Employment of Business Informatics Graduates: Preliminary Results

Pejić Bach, Mirjana; Šebalj, Dario; Garbin Praničević, Daniela; Pihir, Igor

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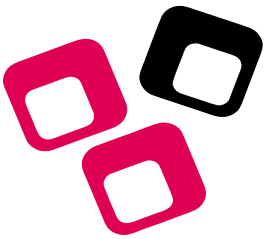

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Preface

The Central European Conference on Information and Intelligent Systems (CECIIS) has been annually held since 1989. International participants, program committee and reviewers have promoted CECIIS to the most important conference in the area of applied information science in Central Europe. These are also prerequisites for referring the CECIIS Book of Proceedings to prominent databases. The Conference and its accompanying events are certainly the most significant scientific event organized by the Faculty of Organization and Informatics of the University of Zagreb. From the early beginnings to the present, the main aim of CECIIS is to foster the cooperation among researchers involved in the development and application of methods and techniques in the field of information and intelligent systems. The special topic of this year's conference is digital transformation, a comprehensive business transformation that seeks out all the advantages and opportunities of contemporary digital technologies and their impact on society.

The Proceedings of CECIIS 2018 include 28 scientific papers, each peer-reviewed by two independent reviewers and approved by the international Program Committee within the following sections: Computer Games, Data and Knowledge Bases, Education and Learning Analytics, Emerging Trends in ICT, ICT Entrepreneurship and Innovation, Intelligent Information Systems, Quality of Software and Services, Software Engineering, Strategic Planning and Decision Making. After the conference, the selected papers are further reviewed by two independent international reviewers with the aim to include the best papers in the Journal of Organizational and Information Sciences (JIOS), the international scientific journal published by the Faculty of Organization and Informatics.

The poster and presentation section for students organized within CECIIS gathered students from Croatia (Varaždin), USA (Cincinnati and Pittsburgh) and Albania (Shkodër). The poster abstracts are published separately on-line. The special value of this year's conference were the outstanding invited lectures held by two esteemed researchers:

- Dimitris Karagiannis (University of Vienna, Faculty of Computer Science, Vienna, Austria) - The impact of digitization on industry: a research perspective
- Dieter Hertweck (Reutlingen University, Faculty of Computer Science, Herman Hollerith Research Centre, Reutlingen, Germany) - The Digital Transformation in the manufacturing sector - Challenges and Chances for SMEs

Furthermore, several parallel events were held:

- 2nd Workshop on Data Analysis
- professional tracks: Digital Transformation of Educational Institutions
  Computer Games - Professional Development
- e-Schools Day - presentations and workshops of the national project "e-Schools: Establishing a System for Developing Digitally Mature Schools (pilot project)"
- project presentations - e-Schools, HigherDecision, CRISS, DIGITRANS and ISSES
- CECIIS 2018 conference sponsors' events.

We would like to express our kind gratitude to the invited speakers, authors, reviewers, session chairs, attendees, organizers of parallel events, as well as Program and Organizing Committee members for their contributions. We acknowledge that the organizational and supporting assistance and hosting of the Faculty of Organization and Informatics was crucially important for the overall success of the Conference. Finally, we are most grateful to all our business partners and sponsors for their support.

We believe that the following pages will provide you with relevant and interesting papers in the field of information and intelligent systems and we look forward to your participation in one of many CECIIS conferences to come.

September, 2018

On the behalf of the
Program and Organizing Committees

Vjeran Strahonja and Valentina Kirinić

Employment of Business Informatics Graduates: Preliminary Results

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Abstract*. Business informatics graduate studies aims at developing both information and business related skills, such as business process management and business intelligence, which are nowadays crucial for the competitiveness of modern companies. Goal of the paper is to discuss the employment trends and opportunities of students that graduate at one of the Business informatics graduate studies taught at the Croatian economic and organizational faculties: Faculty of Economics in Osijek, Split, Zagreb, as well as Faculty of Organization and Informatics in Varaždin. In addition, the abovementioned graduate study programmes are discusses in relation to European e-Competence Framework.*

Keywords. Business Informatics, students, employment, ICT role profiles, European e-Competence Framework

1 Introduction

The rising digitalization and complexity of modern business has led to a demand for highly skilled graduates with different ICT skills and knowledge, aimed to support the economic activities. The named imply the imperative of connecting the ICT and business in tactical, operational and strategic decisions..

