

Research on good practices establishing Open Badges Eco Systems PATHWAYSFOREMPLOY



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Introduction

In the last 20 years, we have seen a shift away from traditional education methods and tools through the use of WBTs, e-learning, and the use of social media tools to support learning (u-tube being just one example). However up to recently certification and the way this is administered, awarded and tracked has stayed largely unchanged. The Open Badge system is challenging this and looks set to drive a change in both our individual learning cultures and the culture of the organisations offering learning. One analogy is that we have gone from an Analogue Society to a Digital one – nowadays often termed a Knowledge Society.

This report is a brief introduction to the Open Badge historical context, current Eco-system, its uses and challenges for its development and proliferation.

Mozilla¹ have a very useful visual story board for Open Badges, what they are and how users can use them to track their lifelong learning at the link listed below. It is recommended to view this first to gain a pictorial representation of the Badge infrastructure and ecosystem as it will aid in a faster and deeper understanding of the items and issues identified in this Summary report². It can be viewed and understood in under three minutes.

"Digital credentials are fast becoming a global currency for skills and competencies. Robust standards for interoperability help this currency gain traction across industry and geographic boundaries, ensuring users enjoy full faith in the credentials they earn online," said Rob Abel, CEO of the IMS Global Learning Consortium.

"The growing ecosystem of digital credentials is changing how the world recognizes skills and abilities -- and rewards achievement. For digital credentials to have a truly transformative impact and meet the needs of individuals on a global scale, we need a common foundation rooted in interoperability and portability that is provided by open standards," said Jonathan Finkelstein, CEO and founder of Credly.

Definition

Open badges are in essence digital tokens that hold information about the skills, interests, competencies and achievements of the holder. This information is evidenced, assessed and verified by an identified issuer and can be shared across the web by the user.

Any organisation can issue Open Badges but they are required to set an award criterion which must be met to achieve the badge - this is to ensure the value of the badges for both the individual and the organisation offering the Badge.

Context

For individuals it has often been difficult to gain formal recognition for the knowledge and skills acquired in the workplace, education establishment and leisure activity if the learning

¹ Available here: https://www.mozilla.org/en-GB/

² Available here: https://wiki.mozilla.org/images/8/84/Open_Badges_Presentation_-_General.pdf

did not involve a formal structure with accreditation as an input and certification as an end result of the learning activity.

In todays connected digital age it is now easier to document skills in depth as opposed to the end qualification achieved. So, for example, it is relatively easy to document and track in detail the separate skills required to successfully bleed a fuel system post a filter change – as opposed to just documenting the skill as the ability to change a fuel filter. So it has become more apparent that the traditional diploma, certificate, and degree continue to provide a general acknowledgement that a skillset has been obtained but lack the detail and specifications of these skills. In other words it is not the degree itself that is critical today but the skill set behind it. Learning is happening in many environments and contexts and it is not limited by traditional classroom learning in today's digital world. The whole concept of learning has changed from a formal and individual experience to social, informal, creative, lifelong and participatory.

The learners are now active, interest-driven participants who are offered multiple pathways to gain competencies enhance and perfect specific skills through a number of available resources in order to compete in the workplace.

The Open badge system allows individuals to receive credentials on the completion of assessments on a particular skill and offers an innovative alternative to traditional formal educational paths and learning experiences [1].

History (2010 – 2015)

The concept of Open Badges was created by the Mozilla and MacArthur foundations based on the research of Erin Knight in 2010.



In 2013 Open Badges 1.0 was launched by Mozilla at the Digital Media and Learning Conference, followed by a full launch of Mozilla Open Badges.

In 2013, President Bill Clinton declared a Commitment to Action to massively deploy access to the Open Badges. The target was set at 2 million of students and U.S. workers which was exceeded.

In 2014 the Open Badges eco-system commenced its development across Europe. Digitalme launched the Badge and in the UK campaign this expanded into a network of over 120 organisations and in excess of 25,000 badges where issued in the subsequent 2 years.

At the Summit to Reconnect Learning in 2014, where the Badge Alliance was established to manage Open Badges specifications and community, a commitment to move Open Badges

from the edges of innovation to the mainstream was made by business and education providers.

Badge Alliance working groups were kicked off to guide different aspects of the work, from developing the standard itself, to advancing the acceptance of badges in the workforce, to technical development of enhancements to the ecosystem, such as endorsement.

At Mozfest 2014, Mozilla and Digitalme launched the Badge the World map, a community project designed to map badge projects taking place around the world.

The years of 2014 and 2015, proved that the demand for verifiable, portable badges was growing with Corporations like IBM, Pearson and Microsoft beginning to adopt Open Badges, joining thousands of cross-sector organisations around the world. Supported by the Badge Alliance, more than 650 individuals—educators, technologists, researchers, community leaders and strategists— are participating in one or more Working Groups to increase support and collaboration across sectors, including higher education, digital and web literacies, educator professional development, workforce, and citywide badge systems [1].

Today (2016 – 2017)

Millions of Open Badges have been awarded to hundreds of thousands of recipients. The Mozilla Backpack alone hosts in excess of 900,000 badges on behalf of learners around the globe as of October 2016. The Open Badges community is actively working toward the release of Open Badges 2.0. This upgrade will make possible dozens of high-priority use cases that were identified by key stakeholders [1].

Role of IMS

IMS Global Learning Consortium³, the world's leading open standards consortium for education technology, in partnership with Mozilla Foundation and Collective Shift/LRNG, has agreed to become the organization responsible for managing the effort to advance the development, transferability and market adoption of the Open Badges specification and community effective from January 1, 2017. This work will take place under a licence granted by Mozilla. The current work of the Badge Alliance Standard Working Group will be taken up by a new working group within IMS. In addition, all existing efforts of Badge Alliance will also transition to IMS.



³ Available here: http://www.imsglobal.org/

As of January 2017, Open Badges has become an IMS standard. As the world's leading educational technology standards body, IMS Global is uniquely positioned to guide the evolution of the Open Badges specification. IMS Global is committed to furthering the adoption, integration, and transferability of learners' digital credentials within and across institutions, alternative educational opportunities, and employment centers. Digital credentials have the power to change the way we think about and represent learning, experiences, achievements, skills, and competencies. Consequently, by expanding the scalability, adoption, and intrinsic value of digital credentials like Open Badges, IMS is helping to strengthen an ever-growing ecosystem.

