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Gender Aspects in ICT Managers Education at PUEB Czech Republic

Aspectos de género en la formación de directivos de TIC en la PUEB República Checa

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Abstract

The ongoing digitalisation of the economy places great emphasis ongreatly emphasizes the number and quality of ICT professionals. In addition, it is very important for master's degree programmes that the investment in individuals' education is effective, i.e., that they complete their studies successfully and enter the workforce after the standard period of study. The ICT sector has long suffered from a lack of women and the female factor in project teams. Does the gender factor play a role in these realities? Therefore, for the purposes of this article, we have selected the following three research questions from our long-term research, and formulate answers to them in this article:

- RQ1: Is the share of women in master's informatics degree programs growing over time?
- RQ2: Do women graduate from master's informatics study programs earlier than men?
- RQ3: Is the completion rate of women higher than that of men?

The source of the data is time series a time series of data on students at the Prague University of Economics and Business (PUEB) for the academic years 2013/2014-2022/2023. On the basis ofBased on the analysis, we can conclude that the proportion of women studying master's degree programmes is increasing over time (from 20 % in AY 2013/2014 to about 33 % in AY 2022/2023), as is the number of successful female graduates. The duration of the Master's degree is approximately 0.1 semester shorter for women than for men, and the completion rate is also higher for women for 8 percent points inby 8 percent points on average during the period 2013-2021.

***Keywords*:** ICT Managers, ICT Management Studies, Gender Aspect in ICT Education, Completion Rate.

Resumen

La digitalización en curso de la economía pone un gran énfasis en la cantidad y calidad de los profesionales de las TIC. Además, es muy importante para los programas de máster que la inversión en la formación de los individuos sea efectiva, es decir, que completen sus estudios con éxito e ingresen al mercado laboral después del período estándar de estudio. El sector de las TIC ha sufrido durante mucho tiempo la falta de mujeres y el factor femenino en los equipos de proyectos. ¿El factor de género juega un papel en estas realidades? Por lo tanto, para los fines de este artículo, hemos seleccionado las siguientes tres preguntas de investigación de nuestra investigación a largo plazo y formulamos respuestas a ellas en este artículo:

- RQ1: ¿Está creciendo con el tiempo la proporción de mujeres en los programas de máster en informática?
- RQ2: ¿Las mujeres se gradúan de los programas de estudios de máster en informática antes que los hombres?
- RQ3: ¿La tasa de finalización de las mujeres es mayor que la de los hombres?

La fuente de los datos es una serie temporal de datos sobre los estudiantes de la Universidad de Economía y Negocios de Praga (PUEB) para los años académicos 2013/2014-2022/2023. Sobre la base del análisis, podemos concluir que la proporción de mujeres que estudian programas de máster está aumentando con el tiempo (del 20 % en el año académico 2013/2014 a aproximadamente el 33 % en el año académico 2022/2023), al igual que el número de mujeres graduadas con éxito. La duración del máster es aproximadamente 0,1 semestres más corta para las mujeres que para los hombres, y la tasa de finalización también es mayor para las mujeres en 8 puntos porcentuales en8 puntos porcentuales en promedio durante el período 2013-2021.

Palabras claves: Gestores de TIC, Estudios de Gestión de TIC, Aspecto de género en la Educación en TIC, Tasa de finalización.

Introduction

Nowadays, when there is an effort in developed companies to digitalize not only basic processes but almost all processes, including processes of public and state administration and processes in the business sector, it is necessary to provide many additional conditions for this change. One of the most important factors on which societal change depends is the mindset of the general population, i.e., the willingness to change their existing habits, which have done quite well without the deployment of Information and Communication Technologies (ICT). Nowadays, this phenomenon is referred to as the digitalisation of society. In this context, however, it should be noted that introducing digital applications into everyday life is only a technological problem, but the actual acceptance of these technologies, whether by workers or citizens, is another matter. A phenomenon of our time is ChatGPT. In this context, ChatGPT, as a representative of advanced artificial intelligence, is facilitating digital transformation by improving communication between people and technology, automating routine tasks, providing personalised support in education and healthcare, and thereby simplifying access to information and services, thus promoting a more efficient and connected digital society.

The stated priority of the digitization process is increasingly encountered in virtually all business organizations today, mainly due to the introduction of Large Language Models (LLM) into common use. By using various technological tools, we are trying to adapt common work processes to ICT-enabled processes and thus generate larger and larger volumes of digital data. We then store these in data lakes, warehouses, databases or files and firmly believe we will return to them over time and finally analyse them properly. As a result, well-intentioned efforts to increase the efficiency of processes may lead to increased complexity and difficulty in management.

