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Using Digital Badges in South Africa informing the validation of a Multi-Channel Open Badge System at a German University

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Abstract: Digital badging has become popular to accredit individuals for a gained competence or developing skills. Simultaneously, badges are meant to provide an incentive and benefit for an individual. In Germany, the use of a unified digital badging strategy, remains an area to explore. One of the most crucial points of concern currently with digital badging is how to validate or credit a competence or skillset and what value this validation will carry for the individual. The Mozilla digital badge backpack (Mozilla, 2013) is the badging system which was adapted to reward teachers in the ICT4RED initiative in South Africa for providing proof of applying the TPD training in the classrooms. Based on the experience from this project where researchers from Germany were also involved, it was decided to apply a similar badging system both digitally in addition to a paper-based model, to validate competencies gained during an online Master's Degree program in Risk Management from the University of Koblenz-Landau in Germany. From the ICT4RED project it was found that validation and acknowledgement was the biggest challenge in the development of an open badge system. The purpose of this paper is to describe how the University of Koblenz-Landau addresses validation in their planned design of a multi-channel open badge system (OBS) to recognize and validate competence-learning.

Keywords: Digital badges; Open Badge systems

1. Introduction

The purpose of this paper is to describe the development of accreditation through open badges at the University of Koblenz-Landau (Germany) based on the experiences and opportunities identified from a project in South Africa. A project coined ICT4RED (Information Communication Technology for Rural Education Development) applied Digital Badging to validate the progress of participating teacher's professional development (TPD) during a three year period. The experiences from this project were shared with academics at the University of Koblenz-Landau in Germany and it led to the adaption and development of the validation aspects for an online Master's Degree course.

The ICT4RED initiative was initiated by the Department of Science and Technology (DST) and implemented by the CSIR in Cofimvaba, Eastern Cape Province of South Africa from 2013-2015. In the ICT4RED initiative, the teachers did not have an initial digital identity (having an email address or any other digital mechanism of identity). As such the Mozilla badges could not be issued to them. The teachers had to create a digital identity for

enabling the receipt and sharing of the digital badges. In contrast to this, students participating in the risk management master course will have a digital identity as an email address is provided by one of the institutions that contribute to the multi-national, multi-institutional Master's Degree course. It is however desirable for an OBS for capacity building in the area of risk management to be received, even if no digital validation of a badge for a certain skill is available. A functional requirement for OBS is that it has to work for both theory and practical assessments as well as validation in risk management. Here the results from the ICT4RED initiative are relevant for adapting them to the needs of the OBS in the Master's Degree at the University of Koblenz-Landau.

The granularity associated with awarding badges for competencies creates a broader representation of an individual's capabilities. However, the value of the badge whether digital or paper-based, is backed by the issuing authority and the decided assessment of recognition. A competence and/or educational based assessment must be linked with evidence of activities, learning, experiences, artefacts and skills development [1;2]. Badges are issued according to success criteria which vary in definition, levels, weight, quality, rigor, motivation and reward. A single badge may be designed and issued by more than one authority making the badge achievable via multiple paths and assessment options. In this case it means that if the online Masters course at the University of Koblenz-Landau is focussing their validation on learning literature on resource management and e.g. a university in Canada is supporting the experience gained in working on digital health as an example of resource management where the knowledge gained is practically applied then they validate the experience side of the badge. With the validation of digital badges comes the concern about security, privacy, spam, phishing attacks as an individual cannot always know all the risks at hand when having a digital identity [3; 4]. This paper will also provide description of how the University of Koblenz-Landau managed to counteract these security risks in their multi-channel open badge validation system.

The research questions which will be addressed in this paper is: *How can the validation system for an online Master's degree course at the University of Koblenz-Landau in Germany designed?*; and *How did the experiences on validation of digital badges in the South African ICT4RED project inform the proposed development of the validation system for the online Master's degree course?*

In this this paper, the methodology that was applied in developing the OBS, as well as Digital badges and their use within the ICT4RED TPD badging system, will be outlined. The paper will also describe the envisaged OBS development at the German university. The developments that have taken place in conceptualising the online Master's Degree course will be specified as well as the business benefits of an OBS. The paper concludes with a description of how the badges will be issued at the University of Koblenz-Landau.