Digital credential pioneer Credly4, which is used by thousands of organizations worldwide, has been certified as the first platform conformant with IMS Global's Open Badges Standard, an industry specification designed to ensure interoperability of credentials issued across a broad spectrum of learning experiences. With millions of Open Badges awarded, the wide adoption of standards ensures the usability and consistency of data contained within credentials and enables their role as a currency in the modern labor market. IMS Global established its new Open Badges conformance program to help ensure a plug-and-play ecosystem for digital credentials earned across different environments. As an IMS-certified Open Badges conformant platform, platforms like Credly demonstrate their commitment to an open architecture that provides the foundation for innovation in education and workforce development.



⁴ Available here: https://credly.com/

Open Badges Ecosystem

Open Badge versus Digital Badge

A digital badge is an online representation of a skill you've gained. It tracks the interactions and work completed to obtain it



Figure 1 Web enabled version of traditional award [2]

An Open Badge is the same badge but it allows you to verify your skills, interests and achievements through credible organisations and attaches that information to the badge image file, hard-coding the metadata for future access and review.



Figure 2 Metadata Badge Content [2]

Because the system is based on an open standard, earners can combine multiple badges from different issuers to tell the complete story of their achievements — both online and offline. Badges can be displayed wherever earners want them on the web, and share them for employment, education or lifelong learning.

So in essence the Open badge tells the story of a learners achievements whether they are online or offline and because it is a free and open technical standard - any organisation can use them.

Capturing learning (skills, tasks and knowledge)

With traditional Qualification Certifications the detail of the skills obtained is lost – so with the Badge systems it is possible to track the building of skills through experience with the specific on the job tasks completed to gain the knowledge (so skill + experience = knowledge). It is possible to capture the specific projects or problems solved as part of the path of learning.

The Role of Motivation

When a learner is aware that their learning path can be both documented and appreciated in some way it provides an important stimulus to learning. A motivated learner will identify new skills and paths they need to explore as they learn. Also, it promotes retention of concepts which they can then pass on to other learners. In fact, when this works well learners become skills mentors for others.

How Innovation is Supported

Innovation skills are by their nature often new and not well documented – so they can be quite tacit in nature. The Open Badge allows users to gain recognition for traits of innovation demonstrated in practical ways whether it be in their own enterprise or when working for an employer. This may be one of the least understood benefits of the Open Badge and certainly merits more case study documentation and study.

Learners who demonstrate high levels of innovation during their learning often become frustrated with traditional learning environments and assessment – as they don't have time to wait for the system to catch up with where they are going or in many cases are already at. Section 6.0 has some detail on how Pathways4employ is running pilot programs with partner companies to support entrepreneurs in the participating companies in Spain, Greece and Latvia.

The Social Context

The Open Badge ecosystem encourages communities of practice and the sharing of knowledge. They also serve as a means of building social capital and when associated with community oriented or defined networks they can promote team cohesiveness and support progression. They allow peer recognition and hence the social status that this can bring. In effect the Badge allows many learners who may feel excluded by traditional formal learning organisations gain both recognition and identity for what they know and have demonstrated.

The role of E-portfolios

E-Portfolios are one of the consequences of the digitalization of many aspects of our life. They offer opportunities for both learners and institutions to integrate formal and informal learning experiences and to collect all learning achievements in the context of lifelong learning [12].

Specifically, E-Portfolios are collections of digital artefacts in various media types. So for example they could consist of a learning portfolio for students for reflection, documentation and collaboration on learning or a lifelong learning portfolio as collection and documentation

of learning artefacts or a career / CV / resume portfolio to store and illustrate learning credentials, career achievements, and to support advisement and career planning [12].

The most important dimensions of E-Portfolios – the standardised Exchange of Information, the learners consolidated identity along with the security and protection of data – are shown in Figure 3 which also maps to a process model to reflect the learner lifecycle which can adapt and change as required (Plan, Build, Design Run).



Figure 3 Process Model and Dimensions of E-Portfolios [12]

Best practice examples

Profiles' development

Usually the first step in developing a badge requires the provision of some kind of learning or other experience. The learning needs to be skills based with specific tasks required to achieve learning called out in detail.

Web Skills	Codery Open Music	MozFest Fellow	Open Badge Awaren
Passion Projects	HTML	hsuer: Mozilla	Itsuer: MyrknowledgeMap Ltd.
	Badge 13493785416 Issuer: yep	Web Navigator	
public	c		

Figure 4 Personalized Open Badge Backpack example [7]

The Badge needs to sit inside a supporting structure of Accreditation, Assessment and Learning. A Model that shows a structure underlying Open Badges is shown in Figure 5. In this figure, the metadata is central to the act of recognition, because it includes the documentation and validation of competencies. Metadata includes information such as the origin, stakeholders, issuer, issue date, criteria for earning the badge, expiration, the earner's work and evidence behind the badge [11].



Figure 5 European Guidelines and Open Badges

Accreditation pathways

Parties involved in the ecosystem will differ depending on the type of badge being offered, who designs and administers them, who recognises them and who earns them.

Each provider will need to work with its own experts to baseline and document the skills needed and the proficiency required for achieving the required level of expertise. The work involved in doing this is not to be underestimated and the chartered expert groups will need to check their own knowledge and expertise with what is best practice for the particular skills in question. In an ideal program the designer of the badge will also deliver the training so that the learner has the opportunity to experience that tacitness of some of the skill and knowledge they are experiencing and learning.