Another factor in human potential is a sufficient number of skilled workers who will be willing to work in ICT and work efficiently and effectively. However, in addition to these, it is also necessary to ensure that there are enough well-qualified ICT experts and ICT managers who will be able to manage and steer such a

transformation in the right direction. However, sufficient funding and the political will of the stakeholders must also be an essential part of this overall socio-political change. This will is linked to developing digital infrastructure, which is key to all these processes. The problem of ensuring a sufficient number of skilled workers is very closely linked to the ability to select such workers, particularly among young people, and then to educate them accordingly or to educate them over the long term in various forms – from school classes to lifelong learning systems.

Projections of the number of skilled ICT workers for the European Union can be seen in strategic materials such as (EU4Digital, 2021). Here, the target is formulated "It is our proposed level of ambition that by 2030: - In addition to the target on basic digital skills established in the European Pillar of Social Rights Action Plan, there are 20 million employed ICT specialists in the EU, with convergence between women and men." Other considerations presented in the article confirm the estimate of the further development of the number of ICT professionals needed (Zatonatska et al., 2022). The projected requirements for ICT professionals and specialists by the Member States with the largest labour markets for ICT professionals are presented here. In addition to the market issues for ICT professionals, the article also looks at the number of students who may enter these ICT professional positions. Reflections on estimates of the number of professionals and students who graduate and enter these positions need to be made regularly for two reasons in particular. One is the simple turnover of the workforce due to their aging as well as the obsolescence of their ability to adopt and work with new technologies, and the second reason is the attrition of top ICT professionals in practice. People at the top ICT management positions (Chief Information Officer – CIO, Chief Security Officer – CSO, Data Protection Officer – DPO, Project Manager - PM, etc.) are only able to perform such tasks for a limited time, and then they have to be replaced by workers with new creative potential (Ahmed & Yang, 2017). All these factors increase the need for highly educated ICT professionals in practice. However, their number depends on the capacity of educational institutions to produce them. The Czech Republic is able to produce approximately 2,000 ICT managers, specialists, and technicians per year, although the annual need of the economy is approximately 2,300 specialists and

technicians per year. These are essentially the three groups of professionals that the economy needs for the operation of information technology. According to the International Labour Organization (2024) classification, these roles are defined as follows.

- ICT Managers (ISCO 133);
- ICT Specialists (ISCO 25); and
- ICT Technicians (ISCO 35).

ICT Managers – plan, manage, and coordinate the purchases, development, maintenance, and use of computer and telecommunication systems. They work in management sections or as CEOs of an enterprise or organization without a management hierarchy. The necessary education for this category of professionals is a university degree or MBA level education.

ICT Specialists – research, plan, design, write, test, provide consultations, and improve IT, hardware, software, and related concept systems for specific applications; process related documentation, including policies, principles, and procedures; design, develop, supervise, maintain and support databases and other information systems to ensure their optimal performance and data integrity and security. This category of professionals also needs a university education. However, it should be noted here that the role of the developer, for example, may be compromised in view of the above-mentioned emergence of language models, copilots, and other representatives of artificial intelligence, as people with less experience and ability can handle the development of solutions. In principle, it will be enough for them to have logical thinking and the ability to understand, analyse and design a solution to a problem. New technical means can then help with the actual creation of the code.

ICT Technicians – support the regular operation of computer and communication systems and networks and perform technical tasks related to telecommunications and to the transmission of image, sound, and other types of

telecommunications signals on land, on the sea or in the air. Most occupations in this class require high school skills and knowledge.

However, it is important for the functioning of ICT in the whole economy that the quality of knowledge and skills is ensured in all the above categories of employees. In addition to quality, another very important factor is the representation of women in particular professions, as gender heterogeneous collectives are likely to motivate workers more and also to achieve better overall performance (Oskrdal et al., 2011). Working in such collectives is highly desirable from an employer's perspective, but heterogeneous collectives pose a risk in the form of the gender pay gap (Shah & Krishnan, 2024) and the overall way in which remuneration is set within organisations.

