Completion Rate on Informatic Studies – Prague University of Economics and Business

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Abstract In 2019, the Czech society overcame a regular decrease in the number of university applicants, where the number of teenage potential applicants reached its minimum and began to go up again the following year. However, even this fact did not ease the pressure on rational education spendings. This naturally leads to an increasing need to monitor the success rate of studies. In this paper, we analyze the data of time series starting in 2010, which contain information about students of full-time and distance learning study programs at the Faculty of Informatics and Statistics of Prague University of Economics and Business. We evaluated the data, using the standard functions of MS Excel, SPSS software package and R product. The results of our analysis show that the total "Completion Rate" in informatics study programs ranges between 75.50% and 40.29%. The average length of successful studies is between 5.69 and 4.58 semesters in study programs for which students pay tuition fees. The median of the duration of successful studies is between 4 and 6 semesters. On the other hand, dropouts study between 2.673 and 3.90 semesters. The median is between 2 and 3 semesters.

Keywords: ordinary study, full-time study, distance study, higher education, completion rate, ICT study programmes.

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1 Introduction

A significant drop in the number of 19-year-olds in the Czech population, especially in the years 2010 - 2015 (by about 30%), became first evident in a secondary education and then also in a tertiary education. Based on demographic estimates (Doucek et al., 2007), the number of people in this stratum in the Czech Republic should gradually increase starting in 2020. However, this increase will not be as dramatic as the decrease in the previous years. This gives rise to a number of questions about financing the education of this category of the population and about the efficiency and usefulness of such investments. The Czech Republic, as an integral part of the European Union, respects the EU strategy of strengthening the number of university-educated people in the total population, both in the CR and the entire EU. The basic framework of this strategy has been laid down in particular in: „In the perspective of the Europe 2020 Strategy, including the ambition to have at least 40% of the 30-34 years olds holding a tertiary education qualification by 2020, the issue of increasing education attainment is gaining importance in the national and international debates in higher education. Reducing dropout and increasing completion are regarded prime strategies to achieve higher attainment levels. A key concern is that too many students in Europe drop out before obtaining a higher education diploma or degree" (Quinn, 2013).

In response to the EU requirements, we can see the attempts of the Ministry of Education, Youth and Sports of the Czech Republic to adopt an active policy monitoring "Completion Rate," Time to Degree" and "Dropout" indicators in the Czech tertiary education system, with a special focus on doctoral studies. This new strategy, which is currently underway, puts more emphasis on monitoring these three indicators in particular (MŠMT, 2020).

National governments and HEIs use different orientations to guide their policy-making with respect to study success:

- **Completion:** to have students successfully complete their study programme with a degree.
- **Time to Degree:** to have students complete their study programme within a reasonable time period.

- **Retention or Dropout:** the aim to have students re-enroll in a study programme until they complete their degree and to reduce the likelihood they drop out before completing their programme.

The 2011 Modernisation Agenda rightfully states that it takes a joint effort of all member states, HISs (Higher Education Institutions) and the European Commission to take a pro-active approach in working towards the objectives and increasing participation and attainment in higher education (Quinn, 2013).

All these discussions about a timely completion of study programs and the minimum study time of dropouts also lead, in a broader context, to the implementation of other new teaching methods as well as to a different measurement of teaching results. There are new trends in the self-assessment of university studies as well as in education feedback assessment. (Evans, 2020). Very up to date prolem is impact of the »Time to degree« indicator on labour market. Some analysis of this problem are represnted f.e. in Aina et al., 2011; Aina et al.; 2020, Brugiavini et al.; 2020, Maryska et al.; 2018 and Messer & Wolter, 2010.

2 Problem Formulation

The aim of the paper is to analyze the "Completion Rate" in informatics study programs at the Faculty of Informatics and Statistics of Prague University of Economics and Business that were taught in Czech during the years 2010-2021. Additional side effects of our research include findings about how long successful students of these programs study and how long dropouts attempt to study. For the purposes of our research, we formulated the following research questions.

RQ1: What is the "Completion Rate" of students in follow-up graduate study programs at FIS?