2. Objectives

The objectives of this paper are to:

- Provide an overview of what digital badges and open badge systems entail
- Describe how digital badges were applied in ICT4RED and the lessons learnt
- Describe how the experiences in the ICT4RED project informed the development of a validation system for the multi-channel open badge system (OBS) of the University of Koblenz-Landau?
- Describe what mechanisms the University of Koblenz-Landau has applied to counteract security risks in the validation system

3. Methodology

The University of Koblenz-Landau has applied the design science research methodology to develop the multi-channel OBS. Design Science research focuses on creation and the purpose of design is "to change existing situations into preferred ones" [5]. Design science (DS) is grounded in the philosophy of pragmatism and creates artifacts which is something created by humans usually for a practical purpose. March and Smith [6] differentiate among four different types of artifacts: concepts, models, methods and instantiations. The University of Koblenz-Landau multi-channel OBS was a method (artifact) to ensure that validation is addressed in digital badging which shows competence in learning in their online Master's Degree on Risk Management.

Two important characteristics of design science artifacts which were addressed were relevance and novelty [7]. First, an artifact must solve an important problem: i.e., being relevant. Second, to differentiate Design Science Research from Routine Design, Hevner et al. [8] suggest that design science research should address either an unsolved problem in a unique and innovative way or a solved problem in a more effective or efficient way. Furthermore, Baskerville et al. [9] and Carlsson et al. [10] are of the view that DS research in IS should be underpinned by a socio-technical perspective where the feedback of users is applied to improve a technical system like the multi-channel OBS of University of Koblenz-Landau.

Due to the iterative nature of the DSR process, an artifact, as solution or innovation, is emergent and opportunities exist for it to evolve. The artifact as solution is continuously evaluated through successive iterations, adapted and evolved through implementations and evaluations. The multi-channel OBS was developed as an artifact by applying the DSRM process of Peffers et al. [11], and it will evolve as it being evaluated and improved through three iterations or phases. The following diagram illustrates the DRSM process of Peffers et al. [11] as it was applied to develop, evaluate and improve the multi-channel OBS.

