Chapter 4
Drivers, Affordances and Challenges of Digital Badges

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Abstract Digital badges point to a significant and innovative disruption to higher education in how learning achievements will be recognised, made more visible and reach beyond institutions. Digital badges provide a means to display transparent and information-rich links directly via metadata to standards achieved, the badge issuer, the criteria for earning the badge, as well as evidence of the skill or competency the badge represents (Bowen, Open badges anatomy (post on blog Class Hack). Retrieved from http://classhack.com/post/45364649211/open-badge-anatomy-updated, 2013).

There are many factors that drive institutions to consider digital badges, including credentialing of lifelong learning and the need for personalised learning approaches. They can play an important part in the credentialing of flexible and more cost effective pathways for learners, and provide meaningful and relevant ways to identify progress and achievements in a more granular way (Finkelstein et al., The potential and value of using digital badges for adult learners. Washington, DC: American Institutes for Research, 2013).

Digital badges open opportunities for personalised learning pathways for students (Grant, What counts as learning: open digital badges for new opportunities. Irvine, CA: Digital Media and Learning Research Hub, 2014) and for employers to gain clarity around skillsets. Badges enable an alternate credentialing system that supports pathways for, recognition of prior learning, and portability outside the institution they were achieved, linking the worlds of education, work and community in meaningful ways. However, like any new systems, digital badges are not without their challenges. Predictably, digital badges are not universally embraced and differences in strategy and enabling structures range as widely institutions within the sector.

This chapter explores drivers, affordances and challenges for the use of digital badges. Drawing on historical roots and influences such as lifelong learning, opportunities and challenges are discussed in light of specific use cases and emerging examples.

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1   Introduction

> Badges can help engage students in learning, and broaden the avenues for learners of all ages to acquire and demonstrate—as well as document and display—their skills… Badges can help speed the shift from credentials that simply measure seat time, to ones that more accurately measure competency… And, badges can help account for formal and informal learning in a variety of settings.
>
> <div align="right">U.S. Secretary of Education Arne Duncan (Duncan, 2011, p. 1)</div>

While the concept of badging has been around for some time (for example, Scouts and Guides) (Halavais, 2012), digital badging, with the affordances it brings, has only recently garnered international attention as a potentially positive disruption across all levels of education. This is due, in part, to the rise of "gamification" (defined by Karl Kapp (2012, p. 10) as the use of "game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems") in education, wherein badges mark progress, achievements and advancement at various levels. More importantly, the current digital badge movement was born of a desire to acknowledge that learning happens anywhere and anytime, both formally and informally, and that, regardless of how learning occurs, learners need a way to communicate skills and knowledge that traditional methods don't enable.

The digital badge movement got its start at a 2010 conference in Barcelona hosted by Mozilla (Ash, 2012), sparking the launch of Mozilla's Open Badges project to establish a mechanism and open standard for recognizing the learning that takes place in after-school programs and other informal learning situations. Public interest in the digital badge movement is credited to U.S. Secretary of Education Arne Duncan's 2011 speech (Duncan, 2011) to the Digital Media and Lifelong Learning Competition (MacArthur Foundation, 2011) regarding the ubiquity of learning and the potential of badges to acknowledge and document learning inside and outside the classroom. The competition itself brought together education institutions of all levels around the world, government agencies and business/industry organisations to create badges that "inspire learning and translate 'anytime, anyplace, any age' learning into a powerful tool for getting jobs, finding communities of interest, and demonstrating skills, competencies and achievements." (MacArthur Foundation, 2011, p. 1)

In March of 2013, Mozilla released version 1.0 of the open technical standard (Thompson, 2013) to create, issue and verify Open Badges. The standard was a community-authored effort, as developers and other interested parties around the world came together to define the elements and characteristics of Open Badges, the ecosystem in which they would live, and how Open Badges would interoperate. In the wake of the release of the standard, several key initiatives were launched in 2013.