Badges can be awarded for achievements such as:

- interest and engagement
- participation
- attendance to events, workshops, etc.
- knowledge or dispositions
- formal certification (degrees, certificates)
- proficiency, competency or skill

These badges can aggregate and shed light on the interests, capabilities and accomplishments of learners. Badges can serve as the stepping stones on a learning pathway, the chosen route

individuals complete as they progress through a range of specific courses, academic programs, and learning experiences. It is a roadmap describing the landscape of a field, program or specialization. Pathways are made of elements that represent requirements, competencies, or other "real-world" experiences and take the form of a hierarchy of nested elements. Issuers should define the learning pathways through their areas of expertise and connects elements to the badges that represent each one, defining the accreditation pathways. Badges issued from different issuers or nested child elements can be set as completion requirements for an element, and a badge may be configured as a "completion badge" to be awarded automatically when an earner meets those requirements. Issuers should organize their badge programs to fit into shared pathways to better connect experiences across multiple learning contexts. Pathway elements can be organized around digital badge systems that are already implemented or can assist with the design of new systems by providing structure. Badges and pathways are defined by a community's understanding of what people have accomplished to get there.

There are so many different ways that you can create and allocate Open Badges. Whether it be high or low stakes learning, badges offer a flexible form of micro-credentialling that is really up to your own imagination. One way of making sense of an Open Badge is as a traditional certificate with built-in breadcrumbs. Another difference is that badges are often a part of an ecosystem. Although they can be created individually, their true potential is ability to interconnect and provide different pathways for learning.

There are different types of pathways:

- **Prescriptive pathways:** seek to declare one homogenized, standard or recommended badge earning path. Typically these approaches rely on a form, structure, and a recommended path laid by institutions, governments, private companies or other formalized education plan. Most likely, this badge pathway will be linear—a straight line from one learning experience to another.
- **Descriptive pathways:** seek to acknowledge the ways people consciously and willfully choose to earn badges. A descriptive pathway is a more natural approach for a badge recipient since s/he's defining his/her own path. When there's no prescribed pathway, people find the way that makes sense to them, choose to follow other people's paths, or strike out in very different directions.

Until recently, most pathways have focused on prescriptive, institutional or corporate learning objectives/achievements, ignoring the successful learning that happens in unstructured environments such as book clubs, volunteer activities and other extracurricular interests. Badges are a means to recognize those opportunities and incorporate their benefits into creating an accurate digital portrayal of accomplishments.



Figure 6 Badge pathways Image via Bryan Mathers CC BY-NC-ND 4.0

The most frequent one is the stepping stones approach. Sequential in nature, it involves doing one step at a time in a prescriptive manner. Another option is where badges are a part of a collection. Like the game Trivial Pursuit, this is where several achievements are grouped together in a non-linear manner. Prescriptive in nature, collections can be linked with the completion of standards or leveling up. In contrast to perspective badge ecosystems, constellations offer a more open-ended approach where users can choose from a range of possibilities, carving out any number of pathways. This is conducive to life-long learning and offers the potential to write your own learning story. Open to borrowing from different providers, it is for this reason that it is descriptive rather than prescriptive.

These aspects will be considered in order to align them with the competence profiles defined in the project based on the DIGCOMP framework, that groups the 21 competences in 5 areas and each of them has three sequential levels (basic, medium and advance).

DigComp 2.0: From 3 to 8 levels of learning outcomes			
Level 1	> Level 2	>	
Level 3	> Level 4	>	
Level 5	Level 6	>	
	/		
	DigComp n 3 to 8 le rning out Level 1	DigComp 2.0: n 3 to 8 levels of rning outcomes	

Figure 7 DIGCOMP 2.0 levels

If you are looking for a guide for creating a badge ecosystem, DigitalMe⁵ have a canvas which outlines all the different requirements in a clear manner.



Figure 8 Badge design cambas

Pathway complexities vary depending on the career goals, personal interests, and experiences of the individual. Some pathways may be short while others may be lifelong. Pathways structure takes on many forms and badging for these pathways may be simple, linear, or complexly interconnected. In 2014, the Open Badges Discovery project identified four possible structures for pathways:

⁵ Available in http://digitalme.co.uk/badgecanvas



Figure 9 Mozilla's Open Badges Discover Presentation, Research Call Feb 19, 2014

Theoretically, pathway structure concepts are well accepted, however operationalizing them into an applied application can be a challenge. The implementations of pathways structure are based on a hierarchical organized set of elements. Completion of each micro-element can be thought of as the steps that form a pathway to the parent objective(s).

It's recommended to handle pathway structures not overly complex making them accessible to many use cases, while providing enough structure to offer a common way to think about badge system design, including defining achievement of an individual or organization's learning goals.

When integrating a badge system, it is important to think about your badges as a whole. How will you implement them? What kind of badges are you awarding? How often will you award badges? Are badge earners allowed to test out of specific elements, demonstrate relevant competencies, or bring in badges earned from other issuers? Rather than plodding through the creation of each badge, one-by-one, how might you organize them in a meaningful way for the recipient and consumer?

For pathway design, identification of purpose, structure and achievement are critical no matter if you are starting from scratch or badge mapping an existing system.

- Purpose (elements)
 - *Guide decisions.* Are you recognizing competencies or tracking progress thru curriculum? Is the pathway meant to be completed in full or to show specialization across a range of options?
 - Use community definitions. What are the values you want to recognize that are already accepted in your community?
- Structure (shape)
 - *Movement.* How do you expect people to move through the pathway, leveling up or getting from point A to point B?
 - *Customizable or prescribed.* Is the learner allowed to pick and choose specializations or do they follow a path of prescribed objectives?
- Achievement (endpoint)
 - Acceptance of external badges. Does the pathway recognize and/or incorporate badges earned from other or more than one issuer(s)?
 - Assessment. What are the assessment practices to required to implement recognition of badges for elements in the pathway?
 - *Collection.* Does the collection of badges clearly demonstrate the objectives of the pathway and is it understood by the community?

One of the biggest considerations when designing pathways is the distinction between (a) integrating badges into an existing curriculum and (b) creating a badge system and a curriculum at the same time

Assessment

The e-assessment platform that is being designed implementing the assessment modules aligned with the 5 areas and 21 competences of the DIGCOMP framework. It will assess the three key elements of the digital competence: knowledge, ability and attitude. The platform will present different digital challenges to the users to assess their levels in the 21 competences according to the DIGCOMP framework. The assessment modules included on the platform will be formed by different types of assessment items in order to present to the users a richer and attractive test. The assessment modules will be designed from the results of O2 Competences Profiles Design, focused on real context situations. It's recommended to use different types of questions according to the element of the competence that we want to measure: Multiple choices, True/false and yes/no, Multiple selection or multiple response, Matching, Sequencing/ordering, Hotspot, Short answer, practical exercises, etc. All the tests are going to present the marks automatically and the "user history" and accreditation pathways will be fed automatically. Open badges will be issued and linked to the platform.

