

# Using digital badges design principles in professional continuing education programs: a scoping review

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Received: 18/05/20    Revised: 31/07/20    Accepted: 18/09/20    Published: 3/11/20

## Abstract

Digital badges are visual representations of a skill, ability or knowledge acquired by a person. Their practical usefulness is to grant these features visibility through broadcasting on online platforms, in addition to storing and publishing evidence and data about the depicted achievement. This new technology is capable of transforming accreditation and evaluation processes for educational and corporate contexts, by providing specific information participants performance in training or work related activities. An exploratory review of sixteen digital badge projects applied in continuing professional education programs was carried out. Details on the design trends and results of these projects were published in twenty documents registered in Scopus and Web of Science. It was determined that the most used design principles were those related to the recognition and evaluation of competences and skills, a situation that agrees with the interest of the participants in that the knowledge learned obtain greater visibility and usefulness for their professional development. In any case, it is recommended to offer more information about the benefits of digital badges to enrich and promote learning experiences in similar educational programs.

**Keywords:** Digital badges; Badges design principles, Microcredentials; Continuing professional education

## Principios de diseño de insignias digitales en programas de educación continua profesional: una revisión exploratoria

### Resumen

Las insignias digitales son representaciones visuales de una competencia, habilidad o conocimiento adquirido por una persona. Su utilidad práctica es otorgar visibilidad a estas características mediante su difusión en plataformas digitales, además de almacenar datos y evidencias acerca del logro alcanzado. Esta nueva tecnología puede transformar los procesos de acreditación y evaluación en contextos educativos y corporativos, al proveer de información específica sobre el desempeño de los participantes en distintas actividades. Se realizó una revisión exploratoria de dieciséis proyectos de insignias digitales aplicados en programas de educación continua profesional. Los detalles sobre las tendencias de diseño y resultados de estos proyectos fueron publicados en veinte documentos registrados en las bases de datos *Scopus* y *Web of Science*. Se concluyó que los principios de diseño más utilizados fueron aquellos relacionados con el reconocimiento y evaluación de competencias, hecho que concuerda con el interés de los participantes en que los conocimientos aprendidos obtengan mayor visibilidad y utilidad para su desarrollo profesional. Se recomienda difundir los beneficios de las insignias digitales para enriquecer la experiencia de aprendizaje en programas educativos similares.

**Palabras clave:** Insignias digitales; Principios de diseño de insignias, Microcredenciales; Educación continua profesional

## Princípios de design de distintivos digitais para programas de educação profissional continuada: uma revisão exploratória

### Resumo

Os emblemas digitais são representações visuais de competências, habilidades ou conhecimentos adquiridos por uma pessoa, cuja utilidade é dar visibilidade a essas características em um ambiente digital. Essa nova tecnologia pode transformar os processos de acreditação e avaliação, ao fornecer informações específicas sobre o desempenho dos participantes em treinamentos ou atividades de trabalho.

Foi realizada uma revisão exploratória de dezesseis projetos de emblemas digitais aplicados em programas de educação profissional continuada. Informações detalhadas sobre esses projetos foram publicadas em vinte documentos registrados no Scopus e Web of Science. Determinou-se que os princípios de design mais utilizados foram aqueles relacionados com o reconhecimento e avaliação de competências, situação que vai ao encontro do interesse dos participantes em que os conhecimentos apreendidos obtenham maior visibilidade e utilidade para o seu desenvolvimento profissional. Recomenda-se divulgar os benefícios dos emblemas digitais para enriquecer a experiência de aprendizagem em programas educacionais.

**Palavras-chave:** Emblemas digitais; Princípios de design de emblemas digitais; Micro credenciais; Educação Profissional Continuada

### How to cite this article:

Canales-Negrón, I. (2020). Using digital badges design principles in professional continuing education programs: a scoping review. *Revista Digital de Investigación en Docencia Universitaria*, 14(2), e1170. <https://doi.org/10.19083/ridu.2020.1170>

## Introduction

One of the success factors in organizations and companies is to have a work team whose performance when carrying out assigned tasks is acceptable, so that they reach high levels of productivity. To keep their workers motivated and committed to the institution, companies can take a series of steps, such as promoting teamwork, building solid relationships with the employer, offering rewards and incentives in recognition of good performance, and facilitating the professional growth of workers (Madero, 2009).