- The Bill, Hillary and Chelsea Clinton Foundation joined with Mozilla Foundation, MacArthur Foundation, and Humanities, Arts, Science, and Technology Alliance and Collaboratory (HASTAC) to announce the *2 Million Better Futures* initiative (MacArthur Foundation, 2013). The focus of the project was to award two million badges to students and workers acquiring twenty-first-century skills over the ensuing 3 years. After a year, it became clear that the goal had been surpassed, and the project was expanded into the *10 Million Better Futures* initiative (Open Badges, 2014b)
- Badge The UK was launched, dedicated to defining and recognising the skills young people need to be successful in life, school and work. The project brings together schools, employers, innovative educators, and charities to recognise all of a young person's achievements, not just the scores a student receives on exams.
- Cities of Learning, launched in Chicago, is a United States effort to turn entire cities into campuses for learning anytime and anywhere and to equip young people with the skills they need to succeed in the twenty-first century (Cities of Learning, n.d.). Digital badges are issued to showcase participation and accomplishments, and unlock deeper learning experiences by connecting to related interests. Each City of Learning is supported locally by public-private partnerships and on a national level by LRNG.org (a spin-off of the John D. and Catherine T. MacArthur Foundation), the Digital Youth Network, and the Connected Learning Alliance.
- Deakin University-led project, funded through the Australian Office for Learning and Teaching, to bring badges to Australian tertiary education providers through resources, courses and forums (Office for Learning and Teaching, 2014).

The years following have seen a further increase in initiatives. In April of 2015, IMS Global Learning Consortium announced the formation of the IMS Digital Credentialing Initiative "to further the adoption, integration and transferability of digital credentials, including badges, within institutions, schools, and corporations," (IMS Global, 2015, p. 1) and to further IMS' leadership in competency-based learning. At the core of this work is the adoption of the Open Badges standard because of the standard's fundamental focus on verifying the competencies of badge holders.

As is evident from the above, there is an increasing interest in the concept of digital badges (Wu, Whiteley, & Sass, 2015), however there remains a lack of qualitative research regarding the use of digital badges in varied educational settings. However, we can draw out the key lessons and opportunities offered by digital badges through exploration of the drivers, affordances and use cases. Much of the power of open badges derives from a deep integration with competency-based education, which provides a framework for more clearly defining learning objectives and shifting the focus to a more explicit connection of content and learning to outcomes. This is at the heart of the drivers yet also presents its' own challenges.

2 Drivers

The emergence of the digital economy and new technology is driving much change in education (Universities Australia, 2013) in the way it is delivered and accessed. There is a drive for future-focussed options while at the same time a push for lower cost alternatives for education. Digital credentials/badges provide a key to a more visible and granular system that is extensible and adaptable to the changing marketplace, and as such may provide part of the answer.

Moves to increase flexibility for learners are connected to widening participation agendas set out by governments in many countries (Bradley, Noonan, Nugent, & Scales, 2008). The widening of participation agenda essentially means that there is a push to increase the number of people completing post-secondary education resulting in a greater diversity of students with many from non-traditional backgrounds (e.g. first in family to attend university, non-school leavers, Indigenous people) (Bradley et al., 2008). These learners come with diverse needs and aspirations which a traditional model of education struggles to meet.

As a result institutions are now striving to offer more flexible and shorter education pathways both to traditional and non-traditional learners (Mandviwalla & Schuff, 2014; Sledge & Fishman, 2014). In particular, the non-traditional segment is a new and growing market of adult learners (Soares, 2013) with prior skills and experience who may work full-time or part-time while learning, may be mobile or transient, and may or may not have participated in formal tertiary education. While traditional education credentials, such as degrees, diplomas or certificates, are still greatly valued there is growing demand for alternatives to earning these credentials. The options may include different combinations of subjects, choice for when and where assessment takes place, and recognition of prior learning.

Learners also strive for more autonomy and agency in demonstrating what they have learned and where they have learned it (Grant, 2014). Connecting and collating the learning experiences across long periods of time is difficult, as much occurs outside education institutions. There is a definite need for more visible and validated credentials, which document and demonstrate lifelong and life-wide learning.