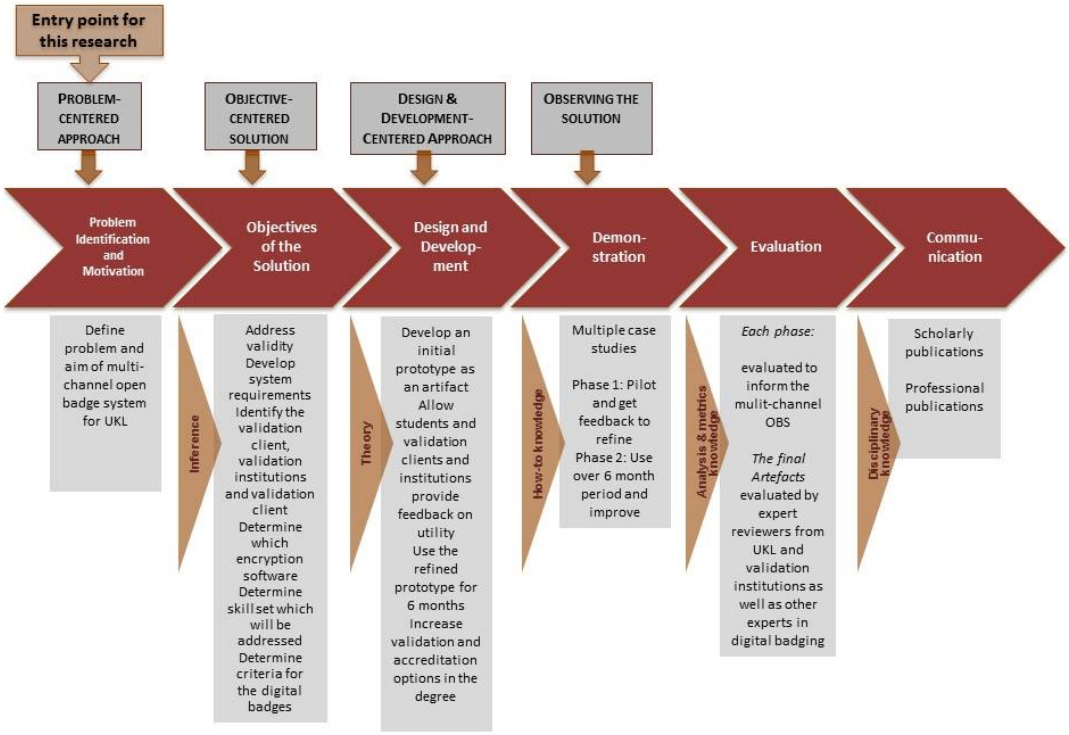

Figure 0-1DSRM process of Peffers et al. [11] as it was adopted to develop the multi-channel OBS artefact at University of Koblenz-Landau

This artifact will be iteratively improved through implementation and evaluation at University of Koblenz-Landau, as well as through feedback from other institutions that will offer elective subjects as part of the Master's Degree on Risk Management. Validation requirements, as explained above, will be negotiated and refined between the validating institutions. It is envisaged that a refined and final digital badging system, where competency learning can be validated through various channels, will be the end results.

4. Digital Badges

According to Gibson [1], a digital badge shows "accomplishment, interest or affiliation that is visual, available online, and contains metadata including links that help explain the context, meaning, process and result of an activity". It can be a review to describe that an individual has attained a specific knowledge level or capability or skill. Digital badges thus contain information on competencies of a person in a given discipline, which can be integrated into resumes or job applications, or posted onto websites [12]. They can also be shared with employers, colleagues, clients, and state licensing boards [13; 14; 15].

The origin of digital badges can be found in digital games practices, online reputation systems used in commerce (e.g. eBay, Wikipedia and Amazon) and media culture as well as the historical custom of awarding recognition via physical status icons, such as ribbons, medals and trophies [1]

These uses of badges not only motivate desired behaviours and provide status and recognition in an online community [12], but also foster brand loyalty and customer retention, features that will not get lost according to education futurists and those involved in the transformation of teaching and learning [16].

In education in particular, badges and badging systems are emerging to [1]:

- Incentivize learners to engage in positive learning behaviours,
- Identify progress in learning and content trajectories, and
- Signify and credential engagement, learning and achievement.

For badges to be recognized as meaningful indicators of learning, they must be linked with evidence of activities, experiences and artifacts created during a learning engagement [1; 2]. To support meaningful use of digital badges in education, developers of digital badging systems embed metadata concerning relationships such as the issuer, standards achieved and certified, activities undertaken, artifacts created, and situations experienced and quality of the experiences, products and performances [1]. All these aspects will be addressed during the discussions on the University of Koblenz-Landau multi-channel OBS.

To date the most comprehensive development of a badging environment is arguably found in the Mozilla Open Badges Infrastructure (OBI) which publishes an interoperable standard [17]. Other systems are emerging with similar goals and approaches (e.g. Credly (https://credly.com/) and Badgestack (http://demo.badgestack.net/). The Mozilla OBI is built upon open software strategies and is intended to provide a structured and standardized environment to utilize the characteristics of digital badges to recognize both formal and informal learning. The OBI provides a platform for verification, portability, creation and collection of digital badges, with associated metadata needed for their acceptance as useful credentials [13; 1; 12].

It is anticipated that the use of digital badges will help university lecturers to design student-centered learning pedagogies with self-monitored mastery-based progression for a 'tech-savvy' generation of students [13]. Badges are nowadays integrated into numerous educational learning tools [18; 19]. The validation of these systems is regarded as the most challenging aspect [20].

5. Background to the ICT4RED TPD Course and Badges

The ICT4RED initiative was a large-scale longitudinal pilot (over 3 years from 2013-2015) that explored the use of Android tablets in 26 deep rural schools in the Nciba district of Cofimvaba in the Eastern Cape Province of South Africa. It consisted of various components of which Teacher Professional Development (TPD) was regarded as a crucial component for success. The aim of the ICT4RED TPD was to support and guide the development of relevant teacher knowledge and proficiency to enable rural classroom practice to portray a 21st century technology enhanced teaching and learning engagement [21]. The ICT4RED TPD consisted of 10 modules of courseware presented through a gamification strategy. It is innovative as it presents a practical, free, practice based (three years and 3 iterations) peer reviewed course and methodology of how teachers in rural, resource constrained contexts can be empowered and supported to integrate technology to address 21st century teaching and learning challenges.

