Web Platform for Carrer Centers in Higher Education – What do the Students need?

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Abstract. *Digital transformation as the process of improvement of services by the use of information and communication technologies (ICT) takes great importance in many different areas of human being, including education as well. In order to achieve their full potential, user involvement in design of different ICT solutions is very welcome.*
This paper presents case study of user involvement in design of web platform aimed to support the work of the career center at higher education institution (HEI). The platform is intended for use primarily by students and employers, who were involved in the process of its design. User involvement is presented through three design phases: user research, prototype development and prototype testing. The results show valuable feedback achieved from end users and their implications for further platform development. Specifically, this study answers the question "What are the needs of students of the use of web platform that supports the work of career center at HEI?" The results of this study may be used by practitioners working on the development of ICT solutions in higher education in general, and in particular related to ICT solutions to support the work of career centers.

Keywords. Higher education; Web platform; User-centered design; User-research; Prototype development; Prototype testing

1 Introduction

In nowadays networked and digitalized world, digital transformation is one of the most used terms related to the ubiquitous use of information and communication technologies (ICT). Benefits of the use of ICT are evident in many aspects and areas of human lives, with higher education being not an exception. As the concept of reengineering processes with the support of ICT in order to make them more efficient, digital transformation is getting much more interest by both practitioners and researchers in higher education. The exponential trend in publications related to the management of digital transformation in higher education in the period from 1986 to 2019 indicates the raised importance of the topic nowadays (Abad-Segura et al., 2020). The current situation with the COVID-19 pandemic has further accelerated the existing, but also encouraged many new processes of digitalization in higher education. This applies not only to teaching processes, but as well to other support processes involving different stakeholders.

Although literature mostly refers to applications in education related to teaching aspects (Kuhnel et al., 2018; Santos et al., 2019), digitalization of higher education services can be applied to many different aspects, including i.e. e-campus construction and application, innovation in talent cultivation, building technology-enhanced research capacity, developing a positive ethos and ideological education through cyberspace and serving a wider community (Xiao, 2019). Accordingly, literature presents different solutions related to digital transformation in higher education. i.e. (Petkovics, 2018) proposed an ICT ecosystem model for higher education based on cloud computing and Internet of Things as the latest technologies that can accelerate the digital transformation in higher education, including the improvement of the quality of learning, students' academic experience and student life in general, while (Sandkuhl & Lehmann, 2017) recognized potential of the application of enterprise architectures and portals in higher education. However, both the practice and literature lack the examples of ICT solutions aimed at supporting the work of career centers within higher education. This paper describes case study of designing the web platform to support the work of Student Support and Career Development Center (further in text: Career Center) at the University of Zagreb, Faculty of Organization and Informatics (FOI), aimed at connecting students with employers and administrating student involvement in extra-curricular activities.

The final aim of enhancing digital transformation processes in higher education is to provide higher quality of services to different stakeholder – primarily students, but as well teachers and broader community,

including the industry and local community. It is important that the processes of digital transformation serve to better satisfaction of stakeholders and their experience with the use of higher education services. In that context, the involvement of different stakeholders in designing ICT solutions that support digital transformation of certain processes is very welcome. Therefore, this paper focuses on user-centered design approach to the development of ICT solutions within higher education, focused on student extra-curricular activities and connection with employers.

The rest of the paper is organized as follows: section 2 reports on the importance of user involvement in development of ICT solutions, characterized as user experience and user-centered design; section 3 describes case study of the development of web platform for Career Center using a three-step approach and section 4 brings final discussion and conclusion.

2 User Experience and User-centered Design

The importance of user involvement in ICT solutions development is often described by connected terms user experience (UX) and user-centered design (UCD). User experience refers to "the subjective experience of an individual in his/her encounters with a technology" (Djamasbi et al., 2016, p. 2) and consequently UX design methods "describe activities for designing the product's interactions and/or interface with a user." (da Silva et al., 2012, p. 743). A very connected term is user-centered design that results with ICT solutions characterized by the outstanding UX. In the process of solution design, in front of UX designer there are numerous decision to be taken, which are often neither simple nor easy (Lin & Hertzum, 2020). In order to make right decisions in the design process, achieve a high level of UX and finally satisfy user expectations with the proposed ICT solution, one of the key prerequisites is user involvement in the process of software development (Bano et al., 2017).