The recent democratisation of knowledge and access has resulted in a massive increase in the availability of learning opportunities and access to education (Bokor, 2012). This includes the fact that knowledge is freely available on the internet for people to pursue when and how they prefer. In a more structured manner, Massive Open Online Courses (MOOCs) on institution-affiliated platforms are now readily available and offer a wide variety of learning opportunities to anyone who has Internet access. There is a strong desire by many learners to collect and collate credentials from these courses, and use them towards employment, professional development or further studies. Additionally, open access means that universities are no longer the holders of knowledge as they once were which is driving changes in both the structure of learning and the expectations of learners (West & Thompson, 2015). Students, government and professions are driving toward employability skills and demonstration of employability outcomes.
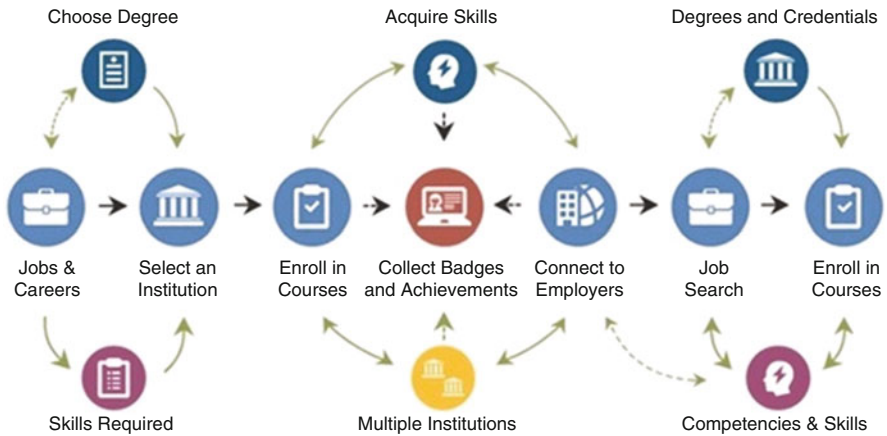
Fig. 4.1 Badges and competency-based learning: a new ecosystem (Open Badges, 2014a)

However, progression through courses, and linking with specific skills is not easy to credential within current traditional certification methods. Transcripts and certification often lack the granularity to link to specific, discrete achievements. Yet because of their modular nature, digital badges linked to competencies can provide a very useful indication of such achievements. This is due to competency-based education, focusing on the ability of students and practitioners to demonstrate skills, attributes and knowledge for specific tasks (Brownie, Bahnisch, & Thomas, 2011), and connecting learning outcomes to competency frameworks that articulate the knowledge, skills and attributes those frameworks comprise. Hence, badges linked to competencies can reveal pathways for skill sets as subsets of qualifications. Further, the progression through a competency-based training program is determined by the student achievements, not by time spent in training.

Specific skill need and skill gaps identified by employers are another key driver for digital badges. To address this, badges can be connected to credentialing skill specific education, and common core skills across different areas. Badges can augment the current learning experience by providing credentialing of specific skills within programs as well as complementary skills and knowledge from extra studies or experience. The following diagram (Fig. 4.1), developed by Blackboard (Open Badges, 2014a), illustrates the interplay among twenty-first-century learners, competencies, badges, education institutions and employers.

3   Affordances and Usability

For generations, the higher education experience has been one of a prescribed course of study within a student's chosen discipline. Upon completion, the student is awarded a credential, which together with a transcript of completed classes and

the grades received, represent the entire record of the student's learning and development. The student might assert knowledge and skills, but no actual proof of learning and ability is available in this scant documentation. Universities have been entrusted with the function of assuring that assessment is in line with key outcomes and this has largely been taken on face value based on transcripts which limited information. This means however that the value and applicability of the student's education career is subject to assumption and interpretation on the part of any third-party consumer (e.g., employer, another learning provider) of the student's record.

Digital badges, in contrast, are transparent and information-rich image files that give information about learning outcomes, the badge earner, the badge issuer, the criteria for earning the badge, as well as pointers to or descriptors of the evidence of the skill or competency the badge represents (Bowen, 2013). While a subject within a course of study reflects multiple learning outcomes culminating in a final grade, badges can be awarded for each individual learning outcome. Badges representing discrete skills can be assembled into a more comprehensive skill set, where a single badge might be foundational to multiple classes and badge sets (Derryberry, 2014). This form of micro- and stackable credential is underpinned by and can drive a positive disruption to education, making learning achievements more accessible, visible and reach beyond educational institutions.

One example is to modularize classes into units of instruction (Harrison, 2014) that are more manageable, both in terms of time commitment and cost, for adult learners. Students can enrol for one or more units at a time and earn badges to document their progress. When schedule and/or budget permits, students can pick up where they left off, rather than having to drop out and start the whole class over again. In this way, badges open pathways for recognition and partial recognition of skills and knowledge that have not been possible before.