The basis for the successful functioning of ICT professionals in practice, and by this, we mean not only in the ICT sector but in the whole economy, is their education level from secondary to higher education. While the secondary level of education for ICT professionals is more widely acceptable in terms of work for professions that can be included under the category of ICT Technicians (ISCO 35) (Nedomova et al., 2017), other professions are fully associated with higher education, both bachelor's, master's or even doctoral degrees (Doucek et al., 2023). However, this "school-based" mode of education cannot, especially in the ICT field, end with school leaving but must be appropriately complemented by the other two modes of education, namely commercial and lifelong learning. ICT is one of the fields that are developing dynamically; therefore, it is impossible to stand still in its adoption into the everyday life of organisations. It is necessary to follow current trends and also to be able to cope with their impact on the running of organisations – an example of which is the recent introduction of cloud services and the change in the understanding of data management with regard to cloud technologies. An example in the Czech Republic is the Prague University of Economics and Business, which provides MBA education in various disciplines, offers lifelong learning courses, and enables practitioners to participate in mainstream teaching.

Setting the way and techniques of education is quite important in terms of the applicability of ICT graduates in practice. If we want a well-functioning economy supported by ICT, it is necessary to have a balanced structure of education methods. Education is one of the priorities of the European Union countries, especially in the areas of computing and ICT work. For example, the source (EU4Digital, 2021) states the assumption of investment in ICT: "Analysis made by Commission services for the recovery estimated at €125 billion per year the needs for ICT investment and skills to close the gap with leading competitors in the US and China. The European Investment Bank has flagged the risk that instead of increasing their investments, 45% of firms would reduce them after the COVID-19 crisis." Another source (Zatonatska et al., 2022) then states, "The increasing trend of e-commerce and the implementation of information and communication technologies (ICT) systems led to significant changes in the labour market. The most visible effect can be seen in the employment rates of personnel who differ by education attainment level. Widely available self-study resources and the high pace of digitalization forced employees to transfer between qualification levels. All middle and low-skilled ICT personnel can be promoted to the high-skilled group. However, according to statistical data, the demand for high-skilled personnel is not as big as for middle – and low-skilled personnel." Although these sources nowhere mention specifically investment in ICT training, it is clear that the need for educated and well-qualified ICT professionals is growing. Following the requirement for 20 million ICT professionals in the EU by 2030, the EU has announced training projects for 2024 totalling €42 million. The main objectives of this training campaign are:

- Funding of €30 million will help design and deliver education programmes in the area of advanced digital skills for developers and users of advanced digital technologies. These will be created by consortia of education, business, and research organisations.

- A coordination and support action, with €2 million worth of investment, will help analyse the advanced digital skills needs in Europe in the key digital areas and strategic sectors.

- To help address the lack of cybersecurity professionals in the EU, €10 million is being invested in the launch of the Cybersecurity Skills Academy. This will fund the implementation of new training and the scale-up of successful ones with a special focus on the needs of Small and Medium Enterprises (SMEs) and public administration. (European Commission, 2023)

The training of ICT professionals can itself be seen from the perspective of state economies as a multidimensional problem, the complexity of which increases with the advent of new principles and practices. One side of the coin is the investment that flows into education – both European and national; the other side is the quality and applicability of the graduated ICT professionals in business. Here, we come across another essential issue of the whole process: the number of IT graduates in universities – the graduation rate. Graduation failure, especially in public universities and ICT-oriented programmes, is one of the most problematic features of Czech higher education. In undergraduate programmes, it reaches 60 to 70 percent in some study programmes – and technical and computer science programmes, in particular, are at the top. In this respect, the Czech Republic is one of the worst countries in the OECD and the European Union (Mačí, 2020). The problem is not only statistical. High academic failure represents a highly inefficient expenditure of public budgets. At the same time, it is demotivating for teachers and students, who are disappointed and leave their studies prematurely. Student success also significantly affects the achievement of strategic and quantitative objectives in higher education at the national and European levels. The attainability of the set benchmarks and targets is quite strongly reduced by the declining success rates of students in different types of studies. In response to this obstacle to the achievement of the goals of higher education development and population education, a number of strategic documents also seek to address the increase in student success rates (MSMT, 2016). Data for 2018 suggest that the long-term trend of increasing undergraduate academic failure in the Czech Republic after 2014 has stopped. The failure rate is now stagnant, and there may even be a slight decline, which can be seen as a positive impact of a number of measures taken at the level of universities and their faculties and institutes aimed at better informing applicants, expanding the

offer of compensatory courses, greater flexibility of study, strengthening social and academic integration, and others. However, a more accurate assessment of the change in trend will only be possible with more time. In contrast to bachelor's programmes, there has been an increase in the failure rate in follow-up master's programmes, especially after 2014. While the overall failure rate is less than one third and therefore significantly lower than in bachelor's programmes, this trend should be considered as a warning.

Graduation and time to degree are paramount concerns in higher education today and have caught the attention of policy makers, educators and researchers in recent years. However, our understanding is limited regarding the factors related to graduation and time to degree beyond students' pre-college characteristics (demographics and academic preparation), especially how student decision and performance in college affect their graduation (Yue & Fu, 2017).