User involvement in ICT solutions development is evident in different stages and it can take different forms. I.e. (da Silva et al., 2012) proposed a framework that integrates UX and agile approach, and consists of following phases: User Research, (Re)Design, and Evaluation. User involvement can take place in all three phases, using techniques such as focus groups, interviews, surveys, prototyping etc. According to Travis and Hodgson, there are two main questions UX research should answer: 1) "Who are our users and what are they trying to do?" and 2) "Can people use the thing we've designed to solve their problem?" (Travis & Hodgson, 2019, p. 18).

The present study describes the development of the ICT solution for Career Center within HEI in which student designers are collaborating with a design and development agency (further in text: Agency), as a part of their final thesis. Except providing a good practice on how to involve users in UX design process, the paper answers following research question: "What are the needs of students of the use of web platform that supports the work of career center at HEI?". Additionally, some inputs from employers' point of view are presented and discussed. Detailed description of case is provided in section III, including the methodology that follows three steps of UX approach (da Silva et al., 2012) – user needs research, prototype development and prototype testing.

3 Development of Web Platform Prototype for Career Development Center at HEI

3.1 Description of Career Center Web Platform

Career Center is a constituent unit of FOI. Its main aim is connecting students with employers though a range of activities, including student internship, career week, employer workshop, company visits, company job announcements, student preparation for the job market etc. In general, the scope of Career Center work covers a wide range of extra-curricular activities, with students and employers as the end users. Currently, Career Center is in the process of the development of web platform that would support all of its activities and enable better connection between students and employers. The solution is being designed and developed by the Agency, within the EU funded project Study4Career.

Figure 1. shows an initial structure of the intended web platform. It is evident that there are three main user types – students, employers (companies) and Career Center employees, each of them having a different set of functionalities.

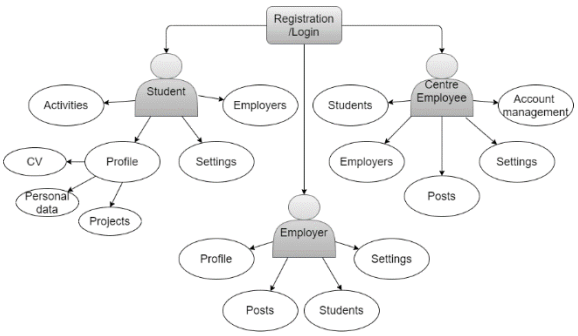

Figure 1. Career center platform initial structure

As stated by (Bano et al., 2017, p. 2340), "typically a user is considered to be someone who would be actually using the system." In this case, that are

primarily students and employers. User needs research usually consider functionalities, attributes, and properties that product must have, and the way it is supposed to behave from the user perspective (Baxter et al., 2015). In this particular case, it was important to get the answers to questions why and how, related to the potential use of platform by intended end users – students and employers. As stated in (Tomicic-Pupek et al., 2020), the understanding of utility perception factors of a certain digital platform may influence the intention of users to join and adopt digital product. The entire process is described in section 3.2. Methodology.

3.2 Methodology

Research was conducted by two FOI students, as a part of their final thesis at bachelor level, and a part of their internship in the Agency designing the intended ICT solution. Students' work on design process was divided in three phases, as proposed by (da Silva et al., 2012): 1) User research that includes survey among students and employers in order to detect their needs and habits relevant for platform development, 2) (Re)Design that considers prototype development based on user inputs obtained within user research phase, and 3) Prototype evaluation based on usability testing with students.

1) User needs research

User needs research was conducted using a survey in an online form. Survey questions were formed based on initial platform structure as created by Career Center and UX designer from the Agency, and were containing qualitative and quantitative questions. The main aim of survey was to find out what the potential future users would expect from the platform, whether they have desires or ideas what the platform should contain to be as useful as possible and to meet their expectations. It is important to stress that survey didn't contain questions about the potential use of platform, but its aim was to detect end user needs and certain problems they encounter in their everyday activities, that can be solved with the platform, as suggested by (Travis & Hodgson, 2019). Survey was created in several iterations, following good practices from (Goodman et al., 2012). Final survey for students consisted of 4 sections (General, Career Center activities, Connecting with employers, Curriculum Vitae (CV)) with 24 questions in total, while survey for employers had 3 sections (General, About students, About Career Center) and 17 questions in total. Both surveys comprise four types of questions: multiple choice, multiple choice grid, open questions, and scale. Survey was conducted using Google Forms and analysis was made with MS Excel. It was shared with all FOI students via Career Center mailing list and with all companies that Career Center has collaboration with. Altogether 16 employers and 56 students provided answers to survey. Answers were analyzed using both quantitative and qualitative methods, depending on the question type.