An interesting option is to design the concept of the assessment modules in terms of storytelling and real context situations, aligned with the accreditation pathway. Storytelling has the power to make knowledge (ideas, research and education) more accessible by reaching multiple audiences and he have seen in previous projects that incorporating the storytelling concept in the design increase people interest and improves the engagement. We will make special focus on "employment" according to the 5th dimension of the digital competences in DIGCOMP framework.

Assessment modules will be designed to represent situations and tasks that usually need to be overcame in usual situations in both competence profiles. Designing them in storytelling terms will facilitate the contextualization of the digital challenges according to the competence profiles.

Moreover, we will create, issue and verify digital badges, and the users will be able to earn, manage, and display these badges all across the web. Open badges will be automatically issued and integrated with the e-assessment platform. Open Badges help knit skills together. Badges can build upon each other, joining together to tell the full story of a learner's skills and achievement. With Open Badges, every badge is full of information. Each one has data built in that links back to the issuer, the criteria it was issued under, and evidence verifying the credential — features unique to Open Badges. Open Badges enables learners to take their badges everywhere with them. Users now have an easy and comprehensive way to collect their badges in a single backpack, and display their skills and achievements on social networking profiles, job sites, their websites and more.

Open Badges provide the perfect opportunity to accredit learners' learning via non-standard means. Open Badges help to provide a richer picture of the learner and as they contain all of the evidence and criteria within them, they mean that learners can look back on their previous

learning to help them progress. The importance of making visible and valuing learning that takes place outside formal education and training institutions is increasing. We'll have into account the European guidelines for validating non-formal and informal learning (CEDEFOP) but we think that there is a gap between the recognition of formal and informal ir non-formal learning. The outcome of recognition process is too often treated with suspicion. We'll have this in consideration in order to design the system that will benefit to our target group.

In Badge system design we'll select what kind of learning is valued, how that learning is assessed and recognized, and how (and whether or not) learners are motivated to participate. This can be influenced by the assumptions and values that developers bring to the design task, and the pragmatic and technical choices that reflect these values, ultimately defining how people learn and participate. Values can also be enacted by specific design principles. For example, designing the badges in order to have external value to employers. Value was also embodied in badges by aligning them to standards or formal academic credit, or in systems that involved expert assessment. Although the badges can be used to support a structured teaching sequence, they can be produced with the idea of providing independent learning opportunities for learners. We'll need to think carefully about values throughout the development process, and where possible, let the system be guided by values relevant to the learners, the organization developing the system, and important stakeholders willing to be involved in the wider trust network.

The value of Open Badges does not lie simply in possessing them. The Open Badges true value lies in the underlying assessment and learning that takes place. However, this assessment can be a challenging task as the traditional methods of exams or tests are not always suitable for informal and non-formal learning.

The level of assessment will differ and depend on the skill type. It is also possible that some of the newer skills may require both open and peer assessment or endorsements.

It is important to differentiate between certification and motivation or behavioral badges. For the former the assessment criteria will be rigid and will most likely be overseen by an external awarding body. However, the badge also allows built in flexibility so that learners can take exams at times that suit them and supports portfolio assessment with badges linked to the relevant artifacts in the portfolio.

Badges also allow for multiple assessors. Whereas in formal classrooms, the instructor does most, if not all, of the assessing, an open badge system supports assessments by authorities from many contexts, course organizers, peers, the system or the learner. This flexible and networked nature could mean that there are multiple paths or assessment options for earning a badge, making the system more flexible, ensuring that the needs of each learner are met and limiting the learning path constraints. [5]

Open Badges for Individuals [13]

Case Study 1 – Tech Partnership



In the United Kingdom the Tech Partnership⁶ is promoting digital skills by providing skills training programs in schools and for apprenticeships. In the reference section on Open Badges they list their badges under the following categories: Cyber Security ; Design and Creativity ; Digital and Technical and Software Development offering in excess of 40 employer supported and recognized Open Badges. An example of a Badge in the Digital Sphere is the IBM Raspberry PI and the Coding in HTLM5 with Intel and CoderDojo. This module teaches students over 20 HTML5 tags, how to use them to create a web page with formatted text, images, tables, lists and even an audio player. Students also gain the skills to help the Intel team fix a Piano App that has some bugs in it with provided code and a set of video tutorials.

What is of interest here is that all badges are Employer supported with companies like Intel, O2, SAS, IBM and CapGemini participating to offer in total 20 Digital Open Badges.

A very informative Teacher Guide⁷ is written for the Cyber Security Badge Academy – this is worth referencing as a good example of best practice in designing learning outcomes for a technical open badge course. Here the Main Badge is split into 8 smaller badges (Network Security, Online Safety, Digital Footprint, Threats, Hacking, Encryption, Social Engineering) with detailed learning outcomes for each.

⁶ Available here: https://learning.thetechpartnership.com/badge-academy

Case Study 2 - EDUCAUSE



EDUCAUSE helps those who lead, manage, and use information technology to shape strategic decisions at every level. EDUCAUSE actively engages with colleges and universities, corporations, foundations, government, and other not for profit organizations to further the mission of transforming higher education using information technology.

They have a comprehensive Badging Program⁸ covering at a high level: Community Development; Communication; Leadership Development; Awards; Subject Matter

⁸ Available here: https://www.educause.edu/badging/

- Community Service badges recognizes efforts to serve our professional community and those who engaged in professional development programs.
- Communications badges recognize efforts to share knowledge or lend expertise through online events.
- Leadership Development badges recognize initiative and commitment through an intense, participative learning experience focused on both professional and personal growth as a manager and leader.
- Awards badges recognize standout community leaders honored through the EDUCAUSE awards program.
- Subject Matter badges recognize learning and the development along specific and relevant content areas through verified engagement and participation.

Each Category carries many Badges, for example under the Leadership Development Program they list 6 badges: Leading Change, Technology Leadership, Institute Leadership, Institute Management, IT Manager, and Management Bootcamp.