The time-to-degree is not a purely academic problem; on a larger scale, it has become an economic and political problem. If the student's tuition is paid for with public funds (tax funds that are used to pay for public universities), it is necessary to take into account the state budget expenditures. This is why both politicians and universities are not motivated to unnecessarily prolong studies. The study time also depends very much on graduates' motivation to start working. Do student advantages outweigh starting salaries or part-time job advantages? (Messer & Wolter, 2010)

The Faculty of Informatics and Statistics is one of the faculties with the highest academic failure rate among the faculties of PUEB (Šperková & Nedomova, 2015). The academic failure rate is significantly higher at the faculty in bachelor studies. This article, which is part of a more in-depth analysis of the learning outcomes at the faculty, shows what the academic failure rate is at the master's level.

Problem formulation

The aim of this paper is to reflect on the gender characteristics of the study of management master's degree programmes at the Prague University of Economics and Business and to follow their development in the Czech Republic from the academic year 2013/2014 to the academic year 2023/2024, i.e. to the present. This is a study at a public university subject to the laws and rules of the Czech Republic. This means that students of Czech-taught study programmes study free of charge (they do not pay tuition fees during the regular study period, but only some very low administrative fees e.g. for the entrance exam – about 50 Euro). The regular study period for the Bachelor's degree is meant to be six semesters, which can be extended by up to two more semesters for a total of eight. The maximum period of full-time study for the free Master's degree is four semesters in total, with the possibility of extension to six semesters. After this period, students also in Czech degree programmes pay for their studies. The amount for each additional year of study corresponds to EUR 1,640 for the first year of extension and EUR 1,380 for each semester of further extension.

Given the breadth of the issue, the granularity of our research, and the limited space for presenting our analyses and research, we have formulated the following three research questions for the purposes of this paper:

- RQ1: Is the share of women in master's informatics degree programs growing over time?
- RQ2: Do women graduate from master's informatics study programs earlier than men?
- RQ3: Is the completion rate of women higher than that of men?

The answers to these questions show the differences between women and men in the concept of studying ICT management master's programmes and their development over the past ten years.

Methodologies and Data

Data collection

The main source of data for this paper is information stored in the Prague University of Economics and Business (PUEB) Information System, which was first put into routine operation in its current form in 2009. Data on admissions were included in the system in the academic year 2010/2011. For the purposes of our paper, we process data only from the academic year 2013/2014, as since then, we have a de facto stable data base where both data on the outcome of the admission procedure and data on all relevant attributes related to the characteristics of both the applicant and the study programme to which they applied are available. The data is updated in our data warehouse once a year, always at the beginning of November. In our case, we are working with data from November 2024. However, this means that we are also working with data from students from the academic years 2022/2023 and 2023/2024 who have not currently completed their studies - there is a significantly lower "Completion rate". This fact is reflected in Figure 3 and also discussed in Table 3 in its context.

The data processing itself is strictly anonymous according to the requirements of Act No. 110/2019 Coll. on the processing of personal data.

Methods

The actual process of working with data at the university level is as follows:

- The data are exported once a year from the UEPB university information system into different text files, which contain only the data not yet exported.
- Data is uploaded to the data warehouse using big data processing tools. In our case, the data warehouse is built on top of Microsoft SQL Server technology and the native ETLs of this system are used for processing.
- Data are processed using Microsoft Analysis Services, Microsoft Excel and Python.

The data for this paper was extracted from the university information system by SQL queries that selected anonymous records of students on all ICT management degree programmes. To answer RQ1, we analysed the time series of all students admitted to study in the relevant year. To answer RQ2, we analysed the graduation rates of each year up to the years where we have a lower graduation rate because students do not study for the expected four semesters (the standard length of study, which can be extended by an additional two semesters), but for longer. However, this fact does not affect the results presented because we are interested in the average duration of the study (here calculated on the basis of a weighted average of the number of graduates per semester in which they graduated), and this is not affected by the lower number of graduates. On the basis of the results, we have also compared the average length of study in Master's programmes by the method of payment for studies - the length of free study with the length of study of self-payers. The answer to RQ3 was obtained from the analysis of the study success time series. We calculated these values separately for each academic year, broken down by female and male.

General data characteristic

The data file with entrance exams currently includes approximately 6.600.000 records about student exams and approximately 380,000 records about applications to study that the University has collected since 2010. Each record provides information about the admission procedure result of one student and other student´s attributes as, for example, are - gender, field of study, faculty, and type of study, entrance exam result and information about whether or not a student passed the entrance procedure and if she/he was accepted. Files also contain content information about each examination and its results. For the purposes of this article, we analyzed more than 55,000 records of students' academic performance in the courses they studied and more than 3,500 records of overall student performance in the Faculty of Computer Science and Statistics' master's degree programs focused on information and communication technology management.