Results from student survey show that most of respondents are 2nd (30%) and 3rd (29%) year of undergraduate study. Section related to questions about students experience with Career Center yielded that students prefer using the platform on mobile phones (75%) along with personal computer (48%), which is important for future decision on platform design patterns. One of the important findings is that more than half of respondents (54%) indicated that they have missed some of Career Center activities they wanted to attend. Related to connection with employers, students are mostly interested to their location (87%), work atmosphere (83%), departments within a company (77%) and technologies used in work (70%). Answers from the last section related to CV preparation showed that students have problems with understanding what to include in their CV (49%) and with the rules for preparing the CV.

Qualitative analysis of student answers to open-ended questions yielded that, from students' point of view, it would be good to include the following features:

- Ability to filter posts by topic
- Receiving notifications about activities of their interest (e.g. if some additional places open for a workshop of their interest)
- Possibility to unsubscribe from activities they previously applied for
- Ability to follow employers and their posts
- Ability to automatically create their resume and send resumes to employers
- Filtering of employers by criteria (e.g. city, technologies, etc.)
- Ability to receive information about the attended activities
- Possibility to add projects and their descriptions in resume

On the other hand, the most important findings related to employers' answers is that they prefer usage on personal computer before mobile phones or tablet, and the most important functionality for them is to have autonomy related to their announcements so they can present themselves to students in a way they prefer (stressed by 13 out of 16 respondents). Additionally, the most important types of announcements that employers would like to post are detected (job announcements and internship, workshops, company visit, competitions). Based on detailed analysis of survey results, recommendations regarding the functionalities that the employer role should contain within platform are as follows:

- Ability to follow students and have insight into their activities and interests
- Possibility of filtering students by criteria (e.g. skills, interests, year of study, field of study, etc.)
- Possibility of direct contact with the student
- Possibility to create and publish their posts independently from Career Center

The presented survey results were used as inputs for further development of initial platform prototype.

2)Prototype development

In order to build a successful product, it is necessary to focus on the needs and goals of potential users and to be guided by this principle during the prototype development. Also, it is very important that this phase in the development process is not avoided as it greatly reduces costs and risks in the subsequent stages of the project. On the other hand, unnecessary burdens on users with large amounts of data or incomprehensible professional language should be avoided (Cooper et al., 2014). According to (Tan et al., 2009), user interface must contain the following characteristics: clarity, responsiveness, consistency, aesthetics, efficiency, and security. In other words, the interface must provide clarity through language, data flow and visual elements, while being simple and comfortable to use. It must also enable users to perform actions quickly and efficiently, as well as the possibility of undoing unwanted ones.

The prototype of the Career Center platform was developed according to the previously mentioned principles and the goal was to develop a simple and user-friendly design. The long-term goal was to build the platform designed for students, employers and Career Center employees.

It was decided to create prototype for student role and test it with students because the success of the entire application depends on student acceptance – the more students use it, the more interesting it will be for employers. The prototype for student role consists of the following screens:

- Dashboard
- Employers
- My calendar
- Events
- Contact
- Career Center
- My profile
- Notifications and
- Fund me.

The design of the initial dashboard can be seen in Figure 2 and similar design extends through the entire prototype. The main features of the platform for student role are browsing new posts and events, connecting with employers and monitoring their own activity, for example the frequency of participation in workshops.

Users' needs identified in the user research are translated into the features. I.e., filtering employers according to their location and field of work, and following employers in order to be informed about job possibilities became platform functionalities (Figure 3). Another example are notifications – since students indicated that they often missed some activities, focus in platform design was put on possibility to notify students about different activities and information, according to their preferences.