RQ2: How long does it take to successfully complete these study programs?

RQ3: How long do dropouts study in follow-up graduate study programs at FIS?

3 Material and Methods (Data Collection)

The basic source of data for our research was the database of students and their study results at Prague University of Economics and Business. This database is part of the university's study system and includes all information about applicants, admitted students and their study results.

3.1 Methodology

Information in Prague University of Economics and Business's Information System, which was put into operation during 2009, was the key data source for this paper. This is why, we used data from 2010 and the following years, which provide complete information – i.e. entrance examination results as well as all relevant attributes characterizing both the applicant and the study program to which he or she applied. The data are updated in our data warehouse once a year, always at the beginning of November. In this case, we worked with data from November 2021. Of course, students who were admitted in 2020 and 2021 have not yet completed their studies. Nevertheless, they are included in our research as students, and if they successfully complete their studies, they will only increase the "Completion Rate."

We need to emphasize that all data in our data warehouse are anonymized in compliance with the requirements of Act no. 110/2019 of Coll. on the processing of personal data. They are processed as follows:

- Data are exported once a year from the UEP Information System to distance text files (these files contain only data that have not yet been exported).
- Data are uploaded to the data warehouse, using big data processing tools. In this case, the data warehouse was created in Microsoft SQL Server 2008, and the native ETL (Extract, Transform, Load) tools of MS SQL Server 2008 are used to process data.
- Data are processed, using analytical tools in the form of Microsoft Analysis Services and Microsoft Excel and the SPSS statistical system and, in some cases, the statistical tool "R."

For the purposes of this article, we were extracted data from the university information system based on SQL queries that selected anonymous records about students in all graduate study programs in the study field "Applied Informatics." We analyzed data starting the year 2010 all the way to 2021 entrance examinations.

3.1 General Data Characteristics

The data file with entrance exams currently includes approximately 1.850.000 records that the University has been collecting since the year 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 content information about each examination and the result of it.

4 Results and Discussion

Based on SQL queries, we obtained a total of 3,215 study records as of September 2021. They concern students of the Applied Informatics study field that includes seven study programs taught at FIS. Five study programs are taught in Czech and are in the form of full-time study (IM, IST, CI, KT a KWT). During the analyzed time period, specifically in 2014, the Knowledge Technology study program (KT) was replaced with the Knowledge and Web Technology study program (KWT). The Business Informatics study program (BI) is taught in the form of distance learning. The Information System Management study program (ISM) is taught in English and students pay tuition fees.

Tab. 1 Results for ICT Oriented Master Studies Programmes at FIS UEP

Study_Programme	IM	IST	CI	KT	KWT	BI	ISM
No of Students	641.00	1759.00	165.00	78.00	149.00	350.00	73.00
No Succesful Students	464.00	1328.00	102.00	49.00	65.00	141.00	52.00
Average Succesful Students	5.48	5.37	5.40	5.41	5.69	5.42	4.58
STDEV Succesful Students	1.49	1.41	1.67	1.47	1.78	1.51	0.67
Median Succesful Students	5.00	5.00	5.00	5.00	6.00	5.00	4.00
No Unsuccessful Students	134.00	319.00	53.00	29.00	62.00	171.00	9.00
Average Unsuccessful Students	3.07	3.69	3.30	3.90	3.10	2.63	2.78
STDEV Unsuccessful Students	6.07	6.80	4.66	6.16	4.09	3.24	7.51
Median Unsuccessful Students	2.00	3.00	2.00	3.00	2.00	2.00	2.00
Studying	43.00	112.00	10.00	0.00	22.00	38.00	12.00
Completion Rate	72.39%	75.50%	61.82%	62.82%	43.62%	40.29%	71.23%

source: authors

Remark to Table1: Explanation to study program names: Full-time study: IM – Information Management, IST – Information Systems and Technology, KE - Knowledge Engineering, CI – Cognitive Informatics, KT – Knowledge Technologies, KWT – Knowledge and Web Technologies, ISM – Information System Management (taught in English, individual paid study programme), BI – Business Informatics (distance learning).