Numerous universities all over the world offer study programs specialized for the field of ICT in (and for) business, with excellent training and education respectively. In Croatia, there are many departments and study programs focused on both business and informatics field. In our research, we focus to the study programmes at the largest Croatian faculties: Faculties of Economics in Osijek (EFOS), Split (EFST) and Zagreb (EFZG), as well as Faculty of Organization and Informatics in Varaždin (FOI). Particularly, we focus to the following graduate programmes: *Business Informatics* at EFOS, *Information management* at EFST, *Managerial informatics* at EFZG, and at FOI. However, at FOI there are four graduate studies in Informatics: *Information and Software Engineering* (IPI), *Business Systems Organization* (OPS), *Databases and Knowledge Bases* (BPBZ) and *Informatics in Education* (IO). For the sake of simplicity, we shall refer to above-mentioned graduate studies under one generic name as *Business Informatics graduate studies*.

Numerous research indicate that public and professional ICT community still lacks knowledge regarding Business Informatics professionals' profiles, and their employment opportunities (e.g. Jelić, 2012). In this research, the authors intend to reduce the named gap and consequently present the ICT professional role profiles as defined within European e-Competence Framework (e-CF, 2018). Moreover, we aim to explore the characteristics of employment of graduated students of business informatics study programs offered on above-mentioned four Faculties in Croatia.

The structure of the paper is as follows. The first part presents in detail the ICT roles profiles, and argues the importance of the European ICT skills transparency. The second part covers the research methodology while the forth part reveals the research findings. Discussion and conclusions are enclosed on the paper end.

2 ICT professional role profiles

Being ICT professional indicates the possession of a respectable core body of knowledge, including in-depth ICT knowledge and practical ICT skills, but also business related skills, such as project management and human resources management (Marius, 2014). New

competencies are also constantly emerging as relevant, that are needed in order to address the challenges of ICT driven innovation. E-learning is more and more used to support the development of these competencies (Gyamfi et al., 2017; Leväsluoto et al., 2016). Noted competencies are considered as the ability to perform a work role to a defined standard with reference to real working environments (IFAC Education Committee, 2003). In professional literature, the set of work-related personal attributes, knowledge, and skills are also considered as competencies (Wang & Tsai, 2014) or job competencies (Lowry & Flohr, 2005; Sisson & Adams, 2013). Many researches focus on the skills and abilities that ICT professionals need to know, and will even need more in the future (e.g. Wessels, 2005).

On the contextual level, the ICT profiles origin from the need to achieve the respective graduate employability, which can be further perceived as a set of achievements, moreover skills, understood as personal attributes – "that makes graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy" (Yorke, 2004, p. 410).

However, competencies taught by universities may differ substantially from the actual competences that businesses need (Chapman & Lovell, 2006: Morgado et al., 2014). Accordingly, the universities and other related institutions need to verify the effectiveness of current strategies used for enhancing employability skills (Andrews & Russell, 2012) and to face the fact that both environment (Guthrie et al., 2008) and students (Suša, 2014) are rapidly changing.

To better explore the labour market needs, it seems as fruitfully to extend the research content toward skills and competences that the European Commission particularly points out as important and crucial for creating future jobs such as "EntreComp: The Entrepreneurship Competence Framework" (CWA, 2018). The stated framework significantly support the development of the European ICT Professional Role Profiles that contribute to overall transparency and convergence of the European ICT skills landscape. The competences of the European e-Competence Framework have been considered as "the main component of profile descriptions" (CWA, 2018, p. 2) and is accordingly incorporated in the ICT Professional Role Profiles formation.

Consequently, the group of 30 ICT professional role profiles has been developed, that include: (i) a generic set of typical roles performed by ICT professionals, covering the full ICT business process in organizations, and (ii) a common European reference language for developing and managing ICT professionals' needs in order to support mutual understanding particularly between HR and ICT departments. Onward, these ICT roles provide the usefuls structure for identifying the main and supporting activities in context of organisational digital strategy provision. In summary, the named ICT professional roles are useful as the: (i) starting point for the flexible creation of more specific ICT profiles, based upon organizational roles of individual job descriptions from wider variety of contexts, and (ii) tool for individuals and organizations who aims to develop and teach skills in line with the European e-Competence Framework standards.