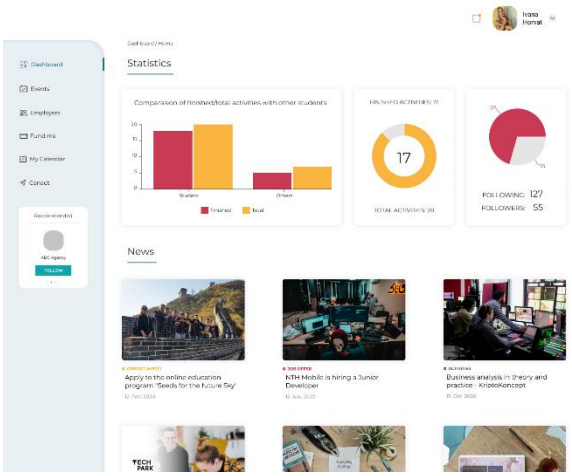

Figure 2. The design of the initial dashboard for Career Center platform

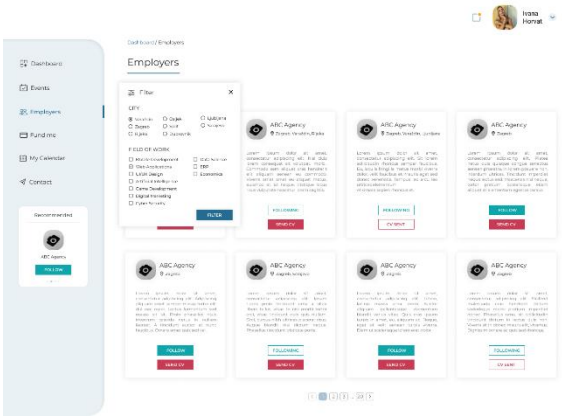

Figure 3. Prototype example for employer search in Career Center platform

3.2 Prototype Testing

By testing the prototype, it is possible to obtain information on the quality and usability of information system in the development process. Usability is a term that implies the ability to use a system or product for the purpose of accomplishing specific tasks in an efficient, effective, and convenient manner. Importance of conducting a usability test lies in gaining insight into how users use product and whether it suits them in achieving their own goals or needs. The usability of the information system is tested by users who represent the targeted group of people (Barnum, 2020; Rubin & Chisnell, 2008).

Test can be conducted in any phase of development, and it is recommended to test product as much as possible. Test should be chosen and adjusted based on the phase of development since not all of them are equally useful at the beginning or ending of development cycle. For example, an exploratory test is used in the early stages of development when we ought to identify issues and resolve them. Specific tasks are given to the targeted group of users by which is

possible to recognize patterns of behavior while using a product (Barnum, 2020). On the other hand, assessment tests are conducted when most of the prototype is designed. They are used as an upgrade to the previous conducted tests. Analytical results, such as the number of errors, the average execution time of a particular task and others, should be obtained with these types of tests (Barnum, 2020; Rubin & Chisnell, 2008). Finally, validation and verification are performed at the end of the development cycle to determine product usability according to previously defined standards (Barnum, 2020).

As stated, prototype evaluation based on usability testing with students was third phase of this study. Usability testing was not conducted in usual way due to COVID-19 situation. For the purpose of prototype testing, an online questionnaire with 8 scenarios was prepared. Scenarios contained instructions for tasks that had to be performed by users, followed by both open-ended and closed questions. Given instructions were not extensive in order for students to use prototype independently and to provide objective views on its usability. One of the scenarios is provided in Table 1.

Table 1. The dashboard screen scenario

Task	Examine the dashboard screen and answer the questions below.
Instructions	In Likert-type questions, choose a number from 1 to 5, depending on how much you agree or disagree with the statement. Answer open-ended questions in your own words.
Questions	1. Navigation menu is intuitive and without clicking I can determine where individual links lead to. (Choose 1-5) 2. Provide a positive or negative comment about navigation menu. Explain how it could be improved. 3. All the necessary information is shown in the statistics section. (Choose 1-5) 4. Provide a positive or negative comment about the statistics section. Explain how it could be improved. 5. The news section contains enough information, and I can determine what the individual post is about. (Choose 1-5) 6. Provide a positive or negative comment about the news section. Explain how it could be improved. 7. Do you think something is missing on the dashboard screen? If yes, state what and please explain your answer.

Seven students from FOI participated in testing. Students were given instructions, scenarios and questions related to a specific action which had to be done, in Google form. The main goals of conducting the usability testing in this case are stated below:

- If users perform defined tasks in a reasonable time and with ease, then the system is not considered time consuming, and it is usable.
- If users successfully find the necessary information to perform defined tasks, then the system contains optimal amount of information.
- If users rarely or never encounter errors while using the system, then the system has no major flaws that should be fixed.
- If users find the system easy to use and do not need much time to get used to it, then the system was successfully developed and there is no need for major upgrades.
- If users find the user interface design attractive and user-friendly, then the user interface should not have major upgrades and overall application should adopt the same design concept.
- If users believe that the platform includes all the necessary functionalities, then the functionality development was successful and comprehensive.