The ideal scenario for any organization is for professionals to become aware of their own educational advancement and to voluntarily participate in various programs and refresher courses while they are working. The idea that people will proactively engage in long-term and lasting training activities is part of lifelong learning. This learning process consists of enriching the

knowledge acquired by a person throughout their life by participating in educational activities aimed at improving not only their work performance, but also their family and social relationships as part of a continuous search for individual growth and development (Curran et al., 2019; Taylor & Neymeyer, 2017).

Professional Continuing Education (PCE) programs are part of a permanent learning process, since they offer a set of courses and services aimed at updating the knowledge acquired by workers during their professional studies, in addition to providing values, knowledge, and skills strictly focused on labor improvements. Generally, these activities are carried out throughout the entire working career and help workers stay abreast of updates and new trends within their profession (Livneh & Livneh, 1999; Pineda & Sarramona, 2006; Reynoso Flores et al., 2014).

Finally, the decision to foster the professional training of workers within the workplace is the first step towards the creation of a learning

culture that aims at the personal development of the worker through the acquisition of new knowledge that will enrich their work experience. Companies also benefit from this, since these learning spaces will improve the organizational climate by strengthening trust, commitment, and collaboration among all members (Gil López & Gallego Gil, 2016).

Traditionally, knowledge obtained in educational programs is represented by generic diplomas and certificates, which do not detail how, when, and where such knowledge was obtained. These documents usually indicate basic information such as the name of the participant, the name of the completed course, the date it was held, and the name of the institution organizing the program. Due to the obvious physical limitations of these documents, it is not possible to provide more information about the course contents, the methodology used, the learning resources presented, and the skills that were assessed.

A system that specifically represents the level of specialization and success that workers achieved throughout job training programs would allow employers to recognize the specific skills and abilities of each worker, thus facilitating decision-making for better staff recruitment, promotion, and advancement practices. In an ideal scenario, this recognition of skills could be replicated in different companies or corporations both regionally and nationally if the necessary logistical and regulatory conditions were provided, facilitating the labor mobility of workers.

In recent years, we have witnessed technological advances that have facilitated the consolidation of digital media as a referent for the transmission of information, as well as the exponential improvement in the capacity to store large amounts of data. We also have search engines that allow recovering systematized information that can be consulted from multiple devices and access points, and thanks to the massification of social media, large communities of peers in social, work, and academic environments have been created, facilitating interaction and the exchange of ideas.

As indicated in the document published by the COTEC Foundation for Technological Innovation (2010), in the period between 1997 and 2001, the development of new information and

communication technologies (ICT) experienced a significant boost due to the popularization of the Internet. By progressively reaching a considerable critical mass of users, ICTs have created a new non-linear learning environment that allows information to be presented in a different way, shaping what is called a digital society that precisely requires educational spaces adapted to these changes in order to satisfy the new information demands.

Due to their characteristics and their rapid implementation on a global scale, information and communication technologies (ICTs) are causing significant changes in many spaces and especially in institutional ones. (...) The accumulation of information, the speed of its transmission, the overcoming of spatial limitations or barriers, the simultaneous use of multiple formats (image, sound, text, code) are, among others, the elements that explain the enormous capacity for change provided by these technologies (de Pablos, 2010, p. 7).

Similarly, this new technological reality has led to the evolution of systems for the evaluation and recognition of achievements, not only in commercial and business areas, but also in academic activities through the implementation of digital badge systems.

Digital badge systems have the technological and structural capacity to materialize the abovementioned benefits, thanks to the correct use of the characteristics inherent in new technologies: availability and permanent access to information, transmission and global diffusion of contents, integration with multimedia resources that facilitate the recording of activities, and extensive data storage capacity.