Furthermore, the ICT professional role profiles „are not intended to represent a rigid standard, but are built as a foundation for the flexible creation of more context-specific profiles in a broad variety of areas" (CWA, 2018, p.2).

The roles refer to seven business groups supported by ICT such as process improvement, business general, technical, design, developments, service and operation, and support, and are categorised as following:

1. *standard role* (CWA, 2018, p.35) including: Account Manager Role, Business Analyst Role, Business Information Manager Role, Chief Information Officer Role, Data Administrator Role, Developer Role, Digital Media Specialist Role, Enterprise Architect Role, Digital Consultant Role, ICT Operations Manager Role, Cyber Security Manager Role, Cyber Security Specialist Role, Digital Educator Role, Network Specialist Role, Project Manager Role, Quality Assurance Manager Role, Service Support Role, Service Manager Role, Systems Administrator Role, Systems Analyst Role, Systems Architect Role, Technical Specialist Role, and Test Specialist Role.
2. *recently proposed roles* (CWA, 2018, p.38) including: Solution Designer Role, Digital Transformation Leader Role, Devops Expert Role, Data Scientist Role, Data Specialist Role, Scrum Master Role, and Product Owner Role.

Croatian graduate study programmes in business informatics will be briefly elaborated in relation to the presented UCT professional roles.

Faculty of Economics in Osijek offers graduate programme in *Business Informatics*, which is organized over the course of four semesters on graduate level. The goal of the programme is to enable students to get skills and knowledge of business information systems as well as ICTs, and are acquainted with the latest tools and methods for developing business software applications.

Regarding the Faculty of Economics in Split, the graduate program students have opportunity to attend the 2-year course: *Information management* which provides them with various ICT skills and knowledge oriented to ICT support to business processes, mainly in e-competency area such as ICT implementation, ICT planning, and ICT manage, less in ICT develop and ICT build.

Faculty of Economics and Business Zagreb delivers the graduate study in *Managerial informatics*, which is taught in both Croatian and English. Graduate study lasts for one year, and is focused to skills related to information management, electronic business, business process management, knowledge discovery in

databases, data warehousing and databases, decision support systems, information technology risk, and others.

Faculty of Organization and Informatics carries out undergraduate, graduate and postgraduate studies in Informatics. Graduate study has four study programme orientations available within the graduate studies in *Informatics*: *Information and Software Engineering* (IPI), *Business Systems Organization* (OPS), *Databases and Knowledge Bases* (BPBZ) and *Informatics in Education* (IO). Studies are held in Varaždin and enable the students to gain competences to solve the most complex problems in the areas of ICT development and application, for the purpose of increasing the efficiency of modern organizations. (FOI, 2018).

Although the described graduate studies differ in their names (Business Informatics, Information management, Managerial informatics, Informatics), they all develop similar competencies.

Diploma supplement for all study programmes contains the list of courses that are taught at the course. Based on the courses taught at analysed studies (EFOS, EFST, EFZG and FOI), students of these study programmes are currently taught for the following European ICT profiles mentioned above: Account Manager, Business Information Manager, CIO, ICT Operations Manager, Data Scientist, Project Manager, Business Analyst, Enterprise Architect, Data Specialist, and Developer.

3 Methodology

For the purposes of this research, survey was conducted among students who finished graduate study of Business Informatics, from 2000 to April, 2017. The survey was distributed over email to the list of graduates of each Faculty, and answers were collected using Google Forms, from February to April 2017. In addition, the survey was placed on social networks (e.g. Facebook groups of graduate business informatics students).

The research instrument was organized into three sections: demographics, employment, and satisfaction with the graduate study. First section consisted of 7 demographic questions: year of birth, gender, county of residence, year of graduate study enrolment, and year of completion of the study, average grade of the study and student status. Second set of questions referred to employment status. Respondents were asked when did they get their first job, are they currently employed, current job industry (according to National Classification of Activities - NKD 2007), county of employment, legal form of employment entity, current net salary etc. The third part of the questionnaire consisted of 14 statements for which the respondents were supposed to express their agreement on a five-point Likert scale (1-"entirely disagree"; 5-"entirely agree"). The statements referred to student's satisfaction with the study, satisfaction with professors and assistants, and study quality.

