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GRADUATE EMPLOYABILITY SKILLS DEVELOPMENT THROUGH REFLECTION AND SELF-ASSESSMENT USING A MOBILE APP

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ABSTRACT

As university students' journey through their studies, their minds are fixed on a common end goal, that of graduating with flying colours and landing their dream job. They aim for achieving the top grades and focus on their studies, assignments, and exams. In this journey, the students often overlook or underestimate the importance of developing some skills that employers may consider important for their jobs. In this paper, we present a prototype of a mobile application that stimulates university students to reflect upon their experiences and assess the skills they may develop that would help them towards their dream job. The mobile application is designed to support students to recognize employability skills, conduct a self-assessment of their skills, document their skills in terms of the experiences that contributed to the development of the skills and to provide learning resources for improving skills. This work is conducted within the EU ERASMUS+ program.

KEYWORDS

Global Employability Skills, Mobile App, Reflection, Experience, Documentation, Self-Assessment

1. INTRODUCTION

University students are ambitious and envision their future in the light of their dream job once they receive their university degree. Their academic journey comprises of courses, assignments, projects, exams, and performance in the study modules, which is the priority of every student (Bass & Eynon, 2009). During this period, students are usually not able to appreciate the significance of employability skills needed to achieve their dream job and are essential to suffice the requirements of employers. With a focus on the fulfilment of academic requirements, students are usually not aware of employability skills that they acquire during their university (Bass & Eynon, 2009) . Formal education mostly organizes learning content in a way that mirrors the structures of academic disciplines, such as biology, mathematics, and history. Real-life problems and challenges, however, rarely fall neatly into the field of a single discipline. Similarly, assessments are based on what a student has learned rather than the non-directly observable constructs and how a student may apply what has been learned. Consequently, the students have gaps in their cognitive structures, which could affect the way they apply their competences (Cowley, Bedek, Ribeiro, Heikura, & Petersen, 2012). Universities are expected to develop graduates' employability to prepare them for the world of work (Cassidy, 2006; Cedefop, 2017; Suleman, 2017) and employability skills have recently increased in their significance.

Skills are often discussed along with the concepts of competence and knowledge. The meaning of the concept of competence is broader than the concept of skill as competencies incorporates a set of skills together with abilities and knowledge (Kennedy, Hyland , & Ryan, 2009). Employability skills can thus be defined as the transferable skills needed by an individual to perform a task and would make them employable. Along with a good technical understanding and subject knowledge, employers often outline a set of skills they want from an employee. A review of the literature has shown the significance of reflections to bring unknown learning to light especially when supported with evidence (Rolfe et al, 2001). Reflection has been used as a catalyst to invoke skill awareness and the need for skill acquisition in students. The questions identified for the critical reflection in the model by Rolf et al (2001) provides reference to determine components of the skill that focus

on reflection and can be saved as evidence. For example, experience is identified as the component of a skill that enables a student to reflect on what part of the experience and include "What did I do?" Or what was the assigned task that has helped me acquire some skills beyond what I study?

The work presented in this paper has been conducted as a part of the European ERASMUS+ project GES App (Global Employability Skills). The main aim of the project is to develop a mobile application to allow students to plan, record and evidence the acquisition and development of Global Employability Skills (GES) throughout their university journey (GES, 2020). Thus, the project includes background studies and requirements elicitation for designing a mobile application that would help to achieve the aim of the project. In this paper, we present the prototype of the mobile application, the GES App, that encourages graduates and university students to identify their employability skills by reflecting upon the process. The design of the GES App aims to facilitate students in their skill identification and assessment processes by providing relevant information about employability skills. The skill assessment process includes documentation of evidence of acquired skill in terms of experiences, artifacts, and references.