Case Study 3 – MMA

The Mathematical Association of America⁹ is the largest professional society that focuses on mathematics accessible at the undergraduate level. Members include university, college, and high school teachers; graduate and undergraduate students; pure and applied mathematicians; computer scientists; statisticians; and many others in academia, government, business, and industry.



Matthew Peeples who is a member of the Naval Academy Newport Rhode Island has written a very interesting article¹⁰ on how he used the Open Badge concept to overcome a problem being experienced teaching calculus at the Academy where the traditional methods of lecture note taking, combined with assignments, followed by quizzes were not working.

The badges corresponded to items in the calculus curriculum

- Differentiability and Limits Merit Badge (Cauchy Badge)
- Basic Derivative Rules (Fermat Badge)
- Implicit Derivatives and Inverse Functions Merit Badge (Leibniz Badge)
- Applications of Derivatives Merit Badge (Newton Badge)
- Antiderivatives and the Definite Integral Merit Badge (Riemann Badge)

⁹ Available here: www.maa.org 10 Available here: https://www.maa.org/publications/periodicals/maa-focus/reflections-mathematics-and-democracy-0

Each badge had three levels of accomplishment. Students completed a level by demonstrating certain activities associated with each area (as shown below) to mathematics faculty or tutors. The mathematician signed the form certifying that the student had become (A) Knowledgeable, (B) Proficient, and (C) Mastery at each level. (An example of these signature sheets is below)

- At the Knowledgeable level, students had to show they could remember the basic rules associated with the area of concern to the satisfaction of the mathematician
- At the Proficiency level, students needed to demonstrate they could solve basic problems associated with the area of concern, chosen by the mathematician.
- At the Mastery level, students had to independently demonstrate an example or explanation

Overall, he found the results positive as the students were required to demonstrate an understanding of the concepts, a large percentage of them sought extra instruction. Students who might not otherwise go to supplemental instructors or tutors sought out their help both to understand the concepts better and to obtain signatures for completed work.

Open Badges for Organisations [14]

Case Study 1 - What Counts as Learning – Sheryl Grant

Sheryl Grant summarizes her book¹¹ by saying it "provides a building block for anyone interested in designing open digital badge systems, and also for educators, policymakers, technologists, humanists, scholars and administrators who have a stake in how badge systems might impact learning, assessment and opportunities for lifelong learners."



In pages 50 - 53 she outlines some examples of practical application of Open Badges projects being undertaken by Voluntary and Commercial Partnerships in North America. Some of these are summarized below:

• USDA Robotics Digital Badges: 4-H enters the world of electronic credentials with the development and introduction of digital badges in robotics. As part of an e-portfolio of learning, youth will be able to add digital badges that document knowledge, skills, and

¹¹ Available here: https://www.hastac.org/news/new-ebook-examines-digital-credentials-what-counts-learning-open-digital-badges-new

competencies attained in robotics competitions, platforms, movement, and mechatronics. Robotics badges are the beginning of a new tradition in 4-H.

- **Earthworks:** Earthworks Rising provides an accessible gateway to meaningful, engaged learning and mentoring experiences that empower young people and learners of all ages to cultivate a broader understanding of the importance and cultural value of the Earthworks of North America. The vision, voices and multiple perspectives of Native American culture will direct and guide the content developed for this interactive initiative.
- Intel and Society for Science & the Public (SSP): Intel and SSP badge system will recognize SSP's premier high school science competitions, the Intel International Science and Engineering Fair (Intel ISEF) and the Intel Science Talent Search (Intel STS), which reward independent scientific and engineering research. A badge system based on the Intel STS and the Intel ISEF will recognize independent research and encourage participation in science fairs for student researchers, teachers, mentors, judges, volunteers, and the community at-large.
- Nature Badges: Open Source Nature & Science Badge System connects the onsite physical museum experience to digital tools for lifelong learning and engagement. The museum will be a hub for a strong international network of science and nature badges so that the audiences introduced to badging through innovative hands-on digital activities at the museum will have the opportunity to jumpstart their informal earning through badges from dozens of organizations.
- National Manufacturing Badge System: The National Manufacturing Badge System recognizes the wide range of skills, competencies, and achievements that students and workers need to be competitive in today's Advanced Manufacturing workplace. The National Manufacturing Badge System will supplement formal learning requirements and pathways, providing individuals with an additional online platform to convey their knowledge and skills to employers.
- Robotics and Stem Badges: The linking of a Series of Badges to the NASA Academy Badge site is of some relevance¹². The Robotics and Stem Badges Using NASA Content badge system will provide STEM learning opportunities, spread awareness of STEM disciplines, integrate standards, and enable the expansion of new content through the creation of a unique collection of digital badges for lifelong learners. The initial goal was to create a badge system whereby Users active on the Astronaut Academy Badge Site can earn virtual items and badges for desired actions, organize their items into personal collections, enter contests and competitions, create and adorn their profile, establish lists of favorite items, and connect and interact directly with other members of the community. Some examples of Badges issued are:
 - Project Moonwalk: Rocket Testing
 - Project Moonwalk: Lunar Landing
 - Project Moonwalk: Lunar Surface Photography

¹² Available here: https://www.hastac.org/wiki/project-qa-robotics-and-stem-badges-using-nasa-content

- Project Moonwalk: Apollo 11 Mission Success
- Starlite Activities: Astro-Rescue
- NASA Activities: Lunar Rover (Geometry)

Case Study 2 – Samsung Electronics Retailer and Operator Training

Samsung Electronics UK & Ireland wanted to create a best-in-class extended-enterprise online training platform, targeted at retailer and operator staff (Three, Vodafone, Tesco etc.), selling Samsung products. To achieve this, they set out to revamp their Samsung Backstage online training platform¹³, originally created in 2011. The aim was to:

- Create a unified learner experience across desktop, tablet and smartphone
- Build ongoing relationships and engagement with retail and operator staff
- Reward users for engaging with Samsung Electronics UK & Ireland product learning
- Obtain improved data and analytics to evidence value and ROI
- Deliver a great brand experience for retail and operator staff

Samsung Backstage makes extensive use of Open Badges, to reward users for completing learning, passing quizzes and other incentivized actions such as completing their user profile.