Additionally, because badges can be agnostic as to the education provider, they enable digital credentials to be issued outside higher education providers. Hence learning outcomes can be evaluated by institutions as evidence of prior learning (Offerman, 2012) and indicators of credit-worthiness (Soares, 2013). This applies equally to recognition of skills and knowledge that a student attains through work or experience. Perhaps most importantly, badges underscore the distinction between—even the decoupling of—learning and assessment (Derryberry, 2013b).

As symbols of accomplishment and achievement, badges rely on evidence-based assessment that is both rigorous and creative (Itow & Hickey, 2013). Clearly articulated rubrics, that indicate to learners what forms of evidence will be accepted and what that evidence should demonstrate, give learners latitude to devise artefacts of their achievement that are both meaningful to themselves and address the rubrics. In this way, badges can mark progress and advancement at various levels, and increase learner motivation (Schenke & Tran, 2014).

Open badges can help make the connection between education and high-value employment more obvious by making explicit what skills and attributes an individual possesses. They connect competencies to job requirements, and connect competency gaps with learning opportunities. In so doing, digital badges reveal unique learning pathways (Finkelstein, Knight, & Manning, 2013; Grant, 2014) that

facilitate the accomplishment of an individual's aspirations. In a very real sense, badges bring together two, often disparate, worlds—the world of education and the world of work.

Badges act as a *lingua franca* for learners, educators and employers, and open possibilities for thinking about credentials in new ways (Chow & Otto, 2014). Not only can badges be issued from a variety of providers, including industry, but options arise to "share" (in a similar fashion to airlines code-sharing flights) or recognise others badges, and allow badges to be "stacked" in a variety of ways to achieve further credentials. Such an approach is likely to challenge and disrupt existing credentialing mechanisms and institutions. Yet they must be adopted and accepted in order to achieve this.

In terms of usability, badging platforms are rapidly evolving, enabling the issuing and display of the digital credentials. The Open Badge Infrastructure (OBI) is emerging as a global standard framework for documenting and distributing badges (The University of Southern California, 2013). The OBI framework addresses issues of validity, authenticity, granularity, interoperability, flexibility and transferability and contains embedded metadata derived from this universal standard to indicate (among other things):

- The competency statement
- Standard(s) with which the badge is aligned
- Performance criteria
- Evidence of performance
- Method of assessment and/or rubric
- Recipient
- Issuer
- Endorser (if appropriate)
- Date of issue
- Date of expiration (if appropriate)

This open data exchange or infrastructure is crucial to badges being shared across multiple platforms or systems. The shared standard will make it possible for other systems to process and recognise the badge, allowing it to travel outside the platform in which it was earned and issued (Grant, 2014). Ultimately, the learner should be able to decide where their badge (verified data) will be stored, shared and viewed (Grant, 2014). This may be in an ePortfolio, digital "backpack", blog or other social media site, with direct links to digital artefacts of progress, experience and achievements.

4   Challenges

Badges, amongst other technological innovations, are often referred to as a positive disruption to education, yet the nature of that disruption is not necessarily unpacked. The 'disruptive' nature is connected to changing and challenging education,

particularly tertiary and higher education in significant and structural ways. While there are likely to be many challenges that are not yet apparent, the underpinning concept of badges, their structure and various pilots and prototyping efforts reveal that challenges to adoption and implementation of badges cluster around a number of issues.

Some of the opportunities that badges provide would rely on major re-structures in terms of institutional approaches, strategies and culture. Changes of this nature are massive undertakings which flow onto policy, process and requisite curriculum changes. Such elements include potential changes to curriculum design, assessment structures, how pathways are defined and enacted to provide credit for previous learning, acceptable evidence and IT infrastructure.

Badges are largely predicated on competency-based frameworks. Pegging badges to competency frameworks (Everhart, 2014), especially when those frameworks are not extant, is cumbersome. Not doing so removes the rigor of badges, and the knowledge, skills and abilities they intend to represent. Developing competency frameworks requires agreement by discipline or domain experts from within the academy and from practice. For some institutions or disciplines within institutions, this may be a major change in approach which then flows onto major curriculum review and re-development leading to re-accreditation internally and in many programs impacting on professional accreditation. Work of this nature is a major undertaking.

Effective implementation of open badges for learning also requires a fundamental shift in assessment methods (Hickey, 2012; Sullivan, 2013) to a focus on performance and evidence of competence. Assessment design is especially challenging for what are called "soft skills," "twenty-first-century skills," or "workplace readiness skills": teamwork, time management, communication, and others (Sullivan, 2013). This may be problematic as the work of Worthington (2014) suggests that few faculty members are well-versed in assessment methodologies; few institutions provide faculty with resources in this critical area.