The use of physical visual symbols, such as medals and badges, has been a common practice within various institutions and diverse social environments (work, education, sports, etc.) for the identification and recognition of certain characteristics assigned or linked to individuals in a community and/or society. The use of these elements has also served to evidence affiliation to an organization, establish hierarchies, highlight skills, as well as to make the recognition of fulfilled objectives visible to a certain group of peers (Halavais, 2012).

In its most generic definition, a digital badge

is a visual representation of an achievement, competence, or skill, which has the particularity of always being available online, on a website, and accessible at any time for consultation or use. Digital badges not only function as credentials, but also allow the validation of the skills stated through the metadata contained within them. This metadata helps explain the context, the evaluation process, and the results of a certain activity. Furthermore, they are linked to evidence in the form of text files or audiovisual material that will serve to validate the skills or goals claimed to have been achieved (Schwarz, 2016; Ostashewski & Reid, 2015).

Digital badges are a new option to the traditional accreditation systems for educational achievements based on hard-copy certificates and diplomas, not only because of the advantages inherent in electronic resources, but also because of their possible application in non-formal educational settings, in which visibilization of soft skills or skills obtained from social and/or work experience is needed. Badges represent a real alternative for increasing the granularity of the evaluation process, as well as offering more precise academic success indicators, specifically in the description of competencies (Ahn et al., 2014; Fanfarelli & McDaniel, 2015). Finally, an important requirement of the badges is the validity granted by prestigious institutions or subject matter experts who accredit the veracity of the information provided, as well as the social validity granted by the community of users participating in the programs, who identify its value as an instrument for achievement recognition (Hamari, 2015; Hurst, 2015).

Compared to other technological projects applied to educational issues, there are not enough studies on digital badges to determine exactly their definitive impact on the teaching and learning processes. The studies that have been completed show the potential of badge systems for increasing the visibility and portability of skills in different contexts, as well as fostering motivation, knowledge retention, and user engagement in the activities carried out. Badges have proven useful as a stimulus for student participation and as an element to encourage a positive change in attitude towards the courses taught (Shields, 2017; Facey-Shaw et al., 2018). Badge platforms provide a new access point for direct communication among

project participants, which is useful to understand the specific needs of students in order to receive adequate feedback after reviewing the work evidence. The advice that the teachers in charge can provide to students, as well as the facility to establish a direct dialogue between the actors in the system, generates an environment conducive to practical activities related to soft skills, whose identification and subsequent evaluation do not always find an adequate space (Hennah, 2017; Mah & Ifenthaler, 2018). It is necessary to emphasize that one of the success factors of the application of digital badges lies in their adequate design, so that the contents represented are easily identifiable by all the participants of the ecosystem and also have a correlation with the skills learned. The rewards offered as a result of using the badges must be sufficiently attractive to convince students of their usefulness. The benefits must be tangible and truly represent an improvement for the participants' academic and/or professional career, such as the validation of courses or the possibility of promotion (Morris et al., 2019).

That said, it is of great interest to know how digital badges can help professionals update and improve their work knowledge, especially in an era of high specialization and competitiveness. The new work credentials developed from the digital badges will allow to clearly evidence that the worker has the capacity to perform the functions assigned, to create a digital work profile that can be shared in public or internal platforms for consultation by his or her peers, and to promote networking with individuals or external bodies that may establish new evaluation policies (Borras-Gené, 2017).

Due to the characteristics described, the implementation of a badge system in a work environment will facilitate the transition to a learning culture within the organization. Aberdour (2016) even points out that badges can be very useful in the following areas: employee recruitment, internal workforce training, certification of standards compliance, and obviously in continuing professional development programs.