The ICT4RED TPD adopted badges were regarded as interim goals. These were clearly articulated as a set of 13 compulsory and 5 optional goals. Each of these goals is operationalized as a badge. Teachers had multiple opportunities to achieve skills and competencies to enable the achievement of a specific badge.

The course was outlined as follows:

The teaching strategy, skills and other competencies built into each module are simulated (the facilitator acted as the teacher and the teachers took the role of learners) during the TPD session. This provides an opportunity to experience the strategy, learn more about a topic and gain technology skills. Each module is linked to at least one badge as learning outcome. The compulsory badges are the ICT4RED badge, Jigsaw, Storytelling, Roleplay, Learning Stations, Educational Content creator, Mind mapping, Flipped Classroom, Game Based Learning, Field Trips, Gallery Walk, Mobile Skills and Reflective Practitioner. The optional badges are E-mail, Twitter, App Evaluation, Assessment and Blog Collaborator. Each school had a dedicated facilitator that acted as a mentor and guide. After the TPD session, the teachers have about 3 weeks to apply the strategy for their own content, using technology in their own class. They need to record some evidence as outlined in the badge criteria.

Figure 0-1: Badges linked to the Narrative [22]

The following table presents the Jigsaw badge, linked to Module 1. The table outlines the instructions, what the expectation is and what to provide as evidence:

Table 2: Example of how the Jigsaw badge had to be earned

JIGSAW BADGE Instructions:	What to do	What to provide
Use the Jigsaw Strategy in your classroom by creating at least four expert tasks for the learners to do, or learn about. At least one of the expert groups must use a mobile device	You have created at least four expert tasks for the learners to complete. You have implemented the Jigsaw Strategy with your learners.	An electronic copy of your four tasks. This can be either a photo of hand written tasks or a word document. A photo of a Home group and an Expert group doing their tasks.

A badge facilitator evaluates the evidence provided and either awards the badge or gives meaningful input on possible improvements. Evidence on all the modules has to be presented. Only then can the participating teacher graduate (all the compulsory badges have to be earned). Each module is designed to not exceed three hours of training. It is suggested that there is a three week interval between each module presentation.

The badge goal, achievement, assessment and the conferring of the badges served a number of functions [23]:

- It outlined clear transparent expectation;
- It provides an opportunity for the teacher to demonstrate individual proficiency;
- It acknowledges achieved competence;
- It allows teachers to individualize and appropriate learning into practice;
- It acts as a scaffolding environment for achieving the teacher development goal;
- It allows the initiative initiators to acknowledge individual growth;
- It acts as an early warning signal of teachers falling behind;
- It allows for timeous investment in further technology needs; and
- It allows for champions to surface and to be acknowledged.

Originally the thought was to award teachers with Mozilla Open Badges but as the teachers lacked a digital presence at the start of the TPD and had no emails, this did not materialize. Instead a paper-based sticker badging system was adopted at first.

The completion rate for participants was 100%. Of the 225 participating teachers and headmasters, all 225 achieved the minimum of 13 compulsory badges. There were 91 individuals who completed more than half of the optional badges to earn a merit graduation. A total of 3,998 badges were assessed according to criteria supplied by assessors who were not directly involved in the facilitation process and were verified by an external party for quality control [22]. Once teachers got an online presence digital badges were also allocated as means of recognition and a reward. These digital badges were working in the following ways [24]:

- A badge issuer, such as a volunteer or online or offline training program, decides what criteria potential earners must be able to meet. They design and offer certifiable badges online for people who meet their badge's qualifications.
- Users collect relevant badges for a range of "hard" and "soft" skills and accomplishments they've accumulated. These go into a personal digital "Backpack," a sort of dashboard that contains badges and allows a user to select privacy and publishing preferences.
- Users display badges they've accumulated on social networking sites, personal profiles, blogs, and community hubs. Mozilla says it intends to work with "career website and credentialing portfolio and profile systems," such as LinkedIn, that might also host the users' badges.
- In the interest of being verifiable on the web, badges will be clickable so viewers can access criteria details about them. They will feature metadata from the issuer that

makes the badges a bit more complicated - but more informative - than a company or university logo image that can simply be dragged and dropped.
- People, who are curious about the badge holders' work and background, including potential employers, can view these identifiers and choose to learn more based on the information that the user, holder and the issuer have chosen to provide.

