of well-paid jobs, it is a solid source of financing to the state budget, and it has a positive

impact on internal consumption. Therefore, IT companies must be considered relevant by public authorities. IT companies are generally good contributors to the state budget, the imbalance between demand for human resources and supply making tax evasion difficult. The author believes that investment in this field should be supported for the stability of the sector and its continuous growth.

A close communication between the public and private sector is recommended in order to acknowledge the needs of the major players in the IT sector. This will make it possible to step in and stimulate the areas that are still troublesome and avoid transfers of investment to other countries, given the harsh competitive environment in Eastern Europe.

Specifically, the two fiscal incentives that the IT sector is currently enjoying in Romania need to be continued, namely: IT-specific, income tax exemptions, and tax exemption on reinvested profits in the acquisition of technology equipment and embedded assets. Their positive effect in keeping a higher share of IT workers from emigrating, as well as stimulating investment, has been proven over the last years. These should also be adapted once the market evolves. For the income tax exemption for IT employees, currently there is a condition in place of graduating from higher education, but in the market, and as revealed by the present research, many experts consider higher IT studies to be unnecessary to work and perform in this area.

The main limit of this research is brought by the impossibility of extending the results obtained, a limit imposed by the specifics of the methodology used. Additionally, the research has been undertaken only on respondents in Romania. Despite these limits, the author considers that the paper brings a valuable empirical contribution to studying the characteristics of the labor market in the IT sector. Starting with these considerations, future research could be directed to investigating the motivations and interests of IT employees in other Central and Eastern European countries, which would permit cross-country comparison of results and pave the way for a more complex quantitative research that would allow for the extension of the results.

REFERENCES

1. Herman, E 2020, "The Influence of ICT Sector on the Romanian Labour Market in the European Context", *Procedia Manufacturing*, vol. 46, pp. 344-351.
2. European Parliament 2018, "The impact of new technologies on the labour market and the social economy", European Parliamentary Research Service, Brussels.
3. Chinoracky, R, Corejova, T 2019, "Impact of Digital Technologies on Labor Market and the Transport Sector", *Transportation Research Procedia*, vol. 40, pp. 994-1001.
4. Abadie, F, Biagi, F, Jaksic, K, Jemmotte, S, Marino, S, Piroli, G, Xavier, A 2016, "The labour market implications of ICT development and digitalization", In: European Commission, *Employment and Social Developments in Europe*, EC, Brussels, pp. 148-186.
5. Oliner, SD, Sichel, DE 2003, "Information Technology and Productivity: Where Are We Now and Where Are We Going?", In: Ginther, DK, Zavadny, M, Foley, LH (eds), *Technology, Growth, and the Labor Market*, Springer, Boston, pp. 41-94.
6. Dedrick, J, Gurbaxani, V, Kraemer, KL 2003, "Information Technology and Economic Performance: A Critical Review of the Empirical Evidence", *ACM Computing Surveys*, vol. 35, no. 1, pp. 1-28.
7. Invest Romania 2021, "Romania's Business Service Sector IT&C, SSC & BPO", Ministry of Economy, Business Environment and Tourism, Bucharest.
8. ANIS 2020, "Study on the Romanian Digital Economy", Patron Association of the Software and Services Industry, Bucharest.
9. Paraschivoiu, A 2019, "The Contribution of IT in GDP – Present and Perspectives", *Capital*, 15 March, p. 10.

10. Thatcher, J, Dinger, M, George, JF 2012, "Information Technology Worker Recruitment: An Empirical Examination of Entry-Level IT Job Seekers' Labor Market", *Communications of the Association for Information Systems*, vol. 31, no. 1, pp. 1-34.
11. Ang, S, Slaughter, S 2004, "Turnover of Information Technology Professionals: The Effects of Internal Labor Market Strategies", *The Database for Advances in Information Systems*, vol. 35, no. 3, pp. 11-27.
12. Matraeva, L, Vasiutina, E, Belyak, A 2020, "The effects of digitalisation on the labour market: the case of Russia", *Work Organisation, Labour & Globalisation*, vol. 14, no. 2, pp. 31-45.
13. Ilich, L 2017, "Impact of ICT on Labor Market Development: Main Trends and Prospectives", *Open Educational Environment of Modern University*, no. 3, pp. 55-68.
14. Barbuceanu, A 2017, "The Analysis of IT Investments in Romania", BSc Thesis, Transilvania University of Brasov.