The affordances of mobile technologies have long been identified as an effective means of supporting learners in many learning related activities, e.g., context-based and situated learning (Parsons, Thomas, & Wishart, 2016). It also supports students to learn or identify learning related content and activities with prompt accessibility. No doubt, one of the most significant properties of mobile technologies is its ubiquitousness, that it is handy and could be used for bite-sized learning, when the learner has some spare time or is stimulated by their surroundings. Similarly, reflecting upon their global employability skills and documenting them could be done at such a moment, either when a student realizes that they have acquired a new skill or enhanced their level of the skill, or if they simply have some minutes to spare and would like to document their skills. The main goals of the GES App are to support skill identification through reflection, self-assessment in terms of evidence and supporting students to acquire good habits in reflecting upon their employability skills and documenting them regularly. This research aims to address the current gap in research and technologies that support university students in acquiring and documenting employability skills. The main contribution of this work is to underline the significance of employability skills awareness among students and graduates while identifying the process to facilitate them through mobile technology.

The rest of this paper is organized as follows: Section 2 provides an overview of related work; Section 3 describes the method; Section 4 provides the conceptual framework for the GES App and the design of the prototype, and Section 5 discusses and concludes the paper.

2. RELATED WORK

Many students do not consider their GESs until after graduation and focus on their final exam results. In the layers of learning that lead to the results, there are several invisible skills that are relevant for employability, both for the students and employers (Bass & Eynon, 2009). An under-regulated aspect of employability research, according to St Jorre and Oliver (2018), is precisely to get the students involved in their employability skills during education (St Jorre & Oliver, 2018).

Technologies such as the GES App have the potential to make the invisible visible as it includes both reflections and evidence of learning so called artifact, which aligns with previous findings related to electronic portfolios (ePortfolios) (Eynon, Laura, & Török, 2014; Kuh, O'Donnell, & Schneider, 2017; Ring, Waugaman, & Brackett, 2017). Reflections are central to raising awareness around what is learned, but to identify skills, students will have to move into, through, and out of learning experiences (Coulson & Harvey, 2013). Moving into, through, and out of learning experiences is very similar to Rolfe et al.'s (Rolfe et al, 2001) reflective model, an established approach to reflection. The model is based upon three main questions: What? So what? Now what? and for each main question a set of guiding questions. Rolfe et al.'s (2001) reflective model was initially developed for critical self-evaluation for nursing. Since then, the model has been used in several areas, where the guidance questions are adapted to the goal and the purpose of the reflection. Ring, Waugaman and Brackett (2017) adapted Rolfe et al.'s (2001) model in a study where the participants were from the Health Sciences and Biosystems Engineering (Ring, Waugaman, & Brackett, 2017). The study aimed to examine how creating an ePortfolio impacted a student's ability to perform in a job interview. The guidance questions were designed to help the students connect past experiences with present understanding and future use or action.

There is a close link between the reflection model used by Ring, Waugaman and Brackett (2017), and self-assessment, as this type of reflection facilitates self-assessment (Yan & Brown, 2017) which involves learners making judgements about their achievements and the outcomes of their learning (Boud & Falchikov, 1989). Achievements and outcomes of the learning can be identified through the guiding questions. The judgements are based on evidence about performance collected from others, such as teachers and peers, and/or themselves, including their internal intuitions, emotions, and physical sensations (Sargeant et al, 2010). ePortfolios have been shown to make students aware of what they have learned because they need to reflect and evaluate upon their work to select suitable artifacts (Johnsen, 2012; Ring, Waugaman, & Brackett, 2017). Self-grading, rubrics, guidance questions or prompts are also used in digital tools such as ePortfolio, apps or other platforms to support students' self-assessment and enable them to select suitable artifacts that evidence and demonstrate students' skills, competencies, or learning acquired from education, training, or work (Johnsen, 2012; Xiaojun, 2016; Ramsey, Khann, & Weston, 2017).