The most important long-term benefits of the badging system in the ICT4RED TPD were its validation requirements. This is supported by Jabbar et al. [12] as well as by Muilenburg and Berge [20] who indicate that validation seems to be the biggest challenge in issuing badges whether the badge is issued digitally or not. According to Muilenburg and Berge [20] "principles of credibility" are essential to establish as it can become a subjective activity and favouritism can play a role. Competency-based learning which a badge will validate, has to reflect and validate the true meaning of the competence or skills gained. Reputation is built on valid, verified and quality judgements not just for badge earners, but also for the badges themselves and the medium of exchange within which they have to have currency [20]. The openness of such a system is regarded as essential for the long term sustainability, so that exporting and importing of badges can be modified and adapted by the open source community. It is also important that validating institutions and organizations are not attached to commercial constraints when doing validation. The validation process of badges should minimize the amount of data that is necessary for checking the badges and has to map progress, signal reputation beyond the community where it was earned and incentivize learners to engage in pro-social behaviours [12; 20].

Based on the experience and implementation of both a paper-based and digital badge system in the ICT4RED initiative, the University of Koblenz-Landau decided to also apply a similar approach to provide an additional way to validate the competence-learning gained by their Master's Degree students during the Risk Management degree.

6. University of Koblenz-Landau Proposed Pilot Design for a Multi-Channel Open Badge System Addressing Validation Concerns

The CSIR, South Africa and the University of Koblenz-Landau have been collaborating since 2011. Based on this collaboration and exposure of University of Koblenz-Landau researchers to the ICT4RED initiative in South Africa, University of Koblenz-Landau decided to use the experiences from this project to develop their own multi-channel open badge system (OBS) for their online Master's degree course in Risk Management. They also plan to apply both a paper-based as well as an online digital badging system. The greatest challenge will be the validation of badges/certificates. The components of their proposed OBS system will now be outlined and it will be outlined how they addressed the validation of their badges.

Based on the ICT4RED strategy, such a validation includes four roles:

- The issuing authority (IA) that provides the badge/certificate to the learner/student, when the learner/student passes an assessment or demonstrated a certain skill to the issuing institution.
- The learner/student (LS) that has earned the badge/certificate.
- The validation client (VC), that wants to check if the badge/certificate was really earned by the learner/student in previous education.
- The validating institution (VI), that performs the validation of the badge/certificate (e.g. via a server).

University of Koblenz-Landau made use of multi-channels as alternatives for authentication of badges. This can then ensure that there are a verification channel available at all times to validate a badge. Examples of these multi-channels are the following:

6.1 Paper Badges

A paper badge is the basic infrastructure for a multi-channel OBS. This is a core channel for the validation of skills that is available, when no IT infrastructure can be used (e.g. in very remote rural areas). This is similar to what the ICT4RED initiative have applied to validate skills per module covered. This is done, because an OBS for capacity building in the area of risk management must be applicable even if no digital validation of a badge for a certain skill is available. Therefore, the OBS has to work for both, areas of risk management and non-risk areas and this is where we can draw on the results from the ICT4RED initiative, who first adopted a paper-based sticker badging system. This paper-based sticker badging system is extended through SMS-Channel and QR-Code Channel in the OBS.