The user's most recent badge is displayed on their homepage with the full collection available on their 'My Backstage' (personalized learning space). Badges are designed to be portable via the user's Mozilla Backpack. Monthly management reports, using a combination of Totara site reports and Google Analytics revealed that the new site has seen a 35% increase in page views and an 85% increase in pages viewed per visit (for the same period, year-on-year). The data also revealed that the number of active users on Samsung Backstage increased 42% and the number of courses completed increased by 181% for the first month of use.

Case Study 3 – Foreign Trade Association (FTA)

With 1,900 members and 41,000 factories and farms reached globally, the amount of people to train is significant. FTA needed a platform that was scalable, yet flexible enough to be tailored to their target audiences and able to keep pace with rapid growth and new demands. Details of the project are contained at: https://www.totaralms.com/case-studies/foreign-trade-association

A company called NEO constructed a Learning Management System (LMS) for FTA using existing Totara LMS functionalities, and added extra features tailored to FTA's needs. The result is a global online learning community called the FTA Academy, in which the FTA and their members can manage large scale continuous improvement programs through their incredibly complex supply-chains.

¹³ Available here: https://www.totaralms.com/case-studies/samsung-electronics-uk-ireland



NEO Learning represents an original approach using extraordinary methods. They are passionate about education and learning through experience. Neo is part of Xylos, a respected IT advisor in mobile, cloud, social and learning solutions.

The Project used Open Badges and delivered:

- A 30% increase in workshop attendance
- More than 350 training sessions, active users in 81 countries
- Extensive use of platform offering eLearning, workshops, webinars, webcasts, informative videos (how to use the system), quizzes, document sharing, certificates of achievement, certification program feedback on trainers and materials
- Rapidly increasing number active users current rate = over 1,000/month

Case Study 4 – Shimano

Shimano has a reputation for high quality bike parts. A critical audience for maintaining that reputation are the bike mechanics who work with their parts. The mechanics need to know about new Shimano products, how they work, how to ensure customers get the best from them. But the business faced a challenge – these mechanics aren't their employees. They work in service centers, which are independent retailers. There are 686 of them in Europe along, and mechanics often move from one to another.



Shimano did not have a system in place to reach their mechanics. They wanted a system that could support these people in multiple countries and languages. They also wanted to be able to certify them accordingly.

Once again NEO Learning, a Totara partner developed a solution based on Open Badges. In the current solution, mechanics can be certified, ensuring that the standards of service expected by Shimano are met. Each learner earns Open Badges for completion of programs.

Over 1,700 mechanics are currently being supported, and the site is being upgraded to support over independent bike dealers as well as service centers. In 2016, this will increase

the user base to 30,000 mechanics across Europe, along with some visual enhancements and additional Badge Features.



Figure 9 Shimano LMS and Open Badge Screens

Case Study 5 – Helvar

Helvar is a family-owned international lighting technology company, specializing in energyefficient components and lighting solutions. For over 90 years, the Finnish organization has been innovating and transforming the technology behind lighting systems across the world. Product knowledge and technical capability is the heartbeat of Helvar as an industry leader. Helvar attracts and employs some of the greatest technical minds in engineering. But most of the organization's product knowledge was sitting in silos or on obscure network drives – or in people's heads – which presented an interesting challenge for the training team.

Having tried to use Sharepoint as a solution for better knowledge sharing, Helvar concluded that a more integrated approach was required with training at the heart of it. They used the services of Learning Pool¹⁴ to partner with them and create a fully branded implementation of Tartra LMS which is called the Helvar eCademy

The list of requirements included:

- In-depth, customizable reporting
- Support for different content types, particularly webinars and live online learning
- Integration with Helvar's HR system
- Flexibility in functionality i.e. being able to switch certain elements on or off depending on their requirements
- Branding and design options around the front-end

The organization has introduced Open Badges to recognize staff's learning achievements. This enables them to provide greater reward for training activity, while also enabling staff to

¹⁴ Available here: https://www.learningpool.com/

transfer their achievements in an easy yet secure way. The badges also showcase Helvar's commitment to innovation and training when they are used by staff on public platforms like LinkedIn.

Full detail of the project is contained at: https://www.totaralms.com/case-studies/helvar

Open Badges software and services

The core technology that supports Open Badges is called Open Badge Infrastructure, designed and operated by Mozilla. It is open source and represents the technical standard that enables the earning, issuing and displaying of badges. It also supports different functions associated with Open Badges, such as earning badges from a variety of issuers and sharing them across the internet. Furthermore, it allows any organisation to design and issue badges with their own unique brand of endorsement. [1]

Open technical standard The Badge Backpack is the digital repository where all badges are stored. Communication with the backpack is enabled through an Application Programming Interface (API) developed by Mozilla in Javascript. For storage and transmission of data, API uses JSON (Javascript Object Notation).



OPEN BADGE SYSTEM INFRASTRUCTURE

Figure 10 Open Badge Infrastructures. [3]

Backpacks are used to store and organise a person's collection of badges.[4] The Open Badge contains three levels of information, namely :





- a graphic image
- machine-readable metadata that has been saved onto the badge
- the web page that includes criteria, evidence, and relevant information

Mozilla is building the Open Badge Infrastructure, which will support the issuance of badges from all the badge systems, the collection of the initial badges by learners and the capacity for badges to then be shared across participating sites including career website, credentialing portfolio and profile systems. [5]

This Badge Infrastructure will support [5]

- Independent Source Badge Issue this needs to be able to support multiple issuers from Academia, Industry, Support Agencies etc. whilst at the same time ensuring the Learner experience is that their learning is supported by the Badge System.
- Badge Collection this needs to allow learners to obtain badges from many environments and experiences through multiple assessment types. The badges should be able to be managed and linked with a user interface for the learner.
- Badge Display this should allow the user to select target audiences to which they can display their badges or sub-sets of badges via various web Platforms such as Linked In, Facebook etc. The badges need also to be verifiable so that the display sites can authenticate if the badges are current and in date.
- Badge Endorsement this is to allow third parties to sign and/or vet badges to add weight and value to the badge for the user.