Finally, Finkelstein, Knight, & Manning (2013) mention some additional benefits that badges can offer to companies, such as recognition of the life experience of workers, that is, those achievements made in non-formal educational settings. Badges

would also facilitate the process of internal and external recruitment of workers, since recruiters would have a granular view of the competencies and skills of the applicants, being able in any case to find the most suitable candidate for the required position. It is even possible for companies to start analytics projects through which they can predict which employees have a greater chance of success in a given position based on the analysis of available data, as well as suggesting what other skills could be improved to meet the requirements of the position.

The main objective of the research is to describe trends in the use of digital badge design principles in professional continuing education programs. To this end, this study will identify the types of use of the principles of digital badge design referred to recognition, evaluation, and motivation of learning throughout the educational activities described in the research papers analyzed.

## Methodology

In this study, we used the techniques that are characteristic of a scoping review, which is a form of knowledge synthesis that aims to map the existing literature within a thematic area in terms of volume, nature, and characteristics of primary research, always looking for an answer to a generic and broad research question. The final product of this whole process is a comprehensive bibliographic database that provides a detailed overview of the existing literature, which can serve as a basis for future reviews that are much more complex and rigorous—such as a systematic review—or, alternatively, to determine the feasibility and relevance of an extension of the study (Brien et al., 2010; Peterson et al., 2017; Pham et al., 2014; Munn et al., 2018).

Previously, two literature reviews on digital badges already published were identified, but with a different approach than the one used in this paper. With respect to the impact of badges in relation to educational activities aimed at the professional sector, the review conducted by Liyanagunawardena, Scalzavara, & Williams (2018) concluded that most employers viewed with interest the development of badges as a

useful tool to learn about the skills of potential workers, facilitating decision-making. Similarly, in the review published by Motheeram, Herselman, & Botha (2019), the previous statement is supported, since for the employers, badges represent a means to simplify the communication between the academic setting, the future professionals, and the labor sector because they allow to obtain granular information on the knowledge and competencies available in the market. Although both studies decided to broadly cover the subject, this study is the first to emphasize the experiences in digital badge programs with specific characteristics, both in audience and in curricular contents.

Scoping reviews offer value to researchers, graduate scholars, and policymakers who wish to establish baseline data about research possibilities on a topic or plan for other type of future research and reviews (Lockwood et al., 2019). They have also proven useful when a topic is new or has not been studied in depth, as it allows for relatively rapid identification of key concepts about the topic, as well as any research gaps or issues. Therefore, it is well suited to the topic of digital badges.

The working methodology proposed by Arksey and O'Malley (2006) was used to develop the review. It consists of six stages: posing the research question, identifying the documents, selecting the documents, analyzing the data retrieved, summarizing the results, and consulting the experts, the latter being an optional stage.

Scoping reviews are characterized by answering a generic research question based on the evaluation and analysis of most of the published literature. The research question posed is "What are the trends in design principles for the application of digital badges in professional continuing education programs?"

The purpose of this stage of the process was to identify studies that would provide detailed information on the process of implementing digital badge systems in specialized continuing education programs aimed at professionals in different fields. The studies were to report details about the curricular and thematic design of the courses, the technical characteristics of the badge platforms used, the professional profile of the target audience, and, if applicable, the results and experiences obtained after the application of the program.