3. METHODOLOGY

For the development of the GES App, the "Design Thinking" methodology is used. For the problem-solving the Design Thinking methodology offers a solution-based approach that is not only iterative but also a non-linear process. The five stages as defined by Hasso-Plattner Institute of Design at Stanford (the "d. school") are: Empathise, Define, Ideate, Prototype and Test, as shown in Figure 1 (Plattner, Leifer, & Meinel, 2009).

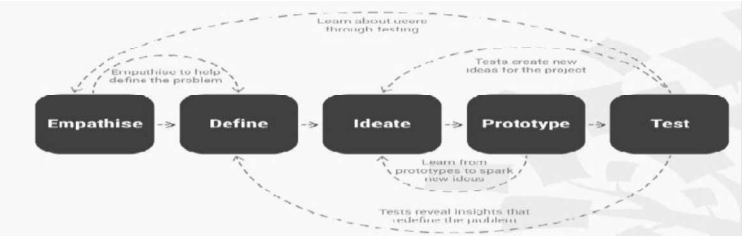


Figure 1. Stages in Design Thinking Process by Hasso-Plattner Institute of Design at Stanford

Being non-linear and iterative, the methodology is flexible and allows revaluation of the output of one phase based on the evaluation of the output of a successive phase. A brief overview of outputs of five phases of the process are as follows:

Empathise: The empathetic study of the problem has offered knowledge of what "Employability Skills" are? For this purpose, focus group interviews were used with stratified sampling of participants based on three characteristics of interest, that is if participants are students/job seekers, employers, or academic teachers. The process resulted in an understanding of employability skills among different focus groups.

Define: Through requirement elicitation of information gathered from the focus groups, the need of awareness for GES was identified and high-level requirements were defined.

Ideate: The conceptual framework for skills and activity design are the main outputs of this phase. The conceptual framework was defined for users to understand employability skills and activities were identified to motivate users for the need of skill recognition, acquisition, and development.

Prototype: The Figma prototype is the high-fidelity key output of this phase in which interactive mock-ups were designed for the GES mobile app depicting different activities of the application.

Test: GES App mobile app, developed in Unity, is the output of this phase.

In this paper, the agile development approach is adopted to Ideate and develop the conceptual framework for skills and the prototype of the mobile app. The rapid prototyping approach has been followed and the Figma user interface prototyping application has been used for designing the core functionalities and the interactive user interface. The Figma prototype has been used to conduct usability studies and to obtain feedback from users.

4. CONCEPTUAL FRAMEWORK AND DESIGN

The conceptual framework for skills is formulated over the notion of a crowd-sourced skills repository and is referred to as the Skills framework. The framework deliberates on all aspects that are identified as important to document skills and assist the reflection process of the user. This includes skill evidence in form of experiences, artifacts or references, skill level and skill goals to achieve the dream job.

4.1 Skills Conceptual Framework

Based on the requirement analysis and existing employability models (Saunders & Zuzel, 2010), the devised conceptual model for the GES App can be described as shown in Figure 2.

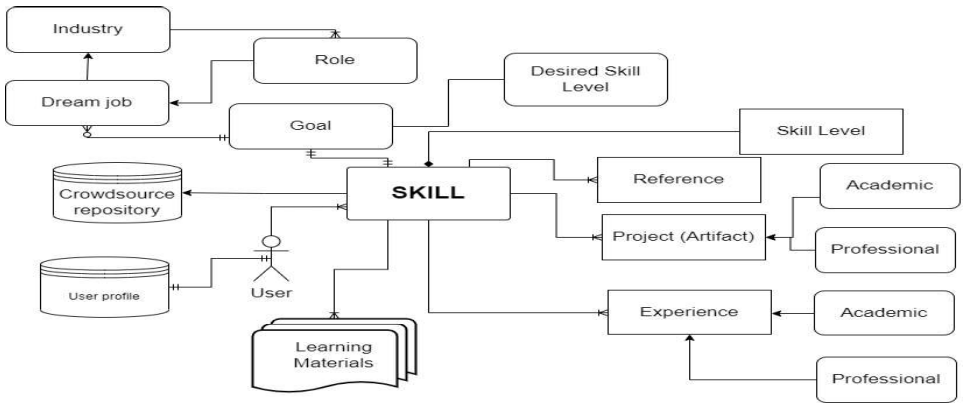


Figure 2. Conceptual Framework for graduate Employability Skills

Important components of the conceptual model are described in the following sub-sections.