In addition to the Mozilla endorsed software, there are several web based platforms supporting organisations in the design and implementation of the Open Badge system. There are a growing number of Open Badge platforms available for organisations and individuals to use to create, earn and display badges. Open Badge Network¹⁵ has compiled an overview of the most used platforms that can be consulted on the website of the project¹⁶.

¹⁵ Available here: http://www.openbadgenetwork.com

¹⁶ Available here: https://docs.google.com/spreadsheets/d/1ut1_Mg-iAEIXht16VPRuaFKx_1RbXKtW29SYfmLTHm4/edit#gid=0 PATHWAYS FOR EMPLOY: Research on good practices establishing Open Badges Eco Systems



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Open Badges Issuing Platforms

.Bestr bestr.it	Open Bodge Factory	openbadgeacademy.com	
a dgr		Credly	
info.badgr.io	makeway.es	credly.com	

International Workshop on Open Badges for Open Education STRIDE / 17-03-2017 / CC BY-SA 3.0

Figure 11 Examples of Open Badges Issuing Platforms

These platforms provide the main functionalities required:

- **Create:** Build your organization's digital credentials using our easy-to-use Credential Dashboard or work with our experts to help design a compelling achievement recognition system. Add rich meta data including criteria, evidence, testimonials, expiration and revocation conditions, alignment to industry standards, and much more. Brand your badges and the overall earner experience to match your organization.
- **Issue:** Issuing and enterprise-class scalability make it easy and reliable. Build on integrations with popular applications like Canvas, Eventbrite, Mailchimp, and Salesforce for automating the issuing of credentials within your existing workflow.
- **Claim:** Claim Tools allows you to choose the workflow for credential granting that works best for your organization. Ensure fidelity to your standards by approving claims, providing unique vanity claim codes or requiring earners to submit evidence for validation of their claims. Distributing credentials that match every context and environment.
- Manage: Designate multiple Account Managers to create, issue, approve and administer your organization's digital credential system. Select users can be granted a reports-only view with access to only their account's data and analytics. Account Owners can add, revoke or change users' account management capabilities at any time.





• **Report:** Reporting dashboard includes a complete user-level report for each recipient containing badge earning, sharing and display activity. Drill down and learn more about your earners, their achievements and interests, discover your leading influencers and filter, sort, and export all available data. Use the information to inform new programs and target marketing and engagement initiatives more effectively.

Pathways4Employ Open badges development

Pathways for Employ is a project that aims to develop an assessment/recognition system of digital skills supported by online badges to guide people to their goal of becoming an entrepreneur or virtual office worker.

The project title is derived from - competence profiles (pathways) to guide people (in this case entrepreneurs and virtual office workers) to their goal of becoming an entrepreneur or virtual office worker (so to be employed). Hence, the title of the project – Pathways4employ. There are seven partners in the Project – the Spanish technological and research foundation Tecnalia, the Institute for Entrepreneurship Development from Greece, Latvian SIA Digital Media Group, Telecentre Europe and three of our member organisations – FIT ltd. from Ireland, and Spanish KZ Gunea and Guadalinfo from Basque country and Andalusia respectively [8]

Profiles

For the purposes of the Pathways4Employ project, the two profiles that are being concentrated on are the 'virtual office worker' and 'entrepreneur'.

As both profiles are somewhat generic in nature – in so far as there are no specific paths or skills documented for either - the first task required in developing an Open Badge for these roles is to agree a detailed fixed profile for the tasks associated with each and then determine the skills required to perform these tasks.

To collate information relating to these profiles Pathways4Employ have developed two online surveys to understand what digital competencies are needed for someone who wishes to work remotely or become an entrepreneur. For each competency identified, both the relevance and level needed for a good performance will be evaluated.

It is important to note that a lot of these competencies align to those identified in the European Digital Competency Framework for Citizens – known as DIGICOMP. They have identified Digital competence as consisting of three elements – Knowledge, Skills and Attitudes. Twenty-one competencies are identified across five areas of Digital Competence, namely Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Safety and Problem Solving. [9]





A brief description of the pilot programs being designed as part of the project are outlined next.

In Spain the telecentres' network Guadalinfo has launched the Innycia initiative, a social innovation ecosystem with the aims of fostering the generation and materialization of social entrepreneurial ideas. Innycia provides a mix of services including information, training, access to resources, community support, mentoring and experts' advice during the social innovation project process, from the idea to its implementation. The ecosystem network spreads all over Guadalinfo's telecentres and virtual platform to improve Andalusian' communities lives. [8]

In Greece, the Institute for Entrepreneurship Development (iED) is participating as partner in the Erasmus+ project A new ENTRance, which aims to foster entrepreneurship among Roma minority in Europe as an alternative to unemployment, through the implementation of entrepreneurship training courses -taking into account Roma specific needs – and the development of an online self-evaluation tool for potential entrepreneurs. [8]

In Latvia Data Media Group has been involved in several activities, the most recent being a national project for e-leadership training for SMEs, coordinated by LIKTA. The purpose of the project is to provide entrepreneurs with up to date digital skills needed for different business processes and different industry sectors. [8]

Accreditation

Pathways for Employ aims to offer options for the accreditation of digital competences, using an updated system of lifelong learning through a system of badges, supported by an e-assessment platform.

Parties involved in the ecosystem (trust network) will differ depending on the type of badge, who designs and administers them, who recognises them and who earns them.

In the context of the Pathways4Employ project, the ecosystem will be made up of organisations related to the Remote Office worker and Entrepreneur - like training providers, educational organisations and other organisations that will offer workshops in skills that are relevant to the learners. These people will need to be recognized experts in their field and ideally will also be called upon to assist in deciding the criteria needed for each specific badge.

Assessment

It is proposed to use an e-assessment web platform to support the evaluation and the feedback. This will be an automated evaluation system which involves a range of activities (digital challenges) including multiple-choice questions, interactive simulations and online scenarios. The automated assessment methods will themselves be evaluated to ascertain their ability and success in gathering evidence of learning at PATHWAYS FOR EMPLOY: Research on good practices establishing Open Badges Eco Systems





all levels. One other aspect being considered is the ability of an automated assessment system to determine and evaluate attitude. Due to current technical limitations on attitude assessment, this issue has not yet been examined in depth. [8]

Regarding assessment type it is pertinent to note that students who see assessment as being tied to relevant activities are more likely to engage in learning.