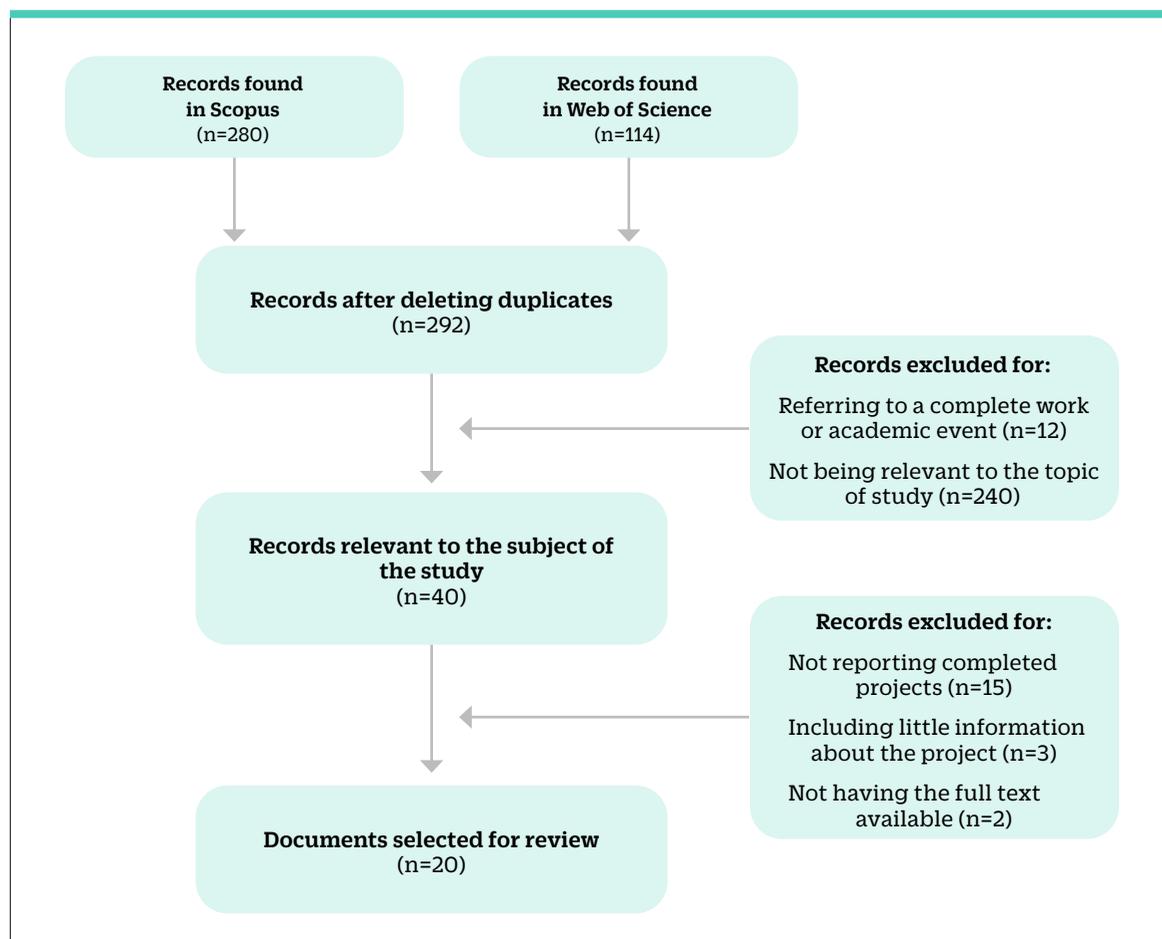
A search for all the literature published in the Scopus (between 2012 and 2019) and Web of Science (between 1985 and 2019) databases was conducted, including journal papers, book chapters, and lectures in scientific conferences. These two scholarly sources were considered due to the fact that the papers published have

undergone a strict evaluation process that assures the quality of the contents, as well as the scientific rigor of the research process.

In the first stage of document selection for analysis, the bibliographic references that met one of the following criteria were eliminated: duplicate records in both databases, records that mention a

**Table 1**  
Structure of the Literature Review in the Documentary Sources

Scopus	Web of Science
<b>Search string:</b>	<b>Search string:</b>
TITLE-ABS-KEY ("digital badges" OR "digital badging" OR "microcredentials" OR "open badges")	SUBJECT: ("digital badges" OR "digital badging" OR "microcredentials" OR "open badges").
<b>Period of time:</b> 2012-2019	<b>Period of time:</b> 1985-2019.
<b>Reviewed collections:</b> Scopus has only one general collection.	<b>Reviewed collections:</b> Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI), Arts y Humanities Citation Index (AHCI)



**Figure 1.** PRISMA Flowchart Used for the Selection of Papers

complete work (book or conference), and records that were not relevant to the study as they did not report on experiences regarding educational programs targeting continuing education and professional development. In addition, the summaries of the remaining studies were reviewed to verify that the contents were directly related to the topic proposed for the study. After applying the aforementioned filters, a preliminary total of forty documents was obtained.