For open badges to have currency, they must be recognised and accepted beyond the issuing institution. Further, there must be no question as to the validity of the badge, the badge holder and criteria for earning and receiving a badge. As noted earlier, breaking units into smaller elements of competency, which has an impact on accreditation, also impacts on such elements as program offerings, enrolments and how credit transfer or recognition is handled in an institution. Furthermore, benefits of badges may include recognition between institutions of study or by employers. Most institutions do not currently provide credit for the sub-elements of a full subject/unit within a course/program. For this to occur would require major policy, system and cultural change. In terms of employers, they must also agree to endorse or accept badges in addition to or instead of traditional transcripts and resumes as validation of the skills and competencies of an applicant or employee. This recognition is essential to all parties: employers, higher education providers, and learners *cum* job seekers (Derryberry, 2013a; The Alliance for Excellent Education & Mozilla Foundation, 2013). In many ways, this may be an easier task than changing major systems and structures in education. However, even to achieve this element

higher education providers and employers must cooperate in the articulation of competency frameworks so that employers recognise the value of badges in their own context.

The infrastructure required to enable badges is also a complex element. While open badge systems may exist, there are a variety of other issues that an institution will need to deal with to be able to produce a badge which is valid and secure. How these are produced and provided to students is no small issue and very dependent on how they are used, the sophistication of learning management systems which in many cases will be a key part of how badges are earned and deployed within curriculum. With this issue resolved, acceptance by employers is more likely.

As such, it will fall to institutions to proceed with development and recognition of badges in a way that is consistent with international, national, regional and discipline-specific accreditation guidelines (O'Brien, 2013) as well as their institutional strategy and infrastructure. One might expect, given the nature of the challenges that this will begin with small scale and more manageable use cases which require less structural change.

Badges do not exist in isolation, but rather are part of a complex ecosystem. The Open Badges Ecosystem Model (Derryberry, Everhart, & Knight, 2013) provides a framework for thinking about badge system design and implementation. This ecosystem is more than merely a mash-up of web-enabled transcript, curriculum vita, and work portfolio; it is also a way to re-structure the process of education and address the needs of twenty-first-century learners, workers and employers (Fig. 4.2).

In a healthy badge ecosystem, learners demonstrate their competencies in authentic learning environments, capture evidence of their achievements, and have valid assessment to back up the earned badge. Just as badges open the field for innovative learning providers, they simultaneously stimulate rethinking about how learning opportunities are provided and assessed.

Learning providers have traditionally relied on academic accreditation and reputation as validation of the value of their targeted learning outcomes. As badges are agnostic as to the mode of learning that learners employed to gain competencies, learning
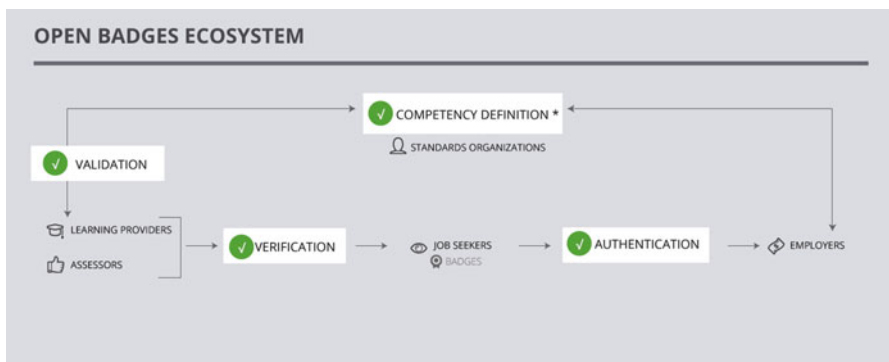

Fig. 4.2 Open Badges Ecosystem Model (Derryberry et al., 2013)

providers are identifying new ways to engage and motivate learners. There are also further opportunities for partnerships and recognition with other providers. However, there is still a need for clear, transparent validation of learning providers and their methodologies, without which the value of their badges could be questioned.