Let's look at the answers to our research questions, as provided by the analysis of data extracted from the university information system for the time period from 2010 to 2020.

RQ1: What is the "Completion Rate" of students in follow-up graduate study programs at FIS?

Summary information about the "Completion Rate" in individual study programs is shown on the last line of Tab. 1. The "Completion Rate" ranges from 40.29% for the Business Informatics study program to 75.50% for the Information Systems and Technology study program. Two full-time study programs that are taught in Czech and have the largest number of students - Information Management and Information System and Technology - show the "Completion Rate" over 70%. The "Completion Rate" of the Information System Management study program taught in English is 71.23%; this is because students are motivated and because they have to pay tuition fees, which increases their motivation.

The Business Informatics study program, where the "Completion Rate" is 40.29%, is rather specific. It is a distance learning program, which is relatively demanding on students who have to study while working in the business sector. The "Completion Rate" is impacted by both their workload during certain time periods and their ability to cope with two parallel roles – as students and employees.

RQ2: How long does it take to successfully complete these study programs?

The time needed to successfully complete studies - the "Time to Degree" indicator – is provided in two different values in Tab. 1. The first one is the average study time and the second one is the median of the semester in which students successfully complete their studies. Tab. 1 clearly shows that the average for Czech study programs is between 5.37 semesters (the IST study program), which is the minimum, and 5.69 semesters (the Knowledge and Web Technology study program), which is the maximum. The results of other study programs taught in Czech are very similar- around 5.40 semesters. The Information System Management study program taught in English is an anomaly; in this case, the average study time is 4.58 semesters, which is shorter by almost one semester. We believe that it is because students have to pay tuition fees.

We reach a very similar conclusion if we use the "Time to Degree" median. We can clearly see that the median of successful completion of Czech study programs is five semesters (with the exception of the Knowledge and Web Technology study program, where the median is six semesters). On the other hand, the median for the Information System Management study program is four semesters. Once again, students try to complete their studies in due time without any further extension.
The relatively small standard deviation indicates that it is a homogeneous data set in this research area.

RQ3: How long do dropouts study in follow-up graduate study programs at FIS?

How long dropouts study is another indicator that has an impact on the efficiency and usefulness of tertiary education spendings. The answer to this question is provided in Tab.1.

The average number of completed semesters in Czech study programs is over three semesters. The minimum average is in the Information Management study program (3.07 semesters) and the maximum average is in the Knowledge Technology study program (3.90 semesters). The shortest time was discovered in the Business Informatics distance-learning study program taught in Czech, which is followed by the Information System Management study program taught in English - 2.78 semesters. All study programs show a relatively big standard deviation, which indicates that there are some outliers, such as dropouts after nine and more semesters.

When comparing the median, we can see (Tab.1) that the usual median of the number of semesters studied by dropouts is two semesters. The Information System and Technology study program and the Knowledge Technology study program, with the median of three semesters, are an exception.

5 Conclusions

The 2015 EU report provides the following information about the "Completion Rate" for EU Member States: "Student completion rates within higher education vary considerably from 59 % in Norway to 81 % in the UK, figures for Spain, Portugal and Kosovo are approx. 80 %, 65 % and 64 % respectively" (Vossensteyen at all 2015). A comparison with these "Completion Rates" shows that the "Completion Rate" above 70% is very good and above 60% is acceptable. The "Completion Rate" of 43.62% for the Knowledge and Web Technology study program requires a more detailed analysis. This "Completion Rate" mainly stems from the start of this study program, where students had different expectations than what the study program offered. Therefore, many students dropped out during the first two or three semesters. This trend has lately reversed.

We still have rather few data for some of the analyzed study programs, in particular for the Information System Management study program.

When comparing data from the study programs taught in Czech, which are paid for by the Ministry of Youth and Sports of the Czech Republic, with data from the study programs taught in English and paid for by students, we can conclude that students are motivated to complete studies within the regular study period (these study programs take four years) when they have to pay tuition fees.

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