An Authentic Assessment is when students perform tasks whereas an Objective Assessment is where the student selects answers. Students will be required to use the same competencies, or combinations of knowledge, skills, and attitudes that they need to apply in the criterion situation in professional life. Some areas have long used authentic assessment, for example nurses spend time in hospitals and are assessment on tasks performed.

Completing relevant activities and investigations is a more valid indicator of their attainment of knowledge, skills, and attitudes. These three important aspects of learning are combined when students apply what they have learned to real-world activities and especially when they work collaboratively. [8]

The assessment modules will be designed from the results of IO2 Competences Profiles Design, focused on real context situations:

- For the definition of entrepreneurial assessment module we will analyze the various initiatives that the European Commission is taking place in entrepreneurship and subsequently will contrast the assessment modules developed with the knowledge and experience contributed by the partners in O2 and the network of experts established. The JRC, on behalf of DG Employment, Social Affairs and Inclusion, has developed a definition of entrepreneurship as a competence and a reference framework describing it, the Entrepreneurship Competence Framework¹⁷ (EntreComp). This reference framework will be our main reference.
- For the definition of **'virtual office worker'** profile we will contrast the assessment modules developed with the knowledge and experience contributed by all the partners in O2 and the network of experts established.

Results obtained after users assess their digital competences in an assessment module, will be integrated with the recognition pathways feeding them with the results obtained. These assessment modules will be integrated on the platform. The e-assessment platform will be designed implementing the assessment modules aligned with the 5 areas and 21 competences of the DIGCOMP framework. It will assess the three key elements of the digital competence: knowledge, ability and attitude. The platform will present different digital challenges to the users to assess their levels in the 21 competences according to the DIGCOMP framework.

 $[\]label{eq:linear} 17 \quad \mbox{Available} \quad \mbox{here:} \quad \mbox{https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/entrecompentrepreneurship-competence-framework} \\ \mbox{example} \end{tabular}$





The assessment modules included on the platform will be formed by different types os assessment items in order to present to the users a richer and attractive test. For example, Multiple choice, True/false and yes/no, Multiple selection or multiple response, Matching, Sequencing/ordering, Hotspot, Short answer, practical exercises, Performance-based questions and Digital challenges, Questions of interaction between different services and Likert scale-based questions, etc. All the tests will present the marks automatically and the "user historry" and accreditation pathways will be fed automatically. Open badges will be issued and linked to the platform.

5 Assessment modules will be developed containing at least 100 questions per module in all the partner's languages. One module per area: Information, Communication, Content creation, Safety, Problem solving. These questions will serve to assess: knowledge, skills and attitude (main components of the digital competency). Results obtained from the assessment of the 5 modules will feed the accreditation pathways selected by the users.

The assessment modules will be evaluated automatically by PATHWAYS4EMPLOY platform and user will receive the marks from their evaluation automatically. The modules will be totally integrated on the platform.

We plan to design the concept of the assessment modules in terms of storytelling and real context situations, aligned with the accreditation pathway. Storytelling has the power to make knowledge (ideas, research, education) more accessible by reaching multiple audiences and he have seen in previous projects that incorporating the storytelling concept in the design increase people interest and improves the engagement. We will make special focus on "employment" according to the 5th dimension of the digital competences in DIGCOMP framework.

Assessment modules will be designed to represent situations and tasks that usually need to be overcame in usual situations in both competence profiles. Designing them in storytelling terms will facilitate the contextualization of the digital challenges according to the competence profiles.





Conclusion

Open Badges are an innovative way of both supporting and valuing learning throughout the lifetime learning journey of learners. There are many contradictions to be overcome and solved not least the need for the need for clearly documented and agreed standards on the one hand and the idea of Open Badges as being available for all learners across multiple disciplines on the other. There are good arguments that can be made by traditional education providers and industry as to the potential "loose" nature of the Open Badge concept including its apparent dilution of proficiency.

For the purposes of the design of Pilot programs a good starting point may be to connect the Open Badge rationale of validation and the process of learning certification as proposed in the European guidelines for the validation of non-formal learning (shown in Figure 8).



Figure 12 European guidelines for validating non-formal and informal learning

With this in mind – whatever Model is used by enterprises, organisations or indeed individuals the approach of mapping the proposed Badge Model against some standard used for non-formal and informal learning will prove a useful supporting exercise.





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Pilot programs designed for sectors in specific Industries need to be able to articulate in detail both specific and generic skills if these programs are to become effective and relevant in other sectors.





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Appendix 1 Pathways4Employ Proposed Outputs

http://pathwaysforemploy.eu/wordpress/?page_id=2

PREPARATION – ANALYSIS OF NEEDS

- Internal report: desk research for the collection of information from professionals working in target sectors (entrepreneurship and 'virtual office workers' with special focus on digital competences) and/or stakeholders.
- Internal report: State of the Art overall report, analysis/mapping of skills needs

COMPETENCES PROFILES DESIGN

- Internal report with the Assessment of Information Collected during Needs' Analysis
- Internal report Competence profile 1: Entrepreneur
- Internal report Competence profile 2: 'Virtual office worker'
- Internal report Specifying key activities for designing the recognition pathways

Intellectual output O3 DESIGN AND DEVELOPMENT OF THE OPEN BADGES ECOSYSTEM

- Public report of Research on good practices establishing Open Badges Ecosystems
- PATHWAYSFOREMPLOY Open Badges Ecosystem:
- Recognition Pathways Design

Intellectual output O4 PRODUCTION OF ONLINE PATHWAYS4EMPLOY PLATFORM

• PATHWAYS4EMPLOY e-assessment and accreditation platform

Intellectual output O5 ASSESSMENT MODULES DESIGN

- Entrepreneur assessment module
- 'Virtual office worker' assessment module

PILOT ACTION – TEST AND EVALUATION OF THE DEVELOPED MATERIALS

- Pilot of adults in non-formal educational institutions / learning environments.
- Entrepreneur and 'Virtual office worker' competence profiles.