Employers have specific requirements about the attributes and competencies they need among their employees, which are reflected in job descriptions, new-hire requisitions, performance reviews and other ways. To date, it has been difficult for employers to determine what a job seeker states in an employment application or resume is true. With metadata associated with a badge, as previously described, and authentication technology, employers have the means to authenticate that job seekers who present badges to substantiate their assertions of qualification are indeed the ones who earned the badges, and that the badges represent the skills and competencies that the employer seeks. However, this will still rely on valid and robust assessment being constructed in way that can provide this evidence.

The competencies that are called out by employers often reflect regulations, industry standards and best practices as articulated by standards organisations. The competencies defined by standards organisations inform and support a healthy digital credentialing ecosystem. When badges are tied to assessments that are themselves tied to industry standards and best practices, the likelihood of finding the right match between job seeker and employer is greatly improved. Further, learning providers are in a better position to offer learning programs that align with employer requirements.

The connection of digital badges to future work opportunities is exciting. A robust badge ecosystem makes clear the building blocks and learning pathways that lead to a particular job, and from one job to the next. Not only that, a job seeker can readily see how their qualifications match up with the requirements of a particular job. In addition, when a job seeker recognises their need to gain new competencies and earn new badges, they can identify a learning provider who can help them acquire what they need.

5   Current Practices

Digital badges point to a significant and innovative disruption to higher education across the board. There are many emerging examples of badges providing value in liberal arts, twenty-first-century skills development and competency-based education programs, vocational education and job training, and faculty and staff professional development. The differences in strategy and starting place range as widely as do the institutions themselves. There are different levels of use from the badges aligned to part of accredited courses, badges with non-accredited courses/activities, and badges to increase motivation. These use cases include:

- Graduate attributes/employability skills
- Vocational Education Training (VET) and Career and Technical Education (CTE) courses/skill sets

- Higher education practicals
- Primary and secondary education
- Game-based learning/gamification
- Admissions eligibility
- Recognition of Prior Learning
- Non-accredited short courses/community courses
- Professional development
- MOOCS
- Community projects

While many programs are not far enough along to be fully evaluated, following are some of the most promising higher education badge implementations.

Rather than addressing the institutional process and political hurdles associated with introducing badges as replacements for or additions to credentials and transcripts, some institutions are focusing their exploration of badges on faculty and staff development programs. Kent State University (public research university in Kent, Ohio) and Cuyahoga Community College (community college based in Cleveland, Ohio) are launching badges for faculty who are porting face-to-face classes to online delivery (M. Nestor, personal communication, May-August, 2014). Faculty earn badges for things like developing rubrics and connecting assessments to learning outcomes.

Co-curricular learning is the focus of several universities' badge programs. Michigan State University (public research university in East Lansing, Michigan) views badges as a way to motivate students to engage in "non-transcriptable accomplishments" that "provide a fun way to gain recognition of activities, participation and learning. Badges awarded in courses… are not considered nor formulated as formal assignment grades." (Michigan State University, 2015) The Joint Education Project (The University of Southern California, 2013) at University of Southern California (private research university in Los Angeles, California) is exploring awarding badges for "otherwise unacknowledged outcomes." or soft skills, such as critical thinking, civic engagement and leadership. DeakinConnect (Deakin University, n.d.) the open learning space of Deakin University (public university in Geelong, Victoria), highlights peer recognition rather than faculty recognition in the recognition of students' achievements in these areas.

The Agricultural Sustainability Institute at University of California—Davis (a public research university) is designing badges for an undergraduate major in Sustainable Agriculture and Food Systems (Fain, 2014). The badges will recognise student achievements in the core competency areas at the heart of the program, e.g., systems thinking, interpersonal communication, understanding values, and experimentation and inquiry. The university will issue both grades and transcripts, as well as badges, to better inform employers about the range of knowledge and competencies that students have attained.

Lipscomb University (private liberal arts university in Nashville, Tennessee) recognises that certain students bring with them a pre-existing set of college-level competencies, knowledge, skills and abilities acquired through prior learning

experiences. Through their Customized, Outcomes-based, Relevant Evaluation (CORE) program, Lipscomb seeks to provide quality assessment measures to evaluate, through behavioural activities, and today rewards exhibited competencies with e-credential badges (Lipscomb University, 2015). Each competency area carries its own badges and levels; with badges being earned as each higher-level of competency is met.