Results and discussion

The overall trend in the number of students enrolled in the Management ICT Master's degree programmes from academic year (AY) 2013/2014 to the end of the period under review, i.e. by AY 2023/2024, has increased by almost 30% from an initial number of 281 female students to 365 in AY 2023/2024. The trend in the proportion of female students is shown in the following Figure 1.

- RQ1: Is the Share of Women in Master's Informatics Degree Programs Growing Over Time?

The answer to the first research question can be found in Figure 1. The time series shows that from an initial ratio of 19% female to 81% male in the academic year 2013/2014 to a ratio of 33% female to 67% male in the academic year 2023/2024.

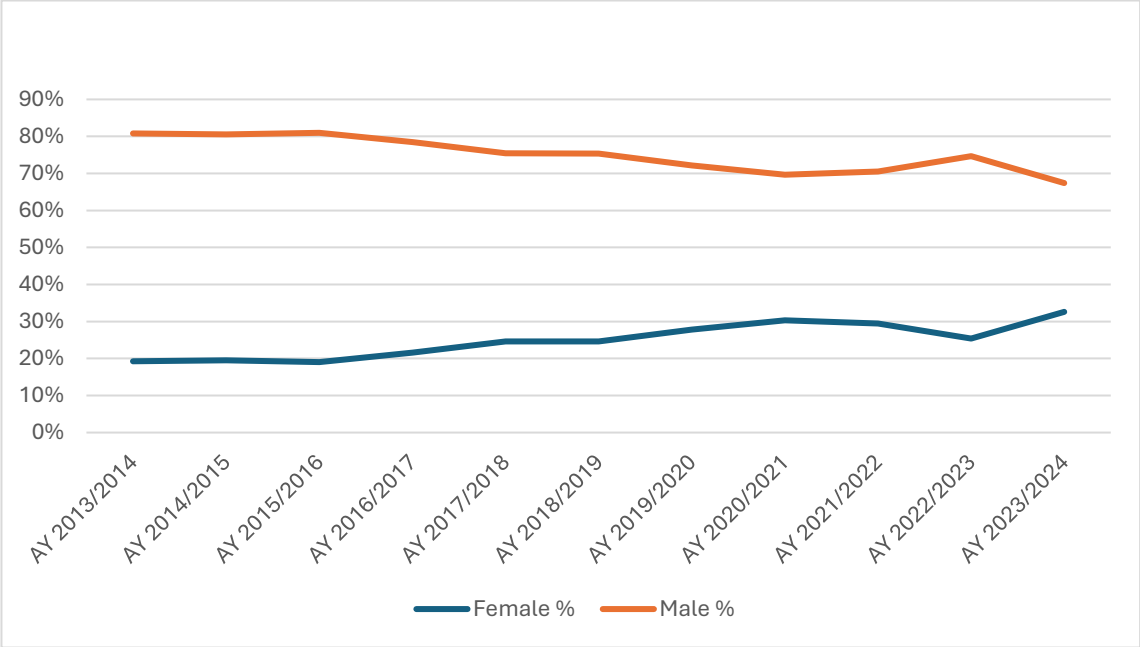

Figure 1. Share of female in master's informatics study programs

Over the whole period under review, there is a clear trend towards an increasing number of women in Master's studies. The trend is not very sharp (eleven

percentage points in ten years), but it is stable. The exception is the academic year 2022/2023. However, this academic year, there has been an overall decrease in the number of female students, which corresponds to the decrease in the number of female students. The number of male students enrolled this academic year remained virtually unchanged compared to the previous academic year. The observed trend is positive as the work in project teams, especially in the implementation of information systems in the practice of consulting, is very diverse and the female element has an irreplaceable role in it (Oskrdal et al., 2011).

The second research question in our paper concerns the length of study of women and men in ICT-oriented management degree programmes.

- RQ2: Do Women Graduate from Master's Informatics Study Programs Earlier than Men?

The average study period differs by 0.1 semester between women and men. This difference is not significant and corresponds to the fact that both genders have a relatively similar approach to their studies and motivation to complete them.