The following channels can be used to check the validity of badges/certificates:

- **SMS Channel:** The SMS-channel will be available via a mobile phone number for all badges provided by the issuing institution/agency of the badge. On the paper badge there is a phone number mentioned that an SMS that contains the certificate ID can be sent to. The validation authority will reply via an SMS, which contains the meta-data of the badge. An additional password protection will be assigned to the validation process. This password is defined by the concerning learner/student.
- **QR-Code-Channel:** The QR-Code-channel is available via a QR-Code, which is printed on the paper badge. The QR-Code contains the validation URL that can be interpreted by a QR-Code-Scanner (e.g. as a mobile phone app), internet connection is required. The encoded URL is also printed on the paper badge. Following the link on the badge the metadata of the badge will be provided, if it is valid. The QR-Code-Channel is available for all badges provided by the issuing institution of the badge. This method can also be combined with the SMS Channel. A password is defined and can only be changed by the learner/student.

For all the methods described above, the student does not need a digital identity. If the student does have a digital identity then the process will have another channel of validation, e.g. the e-mail channel:

6.2 E-Mail Channel with Digital Identity

When the student has obtained a specific competency-based learning requirement and earns a badge from the IA and an e-mail address is attached to the digital identity of the student, then the badge can be provided via a digitally signed e-mail to the student. This supplements the digital badges used by ICT4RED for teachers who got an online presence. The e-mail contains a digital signature from the issuing authority (IA) and can be validated automatically within the e-mail client (e.g. via *Enigmail* in *Thunderbird*) by any VC that wants to validate the skills of the student. The e-mail contains all the meta data of the badge and any alteration of the e-mail will lead to a non-valid badge. For the validation process the VC must download the public key of the IA to validate the digital signature of the e-mail. This creates the requirement, that standard encrypting and digital signature has to be installed in the e-mail clients.

The basic concept of fonts and signatures, which the University of Koblenz-Landau applies in their multi-channel OBS, is derived from *GNU Privacy Guard (GPG) (https://www.gnupg.org/)* as the open source public and private key encryption and digital signature system. The concept of signing documents with the private key of an authority, institution or issuing agency creates for a digital file of any type a signature file, signed by an authorized person (of the institution/ agency concerned). The private key is available only for the signing authorized person and all signed documents can be revoked and regarded as invalid if the private key of the signing person is stolen. A validation is exclusively possible with the public key of the signing person. Additionally, this public-

private key bundle can be used for signing emails submitted by the person (e.g. with *Thunderbird* (https://www.mozilla.org/en-US/thunderbird/) combined with *Enigmail* (https://www.enigmail.net/home/index.php)). It is also possible to allow several authorized persons to use the same public key e.g. representing one institution/ agency. Therefore, a digital file can be shared containing the relevant public key(s) (CA). No digital identity is required for the learner in this case, but at least storing the document together with the signature on a digital device is required to be able to share this document with other institutions to show the earned badges in the context of applications or validation processes e.g. for studying [17].

Furthermore, the E-Mail-Channel can work similar to the validation process by SMS or QR-Code described in section 6.1. The validation organization can send an e-mail with a standard header as subject of the e-mail. The server will respond to this e-mail by provision of the meta-data of the badge certificate or batch. Similar to QR-Code and SMS a change of password by the student and not sharing the new password with the VC makes it impossible for the VC to validate a certain badge.

7. Developments

For validation processes of badges and issued certificates University of Koblenz-Landau is developing a certificate authority (CA) that allows users to download the public key of authorized persons for validating a digital document. The CAs are more or less databases with public keys that institutions/ agencies can trust by following a communicated URL, that is also printed on the certificate. In a multinational collaboration between institutions it is necessary to have a CA that mutually hosts the public keys of authorized persons, agencies and institutions being part of the collaboration.

A life-time availability of a validation infrastructure for badges is a very demanding challenge for the implementation. Therefore, redundancy of validation processes provided by several institutions and alternative channels for authentication and validation are the main aspects that have to be considered.

The security level of badges is determined by the number of channels and the redundancy of those channels. An OBS requires a sustainable approach because the students may need the option to incorporate the accomplished badges into their curriculum vitae to be able to show them to an institution, especially when they apply for a job/place to study. This leads to the requirement of authentication channels for badges and the life-long duration of availability of those channels.

University of Koblenz-Landau also tests the use of Pretty Good Privacy (PGP), which is a data encryption and decryption computer program that provides cryptographic privacy and authentication for data communication (e.g. for signing, encrypting and decrypting e-mails). PGP is used, because it is very efficient.