4.1.1 Skills for Reflection

"Skill" is the central component of the skill framework. This component supports the goals of the application to recognize the skills acquired, while determining the skill level through reflection and evaluating the identified skill with the support of evidence that leads to the other important components of the framework that are "Experience", "Artifacts" and "References". A "Skill" is stored in a crowdsourced repository, and it is assessed in terms of skill level.

Crowdsourced repository of skills: not only enables the storing of the list of employability skills from literature, but also allows users to contribute and share with other users.

Skill Level: is used to allow the user to define the proficiency of their skill, based on the Dreyfus model (Dreyfus, 2004). Skill level is included so that the user can do a self-assessment of their skill through reflection and define one's level as a novice, advanced beginner, competent, proficient, or expert.

4.1.2 Evidence of Skill

The evidence of possessing a skill is documented in the form of "Experience", "Artifact" and "Reference".

Experience: indicates the process through which the user either has gained the skill or practiced it. Assessment of the experience reflects upon the skill acquired during the tenure. One skill can be acquired through one or multiple experiences and one experience can support many skills.

Artifact: represents the output achieved as the result of the application of one or more skills. An artifact can be associated with academic or professional experience.

Reference: This is a common practice to use references in a resume or CV. The same concept has been used as part of the skill framework that allows validation of the skill through a human source. One skill can have multiple references to support the evaluation of the skill.

4.1.3 Components of Skill Development

Skill Development is also an integral part of the objectives defined in the introduction of this paper. Self-assessment and reflection of the skill in light of the user's desired job can stimulate the skill development behaviour in the user. To support the process, 'dream job' and 'goal' are included in the Skill framework.

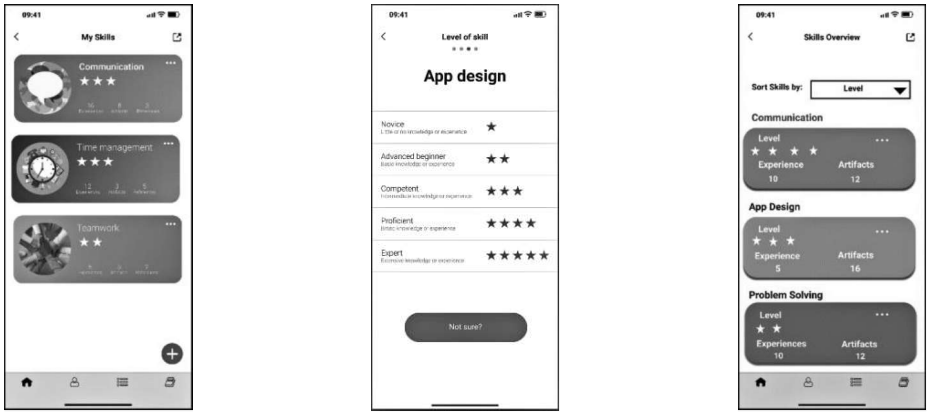
Dream Job: facilitate users to identify the need for skill development by defining the job or role, they want to attain in the future. Every dream job requires a skill set as defined by the industry. This enables users to compare their present skill set with the required skill set for the dream job and leads to the identification of the "Skill gap" (McKenney & Handley, 2019).

Goal: Acknowledging a skills gap through dream job can motivate users to learn or improve skills and encourage them to define a goal. The goal can be identified as the need of improving skill level by the user or learn new skills through different learning resources.

