FAKULTÄT FÜR !NFORMATIK
Faculty of Informatics

Evaluation of digital badges for knowledge exchange platforms

Expose for the master thesis of the same name

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1. Problem description

We constantly keep learning every day, collecting skills, gain experiences and specialize us on particular topics. Human beings acquire this knowledge often at educational institutions (schools, colleges, universities, etc.) or during professional practice, when approaching new challenges for example. Anyhow, knowledge acquisition furthermore happens also on a more subliminal level, when enjoying hobbies for instance. A lot of experience and skills one has gained in his personal life is simply not documented since there is no formal certificate or proof of competence available for this type of knowledge.

But even in formal education, for example at University, this phenomena can be noticed. Courses and exercises often cover the scope of a broad spectrum of a certain topic, a lecture deals with. For example, lets consider Advanced Software Engineering, a lecture offered by Vienna University of Technology. All students of this course need to define a software development project they want to implement. There are quite less restrictions neither regarding the application type (e.g. Desktop application, Web application, Mobile application) nor regarding the used technologies such as programming language, used frameworks, type of database, etc. Hence, a positive certificate is no declaration of skills a student acquired in this lecture. It simply says that one has passed the course with an appropriate grade. Furthermore, individual and more in-depth research of a student in a particular topic will not be recognized. Even the aim of this mentioned lecture is mainly to achieve management competences, there is are a lot of additional technical skills gained during the work in the software project. All this growth of knowledge in addition to conventional education with a curriculum is called informal learning.

Within the scope of this thesis, the feasibility of digital badges for making hidden knowledge, beyond educational achievements, more transparent will be evaluated. The difficulty is how and who attests this informal knowledge and what is an appropriate indicator of the level of skills one could show. One way this could be handled is by knowledge management exchange platforms. Such web portals link people who face a particular problem with experts. Digital badges could be a measure of informal knowledge and personal experience. A proof of expert knowledge could be certified by the user community or it could be derived by competence profiles, automatically calculated by the knowledge exchange platform. Moreover digital badges can have a positive impact on an individual's problem-solving competence.

The master thesis evaluates the following questions:

- Are digital badges an appropriate indicator of informal knowledge and skills?
- How to measure competence and what kind of achievements result in a digital badge? Are state of the art competence mining techniques an appropriate trigger to issue a certain badge?
- What is the acceptance of digital badges among the desired target group (e.g. students, lecturers, scientific employees)?
- How could a digital badge infrastructure be implemented in a knowledge exchange platform?
- What are feasible strategies to proof competence and verify a digital badge, issued by a knowledge exchange platform?
- Are digital badges a motivation for individuals to proactively and constantly contribute to knowledge exchange platforms?

2. Expected results

The result consists of two parts. First, a detailed research on current state of the art will be done. The research will be performed on the TechScreen platform as well as all appropriate platforms to issue and collect digital badges. Different organizations offer a digital badge infrastructure. This requires a comparison of them including the evaluation which is most feasible for the desired integration of TechScreen. Moreover issuers of digital badges and their application of them will be studied.

Second, a concept, based on the research will be carried out. It is based on the underlying evaluation of the questions, mentioned in chapter 1. The content of this concept will be a possible way of integrating a knowledge exchange platform into an digital badge infrastructure. This will be illustrated in detail with TechScreen. TechScreen is a project at Vienna University of Technology to mine competences and to share knowledge within an university context. Additionally, a prototypic implementation of the integration of TechScreen into an digital badge infrastructure will be part of this master thesis.

3. Methodology

The underlying scientific foundation for this master thesis, particularly related to the methodology, is the design science paradigm. Alan R. Hevner, et al. describe in their paper "Design Science in Information Systems Research" a framework for design science research. They describe the scientific value of design science as follows: *„The resultant IT artifacts extend the boundaries of human problem solving and organizational capabilities by providing intellectual as well as computational tools. Theories regarding their application and impact will follow their development and use.*". Furthermore they argue to combine the design science paradigm with the behavioral science which is more related to the explanation of human behavior (e.g. deriving theories, laws, or principles) (Hevner et al, 2004). This paper contains guidelines for research and evaluation which are the basis of this thesis.