In Table 1, we provide the information about the total number of graduate students who finished Business Informatics study from 2006 to April 30, 2017 at all observed faculties, sample of students that has been contacted, as well as distribution of the respondents who took part in the survey. Data were processed and analysed using the statistical software package IBM SPSS Statistics v 24. It can be noted that the response rates are high, ranging from 43.5% (FOI) to 64.8% (EFST).

Table 1. Distribution of the respondents

Faculty	# of graduated students	# of students in sample	# of respondents	Response rate (%)
EFOS	262	123 (46.9 %)	60	48.7
EFST	108	71 (65.7%)	46	64.8
EFZG	633	200 (31.5%)	91	45.5
FOI	1472	200 (13.5%)	87	43.5

Source: Authors' work, based on survey 2017

4 Results

4.1 Sample characteristics

Table 2 presents the distribution of students by birth. Most of the students were born between year 1986 and 1993, which refer to the first generation of "Bologna students". The students are almost equally distributed by the gender (male – 56.3%, female – 43.7%).

Table 2. Year of birth of students

Characteristics	# of students	%
Year of birth		
1970-1980	3	1.1
1981-1985	32	11.3
1986-1989	140	49.3
1990-1993	109	38.3
Total	284	100.0

Source: Authors' work, based on survey 2017

Table 3 shows distribution of the respondents regarding graduation faculty. Most of the respondents finished EFZG, followed by FOI, but those two faculties produced the largest number of graduate students who enrolled business informatics graduate study. Most of the students were Bologna students (92%) enrolled in academic year 2005/2006 or later.

Table 3. Graduation faculty

	# of students	%
Graduation faculty		
EFOS	60	21.1
EFST	46	16.2
EFZG	91	32.0
FOI	87	30.6
Total	284	100.0
Bologna study programme		
No	22	7.7
Yes	262	92.3
Total	284	100.0

Source: Authors' work, based on survey 2017

Almost 58% of the respondents are very good students with final grade between 3.5 and 4.4. There were only 11 students with the grade below 2.9. The 2/3 of the respondents graduated between year 2011 and 2015 (see Table 4).

Table 4. Year of graduation and average grades

	# of students	%
Average grades		
2.5-2.9	11	3.9
3.0-3.4	73	25.7
3.5-3.9	81	28.5
4.0-4.4	83	29.2
4.5-5.0	36	12.7
Total	284	100.0
Year of graduation		
2006-2010	29	10.2
2011-2015	190	66.9
2016-2017	65	22.9
Total	284	100.0

Source: Authors' work, based on survey 2017

4.2. Employment of Business Informatics Graduates

Table 5 shows average time (in months) to first employment.

More than half of the students from all observed faculties found a job within one month from graduation. 30% of the students were employed between 2 to 6 months, and only 12 of them have been looking for a job for more than a year from graduation.

From the same table it can be seen that students mostly stayed at the first job they found after graduation. At the time of conducting this survey, almost 95% of the respondents were employed.

Table 5. Time to first employment; # of jobs from graduation; current employment status

	# of students	%
Time to first employment		
Up to 1 month	147	51.8
2-6 months	85	29.9
6-12 months	35	12.3
13-36 months	12	4.3
Total	284	100.0
# of jobs from graduation		
Only 1	129	45.4
2 jobs	86	30.3
3 jobs	46	16.2
4 to 10	18	6.3
Total	284	100.0
Current employment status		
Employed	269	94.7
Not employed	15	5.3
Total	284	100.0

Source: Authors' work, based on survey 2017

From the Table 6 it can be concluded that more than one third of all students work in ICT sector, followed by Professional, scientific and technical activities, indicating that students can find a job in different industries, both related to economics or ICT.

Table 6. Current job industry*

Job industry	# of students	%
Information and communication	103	36.3
Professional, scientific and technical activities	27	9.5
Finance and insurance	26	9.2
Education	16	5.6
Wholesale and retail trade	14	4.9
Other service activities	14	4.9
Administrative and support service activities	10	3.5
Construction	10	3.5
Public administration; compulsory social security	10	3.5
Manufacturing	10	3.5
Unemployed	15	5.3
Other (4 and less students)	21	7.4
No Answer	8	2.8
Total	284	100.0

**Job Industry classified according to NKD 2007. – Translation according to Statistical Yearbook of the Republic of Croatia (2017).*

Source: Authors' work, based on survey 2017

Table 7 indicate that almost 57% of the students have a work agreement for unspecified period. One quarter of them, have an agreement for fixed period. Surprisingly, students are not keen on establishing their own company or craft (only two students were self-employed).