The usability testing is followed by an analysis of the results. Although students were not observed remotely, their views and opinions were gathered by answering open-ended questions related to a particular screen and scenario. Overall students were satisfied with presented prototype and had proposals for improvement including adding new functionalities. Suggestions for improving the system resulted from prototype testing are summarized in Table 2.

Table 2. Results of Career Center platform prototype testing

Task	Results
Navigation	Students struggled finding notifications due to bad choice of icon inside the navigation menu.
Dashboard	Student's statistics can be improved by adding data on the most attended or most desirable activities.
Events	Students suggested filtering posts by date and specific categories. Posts should also contain a brief description of the event and its activities.
Employers	Students suggested that the filter of employers should contain more categories.
Fund me	Students suggested implementation of better visual difference between past and active applications for *Career Center* funding.

My calendar	Students suggested implementation of a legend that explains the meaning of each color used in a calendar.
Contact	Students want to be able to upload and send attachments. Also, it was suggested that the page should contain more information about *Career Center* and its staff.
My profile	Students want to see a list of who they are following and who follows them. Also, students suggested implementation of a list of their past activities which they attended.

4 Discussion

This paper presented a user-centered approach to information system development. In particular, the paper presented a case study of the development of the platform for support the work of Students Support and Career Development Center at the University of Zagreb, Faculty of Organization and Informatics. Several main findings and contributions are discussed in this chapter.

First, it is important to say that there are not many examples of publicly available platforms that support the work of career centers within HEIs. Therefore, it is an innovative product both for the Agency engaged for its design, as well as for the Career Center as the client. In this situation it was of crucial importance for future platform development to conduct high-quality user research. Three main user types were recognized – Career Center employees, students and employers (companies). As Career Center employees are clients, they were actively involved in communication with the Agency, having the opportunity to directly express their needs. But, as students and employers were not directly involved in the platform development, a user research methods were applied in order to detect their needs. Students, to whom the platform should serve the most, were included in three phases: 1) two students themselves were involved in conducting users' needs research, 2) 56 students participated in survey prepared for detecting their needs and 3) 7 students participated in prototype testing. This kind of user involvement contributed to better understanding of students' needs and problems this platform would solve. It also prevented the situation that some important features are left out. Employers were included in the phase of conducting survey for detecting their needs. Detailed explanation of user involvement in UX research, presented in this paper, represents a good example to other practitioners and experts creating ICT solutions for different end-users. In particular, it brings addition to the user needs research for ICT solutions in higher education, similar to (Tsivitanidou & Ioannou, 2020) who included higher education instructors and students in users' needs assessment for chatbots' use in higher education.

Secondly, the results of users' needs assessment provided insight into most important feature that the platform for supporting the work of HEIs' career center should contain. One of the important findings that greatly affects user interface design is that students prefer usage on mobile phones, while employers would use the platform mostly on their personal computers. This is one of the non-functional requirements, but the functional requirements are important as well. For employers, the most important is autonomy in presenting themselves to students and contacting them. Although career centers at HEIs are a necessary link that connects students with companies, employers would appreciate more direct contact and possibility of sharing information directly with students. This presents a valuable result for all career centers aimed at improving their work through digitalization of their services. When it comes to students' needs, they stress different filtering and notification options as important. From the results, it can be concluded that students would prefer the platform that shows them only information that are relevant to them and notify them about relevant news.

Thirdly, a decision was taken by Career Center and the Agency to include students in the process of web platform UX design. The reasons for that are twofold, with benefits for both students and the company. First, the added value of student involvement in certain phases of design processes is that student themselves represents the end-user and as such can help in recognizing student needs. Secondly, the benefit for students is work on real project during their studies. As recognized by (Mitchell et al., 2020), students educated for designers needs to be exposed to the activities "out-side of the safety of the studio and collaborate with their target users".

9 Conclusion

This paper presented a case study on user-centered approach to the development of a web platform for supporting the work of career center at a certain HEI. The paper contributes to the field in two main areas: 1) it shows an example of how to include end-users in ICT solution development in higher education and 2) it detects the most important features for the platform supporting the work of career centers at HEIs, from the perspective of its end-users – students and employers.

The current situation with both the rapid development of ICT solutions on a global level and digital transformation of processes as a result of COVID pandemic, has a great effect on higher education as well. It is evident that future of education relies on innovative and user-centered ICT solutions that will enhance the quality of, not only teaching, but as well supporting processes. This paper shows an example of the area of extra-curricular activities in

higher education that can be supported with an innovative user-centered ICT solution and therefore serves as a good case practice for other practitioners and researchers interested in digital transformation in higher education.

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