4.2 App Design Integrating Skill Framework

Integrating the components of the skill framework, activities for the mobile application are identified and incorporated in the GES App design (Fredheim, 2021). The complete design of the app is beyond the scope of this paper. Hence, we have focused on the activities that are designed to support students to reflect upon their employability skills through identifying and documenting them.

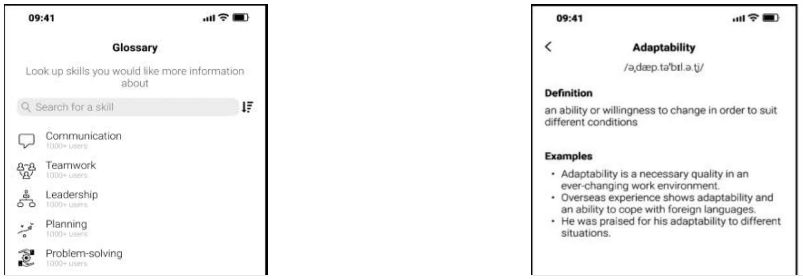
Add a New Skill: This activity is based on the main component of the framework that is "Skill". The main goal of the activity is to enable the user to add acquired skills to their profile. The crowdsourced repository supports the activity by offering a list of employability skills to browse from or to add the skill to the repository allowing other users to access it. This activity aims to facilitate the evaluation process of skill through reflection. The add option depicted by the (+) sign provides an option to add a new skill as shown in Figure 3 part (a). Users can assess their skill level as per the level of expertise as shown in Figure 3 part (b) below. Figure 3 part (c) shows an overview of the skill profile saved by the user. In the skill profile, a skill card shows information regarding skill level in terms of stars, number of experiences associated with skill and number of artifacts that support as evidence of the skill.



(a) (b) (c)

Figure 3. Add skill activity where (a) shows the option to add skill to user profile, (b) shows the evaluation of skill into skill level and © shows an overview of skills added to profile

The crowdsourced repository not only supports users to browse from the list of skills available through the GES App, but also enables users to identify the learned skills by acquiring more information about the skill through definitions and examples. The screenshot from the crowdsourced repository in Figure 4 part (a) shows the list of skills stored in the repository from which users can search for skills. If the skills are not in the skills repository, the user can add a new skill to their profile and the crowdsourced repository which can be accessed by other users as well. Descriptions of skills are also stored in the repository as shown in Figure 4 part (b) defining skills with examples for learning.

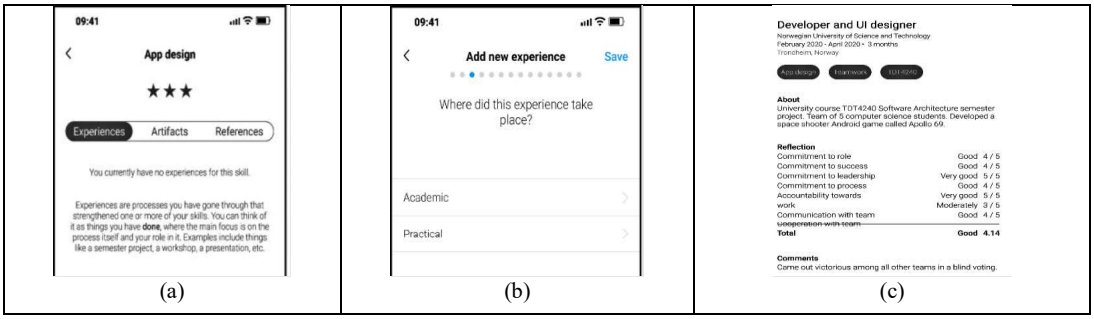


(a) (b)

Figure 4. Cropped screenshots of crowdsource repository in design where (a) shows the list of skills available in repository and (b) shows definition and examples of the selected skill

Document evidence of skill: Documentation of the evidence of skills allows the user to assess what has helped them to acquire the skill and how they can showcase the skill. This activity along with the skill assessment in the light of reflection encourages the sense of skill development process in user. The skill evidence documentation is integrated in application design by allowing the user to record experiences, artifacts they may have developed and a referee that could voucher for the experience.