The secure hash algorithm (SHA-1), which is a family of cryptographic hash functions, can be used for hashing. A cryptographic hash function is a mathematical algorithm that maps data of arbitrary size to a bit string of a fixed size which is designed to also be one-way function, that is, a function which is infeasible to invert. In using this software, each signature is associated with a signatory trust. It takes the same range of values as the owner trust. If the signatory's key is in the keyring, then its owner trust is used; else, “unknown” is used. The key legitimacy is computed by PGP from the collection of signatory trust fields. If a signatory has ultimate owner-trust, then the key legitimacy is set to complete. Otherwise, PGP computes a weighted sum of the trust values. A weight of 1/x is given to always-trusted signatures, and 1/y to usually-trusted signatures, where x,y are natural numbers which are set by the user with $0<x<y$ (defaults: x=1, y=2). When the sum reaches

1, the legitimacy is set to complete. Thus, x always-trusted signatures or y usually-trusted signatures, or some combination of both, is needed for a user to consider a key legitimate.

8. Results and Business Benefit: An Open Badge Management System

The OBS which will be developed at the University of Koblenz-Landau applies Mozilla Open Badges [17] to create, issue and verify digital badges. As it is an online tool, the badges can be accessed from everywhere, where internet is available. Badges can be collected from multiple sources, online as well as offline, and put into a single digital backpack, i.e. it is possible to knit the user's skills together. Based on this, the user has the possibility to display his/her skills and achievements on social networking profiles, job sites, websites and more. It is also possible to implement the gaining of badges into business infrastructures to ensure a qualitative high training of employees. The badges can be issued by one or more organizations at the same time, can be adjusted to a job-call, build upon each other and be stacked to tell the full story of the user's skills and achievements. Open badges are information-rich. Each badge has important data built in that links back to the issuer, the criteria and verifying evidence. The University of Koblenz-Landau will also apply the 5 steps of Goligoski [24] to issue digital badges (as was discussed under the background of ICT4RED) and include:

- A badge issuer, which is the issuing authority (IA) in our case, decides what criteria potential earners must be able to meet. They design and offer certifiable badges online for people who meet their badge's qualifications.
- Users collect relevant badges for a range of "hard" and "soft" skills and accomplishments they've accumulated. These go into a personal digital "Backpack," a sort of dashboard that contains badges and allows a user to select privacy and publishing preferences.
- Users display badges they've accumulated on social networking sites, personal profiles, blogs, and community hubs. Mozilla says it intends to work with "career website and credentialing portfolio and profile systems," such as LinkedIn, that might also host the users' badges.
- In the interest of being verifiable on the web, badges will be clickable so viewers can access criteria details about them. They will feature metadata from the issuer that makes the badges a bit more complicated—but more informative-than a company or university logo image that can simply be dragged and dropped.
- People who are curious about the badge holders' work and background, including potential employers, can view these identifiers and choose to learn more based on the information that the user holder and the issuer have chosen to provide.

This OBS can allow University of Koblenz-Landau to provide a secure and validated open badge system to their online students which is encrypted and protected against redundancy.

9. Conclusions

Open digital badge systems will force us to define in greater detail what validation and credibility means for each level or step of competency-based learning. Validation institutions have to be clear on what they value as credible and quality in competence. Digital badges provide new and novel ways to design more flexible pathways of learning, but also need to address security and privacy risks and refine their validation systems to accommodate these risks. The detail provided under the University of Koblenz-Landau discussion is a way to assist other organizations or institutions to apply the same way to ensure validation of certain badges or levels of competency-learning.

The lessons learnt from the ICT4RED approach are, that multiple channels to issue badges are required to support different needs of different types of online profiles of participants. An OBS for capacity building especially in validating practical experience in the area of risk management must be applicable even if no digital validation of a badge for a certain skill is available. Therefore, the OBS has to be both paper-based and digital in format to validate competence. Students from both developed and developing countries can through this approach build a profile which shows credible skills gained and even post their digital badges on their social media platforms like LinkedIn. Acknowledgement of skills has reached a new perspective through the application of digital badges and future work will entail to test and refine the University of Koblenz-Landau validation system which is encrypted and protected against redundancy in order for it to be used for all online courses at this university and other universities.

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