The roadmap for the thesis consists of the following phases:

1. Knowledge absorption
   A general investigation on the problem domain will be performed. There has been done scientific work on that topic over the last year with regards to digital badges, also in particular to digital badges in education. Drupal is TechScreen's backend, thus Drupal must be studied as well. Finally a research and evaluation of available digital badges infrastructure platforms will be carried out.
2. Evaluation of requirements
   With the in phase 1 acquired knowledge as well as available case studies of prior applications of digital badges in education, the requirements of a integration and implementation into TechScreen will be defined.
3. Conception
   The conception first starts with a user questionnaire and interviews with a sample of the desired target audience (student's that are enrolled in in a bachelor or master program in informatics at Vienna University of Technology). The results will be a valuable input for the evaluation of the acceptance of digital badges as well as the motivation for additional informal learning. Secondly the conception contains the technical implementation of an interface to a feasible digital badge infrastructure which has been worked out at phase 2. The concept furthermore needs to consider all aspects regarding security, privacy and verification of an issued badge.
4. Prototype implementation
   A prototype for testing and evaluation purpose will be set up.
5. Evaluation
   The evaluation of the prototype must be done in two steps: A validation and a verification must be performed. (Winkler, 2011). The increase of transparency of digital badges will be evaluated as well as the reliability of digital badges with regards to security and trustworthy. Since TechScreen is used for teaching assistance in certain lectures (e.g. Knowledge Management), a meaningful evaluation on the question, if there is an influence on the user's activities within the knowledge management exchange platform is noticeable, can be performed.

4. State-of-the-art

There has been done already some research on digital badges and later under the aspect of using digital badges in education. The paper "7 things you should now about digital badges" describe the general purpose of digital badges as *"Badges are digital tokens that appear as icons or logos on a web page or other online venue. Awarded by institutions, organizations, groups, or individuals, badges signify accomplishments such as completion of a project, mastery of a skill, or marks of experience."* (Casilli & Knight, 2012) Răzvan Rughiniș presents in his paper "Badge Architectures in Engineering Education – Blueprints and challenges" the descriptive and creative effects of digital badges (Rughinis, 2013). He furthermore examines the different reasons for an instructor's and student's motivation to use digital badges for educational purpose. The paper contains also a case study of using digital badges in a Computer Networks course of about 100 students enrolled.

As mentioned, there are different platforms available, offering an infrastructure for digital badges. To name two examples, the Mozilla Foundation runs a project called "Open Badges" (Mozilla). They offer a technical infrastructure to issue, earn and display digital badges. Their underlying technology is called open badge infrastructure (OBI), it contains the specification that describes the Open Badge standard and the Badge Backpack, a users repository that contains his or her digital badges and is stored in the cloud. Among the Open Badges, there are various educational institutions such as Seton Hall University, Purdue University and other high schools and colleges, mainly located in the U.S. Mozilla Open Badges is fully open and free software.

Basno is the second platform that enables one to collect digital badges, received by various issuers (Basno). Basno has been launched in 2010 as a start-up and offers their services as a freemium-model. A basic plan is for free and enables the issuer of digital badges to create digital badges with predefined templates and to issue an unlimited number of badges to people. A fee-based advanced issuer can use the service of designers to create badges with an individual design or to use advanced analytics and targeted badge invitations. Also Basno offers schools and universities to offer digital badges and diplomas.

Wikipedia and Stackoverflow are using digital badges as well. For Wikipedia, the main driver to make us of them is to help encourage a user's participation in Wikipedia projects (Wikimedia Foundation). Stackoverflow uses digital badges in addition to the motive of Wikipedia also to describe a user's competence. They have a long list of more than 50 different badges, classified into the following groups: question badges, answer badges, participation badges, tag badges, moderation badges, other badges. (Stack Exchange). There is a condition for each badge to achieve it (e.g. ask a certain number of questions, posted a certain number of answers, rating of other users, etc.).

Martin Hochmeister and Jürgen Dorn described in their paper "TechScreen: Mining Competencies in Social Software" a web based social software platform for knowledge exchange with a focus on efficient knowledge filtering and processing. Furthermore they focus on the quantification of expert knowledge and skills. *"In this paper, we propose a knowledge-based information sy tem, which measures the competencies of its users in an auto-mated manner. The sources for assessments are the textual contributions written by users."* (Hochmeister & Dorn, 2009). As part of this paper they raise the question *"How are users motivated to generate content and to share it with other members?"*. Such social software systems are also an approach for academic education and research. TechScreen moreover should help increasing efficiency in inner university faculties and research groups since it allows automated mining of expert knowledge for a certain problem, among the knowledge platform.

5. The work's relation to the study program.

The objective concept of digital badges for knowledge exchange platforms is part of management science. With perspective to the study "Business Informatics" of Vienna University of Technology and its referring study plan it is tangent to the modules Management (BAE/MGT) and Knowledge-based systems (FMF/KBS). According to the study plan the BAE/MGT module is described as follows: *"In this module, students are provided with fundamental knowledge and skills necessary to manage complex socio-technical systems."*. This thesis deals with digital badges for knowledge exchange platform. Beside the technical component, the thesis deals moreover with a social component: Such platforms are built on a user community, digital badges are the digital expression of an individual's reputation.

Obviously, the thesis also covers topics of the FMF/KBS module: *„This module covers an introduction into important concepts of knowledge-based systems like problem solving techniques, formalisms to represent knowledge, and corresponding deduction concepts."*. Social systems TechScreen is a knowledge based system to share knowledge and to derive an individual's competence.

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