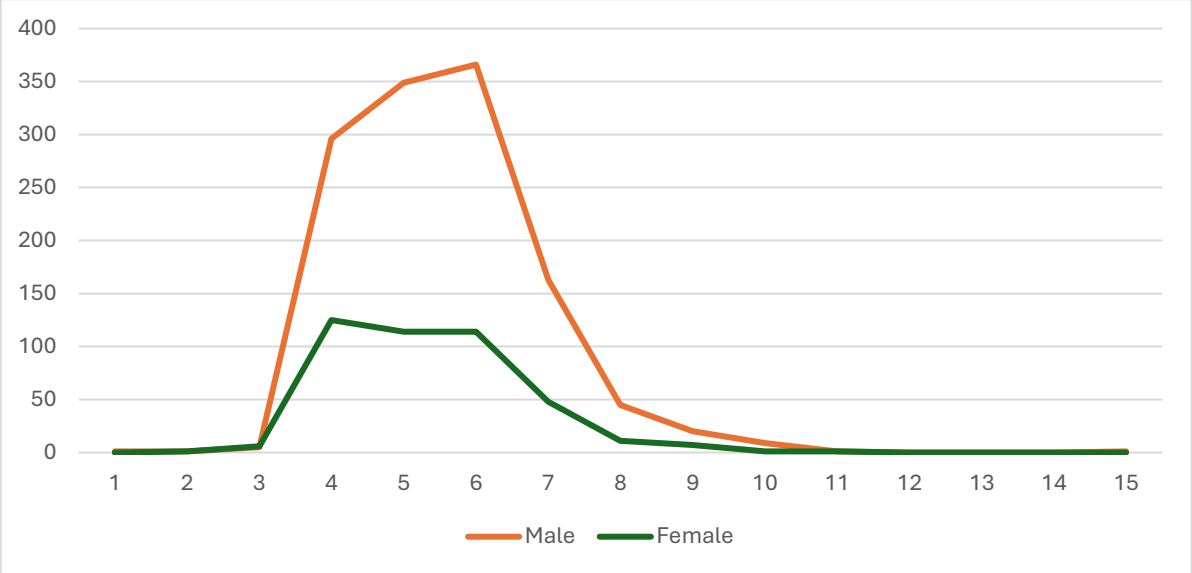

Figure 2. Graduation graph - graduation rates by gender and by semester

The distribution of graduation rates between women and men is shown in Figure 2. This distribution shows that for males, the most frequent semester of graduation is semester six, while for females, the most frequent semester of graduation is semester four, followed by semester six.

Table 1. Frequencies of graduation in different semesters

Semester	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average
Male	1	1	5	296	349	366	163	45	20	9	1	0	0	0	1	5,23
Female	0	1	6	125	114	114	48	11	7	1	1	0	0	0	0	5,13

Note. The effect of one student graduating in the fifteenth semester on the overall average score is marginal.

Graduation time is influenced by two main factors in the PUEB context. The first factor is that practically all students work mostly part-time during their studies in various companies dealing mostly with information technology issues. The second factor is the fact that they are students of Czech study programmes that allow free studies for the basic period of study (four semesters) and two additional semesters. Students have to pay for further studies (approximately 1.400 Euro for each semester). Here is an even more interesting comparison with previous research we conducted in this area in 2022 (Maryska et al., 2022). That research compared graduation times between different degree programmes of the Master of Management at the Faculty of Computer Science and Statistics. Selected results are presented in the following Table 2.

Table 2. Analysis of study time by study programmes (Maryska et al., 2022)

Study Programme	AI	AI-P	AI-D	QM-CZ	ISM	QM_A
Average Successful Students	5.41	5.41	5.42	5.45	4.58	4.20
Average Unsuccessful Students	3.18	3.33	2.63	3.05	2.13	3.75

Note. **AI -** are all students in the Applied Informatics program in the Czech language. **AI-P** are full-time students in the Applied Informatics program, **AI-D** are distance learning students in the Applied Informatics program. **QM-CZ** are students in the Quantitative Methods program in the Czech language. **ISM** are students in the Applied Informatics program - Information System Management in the English language (self-payers). **QM-A** are students in the Quantitative Methods program in the English language (self-payers).

Comparing with the current research, it can be concluded that students of the study programmes under study try to keep to the maximum standard study time in order not to have to pay for their studies. This can be seen in Table 1 as well as in the previous analyses presented in Table 2 (the average study time across all degree programmes is 5.42 semesters. The value is affected by the significantly higher number of students in the Applied Informatics - AI degree program). The data in Table 2 for paid degree programs (programs taught generally in a foreign language, in FIS terms in English) are very interesting. These are the ISM and QM_A programs. Here, the students are self-paying, i.e., they pay for their studies. The average duration of study is found to be approximately one semester shorter here (the effect of gender characteristics on the length of study is minimal, as can be seen from Table 1). This clearly suggests that if students pay their own tuition (or if their studies are subsidized by a particular government - government scholarship holders who participate in these study programs), they have a significant incentive to minimize their study time.