Documentation of Experience: As defined in the conceptual framework, the experience is recorded as evidence that shows the implementation or acquisition of skill through any process. The app design enables the user to record the experience regarding the skill as shown in Figure 5 part (a). The process of acquiring skills can be academic like projects, seminars, courses, etc., or practical in terms of internships, projects or job as shown in Figure 5 part (b). For experience evaluation App design enables the user to assess skills from a role perspective. Assessment of experience in terms of these skills enables the app to substantiate the execution in 5 level metrics that correspond to "Very good", "Good", "Moderate", "Poor" and "Very poor" and can be summarized in terms of points as shown in Figure 5 part (c).



(a) (b) (c)

Figure 5. A cropped screenshot of adding experience as evidence in the app where part (a) shows the option to add experience (b) shows the option to select if the experience is academic or practical (c) shows the experience evaluated in terms of quantity

Documentation of artifact: The following activity provides evidence for skill as a potential output of experience. The GES app design enables the user to document the artifact in terms of different types of elements such as a tangible object, online or multimedia content, image, link, repository, video, or a note, etc. The recorded artifact can be used as evidence to support multiple skills in the user's profile. The recorded evidence along with the skill level assessment can be viewed in the skill card as shown in Figure 3 part (c).

References record: The component of reference is used in the framework to support skill through validation by human resources. The design allows the user to record the details of the reference for verification of skill however, consent of reference is required for this purpose. One reference can validate one to many skills of the user and added references are visible in the skill card as shown in Figure 3 part (c).

5. DISCUSSIONS AND CONCLUSION

Students are usually assessed based on what they have learned during their academic life that often lacks the depiction of real-life challenges which not only influence the way they practice their competencies but also obstruct the process of employability skill development because of lack of awareness (Bass & Eynon, 2009). It has become evident from the literature review that reflection supports the process of self-assessment (Boud & Falchikov, 1989; Yan & Brown, 2017). Using this concept in the GES App development project along, with requirement analysis of gathered data, enabled us to explore the probability of enhancing the element of awareness for employability skills, supporting it with the relation between reflection and self-assessment while utilizing the affordances of mobile technologies in learning related activities.

The two activities defined in this paper (add skill and add evidence) are designed to promote the self-assessment process in the user while reflecting on an employability skill they have acquired. The activity of adding skills is not only designed for users to add known skills to their profile but also prompt them to think if they have any skills that they are not aware of due to ignorance or lack of knowledge, as previous studies have proven to be effective when students develop ePortfolios (Johnsen, 2012; Ring, Waugaman, & Brackett, 2017). For this purpose, a crowdsourced repository has been used that provides a user with the list of common employability skills, with descriptions of the skills. In addition, if a desired skill is not available in the skills repository, the user is also able to add and share the skill through the skills repository. The self-assessment process is initiated while adding a new skill to the user's profile, where the user needs to determine their skill level. This process also stimulates reflection upon their skills and experiences that led to the skill. The reflection process is further enhanced while documenting the evidence of the skill in the form of experiences, artifacts, and references. The self-assessment of experience allows users to reflect upon what they have done in the light of defined skills and enables users to recognize the need for learning or improving. Both activities play a strong role in the initiation of skill development by allowing users to understand the skills gap for their dream job.

Based on the components of the skill framework, more activities are designed to encourage the process of skill development that enhance the overall compatibility with competency frameworks of different organizations while focusing on enabling users to determine their dream job and to realize the skills gap while facilitating them with learning resources to improve skills and employment readiness. The main limitation of this work is the lack of a full-scale user evaluation. We have conducted formative evaluations of some of the concepts and improved the design. The next step in our research is the evaluation of the design by university students in Norway, the UK, Poland and Greece, the partners in the project.

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