Table 7. Form of employment*

Form of employment	# of students	%
Craftsmen	1	0.4
Through the agency	1	0.4
Self-employed, owner of own company / craft	2	0.7
Professional training without employment	26	9.2
Student agreement	2	0.7
Work agreement for unspecified period of time	164	58.0
Work agreement for fixed period of time	71	25.1
Work agreement	1	0.4
Unemployed	15	5.3
No answer	1	0.4
Total	284	100.0

**Form of employment translation according to Statistical Yearbook of the Republic of Croatia (2017).*
Source: Authors' work, based on survey 2017

Table 8 reveals that the students who finished Business Informatics study mostly work in a private sector (70% of them).

Table 8. Legal form of employment entity*

Legal form of employment entity	# of students	%
Trading companies in which the government hold majority in ownership	1	0.4
In government sector	35	12.3
In public sector (kindergartens. schools, faculties, …)	24	8.5
In private sector	198	69.7
In own company	11	3.9
Unemployed	15	5.3
Total	284	100.0

**Form of employment entity translation according to Statistical Yearbook of the Republic of Croatia (2017).*
Source: Authors' work, based on survey 2017

Net salary of the respondents differs a lot. Most of the students have a salary greater than average net salary in Croatia (which is approximately 6,000 HRK). From the Table 9 it can be seen that the largest number of the respondents have a net salary between 4.000 and 6.000 HRK. Less than 3.000 HRK gets only 10% of them. Those respondents mostly have professional training without employment. Only 16.2% of respondents have net salary greater than 10,000 HRK.

Table 9. Net salary

Net salary	# of students	%
3,000-3,999 HRK	18	6.3
4,000-5,999 HRK	80	28.2
6,000-7,999 HRK	61	21.5
8,000-9,999 HRK	36	12.7
less than 2,999 HRK	28	9.9
more than 10,000 HRK	46	16.2
Unemployed	15	5.3
Total	284	100.0

Source: Authors' work, based on survey 2017

Table 10 reveals that 2/3 of the respondents work on jobs related to ICT. According to European ICT professional profiles, 15% of them work as developers, followed by digital transformation leaders, business analysts and CIOs. In addition, teachers of ICT in secondary school as well as professors/assistants at the faculties can be found. However, about one fourth (27.8%) of the respondents have a job that is not directly related to ICT.

Table 10. Type of job

Type of job	# of students	%
European ICT professional profiles		
Developer	43	15.1
Digital transformation leader	38	13.4
Business Analyst	29	10.2
CIO	21	7.4
Data administrator	10	3.5
Service support	5	1.8
DevOps	1	0.4
Account manager	1	0.4
Other types of jobs		
Teacher of ICT in secondary school	5	1.8
Professor / Assistant at the faculty	2	0.7
Other job related to ICT	35	12.3
Other		
Not related to ICT	79	27.8
Unemployed	15	5.3
Total	284	100.0

Source: Authors' work, based on survey 2017

4 Discussion and conclusion

The main purpose of this paper is to presents the research results about survey conducted on sample of business informatics graduates of four Croatian largest faculties. In this preliminary study, characteristics of

their employment were explored. From the results, it can be seen that the time from graduation to their first job is relatively short. More than 50% of the respondents found their first job within one month from graduation. It can also be noted that some students found a job during study, so they were already employed after graduation. Most of the students (95%) were employed at the time of the survey, mostly in a private sector. Most of the respondents, about two-thirds, work on jobs related to ICT, such as developers, business analysts, CIOs etc. These preliminary results indicate that the knowledge and skills acquired at the Croatian faculties teaching business informatics graduate studies are sufficient to find a job in the ICT sector. However, the results of the study has several limitations that also indicate the directions for future research. First, we provide only descriptive statistics on the total sample, while larger sample would allow the comparison among faculties. Second, in our research we focus only to Croatia, while comparison with similar countries is lacking, indicating the need for the future research in neighbouring countries. Therefore, we plan to extend the sample in the future, both in Croatia, and to the other countries, which will provide the more objective basis for the conclusion on the employability of business informatics graduates.

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