RQ3 seeks to answer the question whether there is a higher success rate for women or men in studying management master's degrees with a focus on information and communication technologies.

- RQ3: Is the completion rate of women higher than that of men?

Based on the identified data, we constructed a time series of completion rates in each academic year for females and males separately. The results are presented in the following Figure 3.

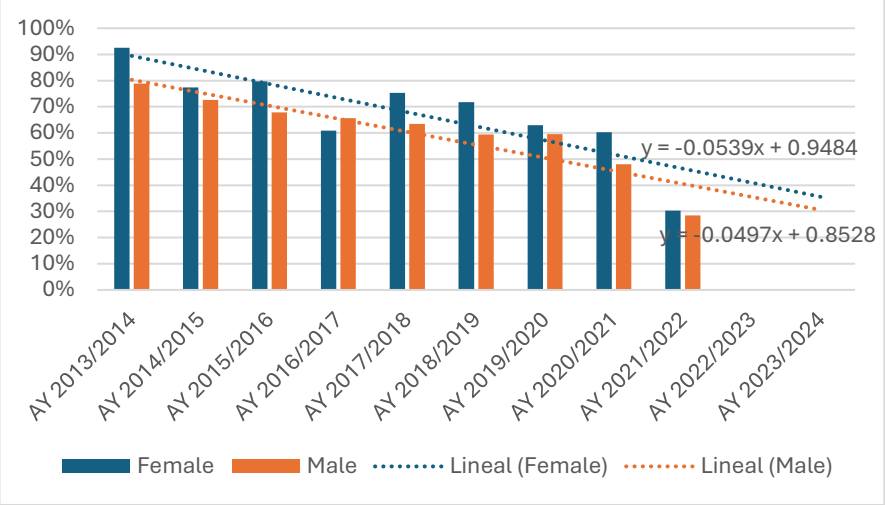

Figure 3. Completion rate by gender

Although we analyse the time series from 2013 to 2024, it does not make sense to calculate or take into account the observed Completion Rate values of the academic years 2022/223 and 2023/2024 because, as shown in Table 3 below, a relatively large percentage of students are still studying or have interrupted their studies.

Table 3. Proportion still studying by gender in each academic year

Academic Year	In Study or Interrupted	
	Female	Male
2013/2014	0%	0%
2014/2015	0%	0%
2015/2016	2%	0%
2016/2017	0%	0%
2017/2018	0%	1%
2018/2019	1%	4%
2019/2020	6%	6%
2020/2021	17%	19%
2021/2022	39%	41%
2022/2023	78%	70%
2023/2024	82%	80%

Note. The data in the table shows what percentage of students by gender are either studying or have interrupted their studies, i.e. have not completed their studies either successfully or unsuccessfully.

The predictive power of the Completion Rate data is already very limited for the 2021/2023 academic year, given the percentage of students still enrolled. Completion Rate results for students enrolled in the 2022/2023 and 2023/2024 academic years are not practically provable.

Looking at Figure 3, it can be seen that the completion rate is higher for women than for men. This is a consistent trend except for the 2016/2017 academic year, when the completion rate for males was five percentage points higher. The likely reason for this may be the impact of the Covid 19 epidemic, as there was a step change in the mode of teaching from face-to-face to virtually permanent online teaching at that time. In the same way, the relevant examinations were conducted mainly in the form of online tests. Students who started their studies in the COVID period then have a higher Completion rate than students who started their studies later. Here, however, is the fact that many students from later entry years have not yet completed the degree – Table 3.

Another trend observed is a steady decline in the Completion rate over the period under review. The approximation of the linear function of the decrease in Completion rate is expressed as a function of $y = -0.0539x + 0.9484$ for women and $-0.0497x + 0.8528$ for men. Both linear functions show a long-term decline, with men showing at least a slower decline than women. The data for the academic year 2020/2021 and beyond can fill us with optimism, as there is still a relatively significant percentage of students who have not completed their studies and, therefore, have a chance of successfully completing them.

However, if we compare the decline in graduate success rates from the 2013/2014 academic year only to the 2020/2021 academic year when the data still show an acceptable level of students who have not yet completed their studies (17% of females and 19% of males), the linear functions of the decline in success rates look very similar - for females, it is a function of $y = -0.0366x + 0.891$ and for males it is a function of $y = -0.0367x + 0.8095$. The coefficients before the value of the variable x differ by one ten-thousandth. This suggests that gender has virtually no impact on reducing the completion rate for management master's degree programs.