Carnegie Mellon University is investigating the application of digital badges in academic programs. They have collaborated with the US Defense Advanced Research Projects Agency (DARPA) (CS2N, n.d.) to develop a badge system to increase the number of students pursuing computer science and science, technology, engineering and math (CS-STEM) degrees. Using mobile apps created on campus, Purdue University (research university in Lafayette, Indiana) gives students and instructors alike the ability to create, issue and display badges for online courses in nano-technology. Concordia University-Wisconsin (private liberal arts college in Mequon, Wisconsin) has re-designed their education technology Master's program to add badges, with the ambition of replacing grades. Quinnipiac University (private university in Hamden, Connecticut) faculty share Concordia's ambition of replacing grades with badges, and, as is being done at Deakin University (see above), are using peer review to verify achievements prior to badges being issued.

As education researchers try to tease out the benefits of MOOCs, Dan Hickey and his team at Indiana University (public research institution in Bloomington, Indiana) have been studying the value and appropriateness of implementing badges in these online learning environments. Early results are promising, with the following accomplishments reported: "high retention rates, substantial Wikifolio posts, high levels of engagement, good average exam scores, enthusiastic sharing of badges." (Kelley & Hickey, 2014). Hickey is conducting a project (funded by MacArthur Foundation) to introduce badges and badge practices to the Open edX platform, and through collaboration with higher education innovators who want to implement digital badges. Initial collaborators include Deakin University, University of Sydney and Australia National University in Canberra (Hickey, 2014).

Some institutions are investigating all potential applications of digital badges. Curtin University (public university in Perth, Western Australia) is currently piloting digital badges in a number of ways: leadership development; career exploration; admissions; student success; and, student teacher field placements (Curtin University, 2015). At the request of Curtin University, the Badge Alliance (a network of organisations and individuals working to build and support an open badging ecosystem) convened a group of researchers and practitioners to draft a policy framework for higher education institutions preparing to use digital badges (Badge Alliance, 2014). Pennsylvania State University (public research university in State College, Pennsylvania) has identified several key areas in which they see digital badges providing value to the institution: enhance digital identity of learners; enable global perspectives of learners; foster better instruction by facilitating innovative pedagogy; facilitate better instructional management by encapsulating achievements and individual learning pathways; promote the university through the branding that visual design of badges provides; and, establish new business models and monetization strategies (Bixler & Layng, 2013).

Perhaps some of the most exciting digital badge implementations are those that are targeted specifically at workplace requirements. Madison Area Technical College (a technical and community college in Madison, Wisconsin) has integrated digital badges into at least 30 non-credit, online continuing and professional development courses in areas such as food service management and health care interpreting. This implementation of badges at Madison College has resulted in standardized non-credit classes; validation of the skills/knowledge gained by students; recognition of the validity of the badges by for credit programs that are now allowing transfer credits for these classes; and employers accepting badges as proof of claims made by students on their resumes (Radnioff & Voigt, 2014). The Manufacturing Institute has launched the National Manufacturing Badge System to recognise the wide range of skills and competencies that workers need to be competitive in today's Advanced Manufacturing workplace. They have partnered with a number of community and technical colleges around the U.S. to provide formal training in these skill areas, and are supplementing formal learning requirements and pathways with their online badging platform to convey their knowledge and skills to employers (McNelly, 2013).

6   Conclusion

While the body of research about digital badges is scant, the depth and breadth of active interest in this emerging innovation suggests that digital badges have a meaningful role to play in twenty-first-century higher education. Digital badges are particularly relevant because they open up our current system of credentialing to more nuanced levels of understanding, and allow more transparent evidence-based approaches (Grant, 2014). Digital badges enable linking directly with evidence of learning, as well as details of the skill or outcome they represent. Further, digital badges can be "stacked" together in different ways to enable flexible learning pathways and support lifelong credentialing of learning.

Facilitating change begins with articulating where we are and what problems need solutions. There are many different aspects of a badge ecosystem that will need careful consideration by education stakeholders. Badges have the potential to fundamentally change how we credential learning and articulate learning pathways, and will need to be developed with consistent frameworks if we are to maximise the potential benefits of interoperability and portability.

Digital technologies have made it increasingly possible to learn anywhere and anytime and digital badges hold a key to enabling transparent, information-rich credentialing of this learning. As such, they support educational reform, with granular and fluid characteristics enabling adaptation to the changing education and job landscapes. It will be up to the sector to harness the opportunities and overcome the challenges to ensure that they are in a form that is of benefit to students and their prospective employers.

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