Rather, the selection of students to study or other factors such as the difficulty of some of the courses taught or project work during the course of study may be to blame. The situation in the labour market may also be another possible factor in the success or failure of the studies. In the current conditions of the Czech Republic, there is a significant shortage of workers and students, especially of computer science degree programmes, are in practice confronted with offers of full-time jobs at very favourable salary conditions, including other employee benefits. This trend is especially evident in larger cities where management informatics programmes are studied and where multinational or international organisations are located. In these companies, the wage conditions are close to the European Union standard, i.e., significantly higher than the average in the Czech Republic. The gross monthly nominal wage in Prague, for example, is approximately 22% higher than in other regions of the country (Czech Statistical Office, 2024) and amounts to approximately 1.700,- Euro. The median gross monthly nominal wage in the Czech Republic in the same period was EUR 1,466, while for men, it was EUR 1,582, and for women, it was EUR 1,352.

Conclusion

In our article, we have examined the impact of gender on selected characteristics of the study of management master's degree programmes at the Prague University of Economics and Business and have followed their development over the last eleven years. To the formulated research questions, we came to the following answers:

- RQ1: Is the share of women in master's informatics degree programs growing over time?

The share of women, or their interest in studying master's management ICT programmes, has been increasing over the period under review (Fig.1). This is not a dramatic increase, but it is nevertheless evident from the results. There was a 14-percentage point increase in the proportion of women over the period under review. If this trend is maintained, there will be an equalisation of the number of women and

men in these degree programmes in 38.4 years. Here, however, I have to take into account that young women not only in the Czech Republic are increasingly interested, especially in managerial positions in future jobs (Deloitte Insights, 2022) and, on the other hand, that after all, substantive solutions in the field of information and communication technologies are more technologically oriented. The latter fact works rather against the growth of women in ICT management degree programmes. However, women in these positions also have to deal with a range of prejudices in the social, technical, customary and historical fields. There are still challenges and barriers that need to be overcome to achieve gender parity in the field of ICT and ICT Professionals jobs.

- RQ2: Do women graduate from master's informatics study programs earlier than men?

As for the answer to the second research question, we were surprised to find that the time required to complete the degree for both men and women is virtually the same, with the "Time to degree" being 5.23 semesters for men and 5.13 semesters for women. The graph in Figure 2 shows a slightly different distribution of graduation frequency, which the average calculation erases. For males, the most frequent semester of completion is semester six (they would have to pay to study in the next semester), while for females, there are two peaks in the completion frequency curve - namely semester four and semester six.

The extension of studies beyond the minimum study period is mainly due to two factors. The first is the fact that virtually all of our students are working during their studies (Gwosc et al., 2021). Interestingly, from a European perspective, Czech students rank third among countries in terms of the number of students working during their studies (about 92%). Only Romania and Turkey have a higher proportion of people working during their studies (Gwosc et al., 2021). The positive thing about working while studying is that they work in organizations, usually in IT departments, where they have the opportunity to verify the theoretical knowledge acquired through teaching and also to connect and complete it into a whole with the acquired

knowledge of practical management of business informatics. The second factor is the students' one-semester stays abroad when they have the opportunity to complete part of their education at a foreign university.

Here, it is probably worth noting a fact that we have come to in other research on the "Time to degree" variable in our students. This fact is that if a student pays for their own tuition costs (self payer category), his/her average time to degree is shorter (Table 2).

- RQ3: Is the completion rate of women higher than that of men?

In the data analysis of the completion rate (we had to reduce the data sample to a period of only eight academic years), we concluded that it is higher for women than for men. Its value varied between 93% and 61% for women and 79% and 48% for men.

Another finding is that the completion rate is decreasing over time. The exceptions are AY 2017/2018 for females and AY 2019/2020 for males.

We need to reflect on this fact and investigate more deeply the reasons for the steadily declining completion rate, also for the sake of efficient spending of public financial resources on the training of ICT managers.

Open issues

Another area of research that we want to address in relation to this issue is the gender pay gap in the Czech ICT sector and then in ICT Professionals, namely in all three categories - ICT Managers (ISCO 133); ICT Specialists (ISCO 25); and ICT Technicians (ISCO 35). Here, we would also like to analyse the differences in the gender pay gap between the business sphere and the sphere of public and state administration.

Another area of research may be to analyse the results of entrance exams or results from secondary schools on the basis of which students were admitted to

study and their relationship to the observed outcomes such as Completion Rate and Time-to-Degree.

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