The pre-selected documents were categorized as follows:

Twenty theoretical and/or empirical studies that describe in detail the technical and conceptual characteristics of the digital badge projects, as well as the results of their application.

Fifteen documents that did not provide information on completed projects, but rather proposed guidelines and theoretical recommendations for the implementation and development of future digital badge projects. Three compilation papers with brief general information about the existence of already implemented digital badge projects. Basically, the objectives of the project, the subject matter of the content, and the target audience are reported on, but no technical details or results are included.

Two papers whose full content was not available by any means (scholarly databases or internal collaborative networks).

Finally, it was decided to analyze the experiences described in the first twenty documents, since the detail of the information provided would allow to identify a greater number of design principles. The entire selection process was systematized according to the PRISMA guidelines applicable to literature review (Tricco et al., 2018; Liberati et al., 2009).

## Results

The 20 documents selected reported a total of 16 digital badge projects implemented in professional continuing training programs and courses. It should be noted that some of these projects were mentioned more than once in different studies.

Most of the projects, eleven in total, were developed by educational and/or governmental

institutions in the United States (68.75%). The remaining five projects were implemented in Australia, Finland, Canada, Italy, and Spain, respectively. There was no record of experiences with digital badges in continuing education in Latin American countries.

With respect to the institutions in charge, it is worth noting that ten projects were carried out entirely by universities or higher education centers (62.50%), two projects were carried out by national government entities, two projects were carried out by non-governmental organizations, and two projects were carried out by consortia or mixed initiatives made up of research centers, universities, and other state entities.

Finally, eleven digital badge projects (68.75%) were aimed at training teachers at all levels of education: higher education, elementary education, instructors, etc. Next, three projects aimed at professionals and researchers in different areas of knowledge stand out: health, business, technology, etc. The remaining two projects focused on training administrative staff in academic libraries.

For the data extraction process, the recommendations made in the Design Principles Documentation Project (DPD) were used as a reference. This document describes a set of best practices for the general design of micro-credential systems in educational contexts. The use of these principles is not mandatory, but it is highly recommended because they provide a starting point for the configuration of an ecosystem that allows for the maximum benefits of digital badges while boosting the participants' levels of commitment, ensuring the validity of the knowledge represented and also favoring the adequate dissemination of all the evidence of the knowledge acquired.

A total of 29 design principles are listed, organized into three categories directly related to the main functionalities of the digital badges: recognition, evaluation, and motivation in learning. The first category is related to facilitating the recognition of the knowledge acquired by increasing the visibility of competencies and knowledge, as well as their validation by the external educational community. The second category focuses on improving the

**Table 2***Digital Badge Projects Identified*

<b>Study</b>	<b>Project</b>	<b>Institution in Charge</b>	<b>Country</b>
Gamrat, Zimmerman, Dudek y Peck (2014) Gamrat y Zimmerman (2015) Gamrat y Zimmerman (2016)	Teacher Learning Journeys (TLJ)	Penn State University, NASA y National Science Teachers Association (NSTA)	United States
Cucchiara, Giglio, Persico y Raffaghelli (2014)	Scientific Information for Biomedical Research (SIBR)	Italian Digital Agenda	Italy
Epps, Kidds, Negro y Sayles (2016)	Customer Service Training Curriculum Program	University of Maryland Libraries	United States
Kappes y Beltro (2015)	Open ACC Workshop	XSEDE	United States
Bondie (2015)	Project Reach Online	US Department of Education	United States
Lius (2016) Kullaslathi, Ruhalahti y Brauer (2019) Brauer, Korhonen y Siklander (2019)	Learning Online PDP	Omnia, The Joint Authority of Education in Espoo, Oulu University of Applied Sciences, HAMK School of Vocational Teacher Education	Finland
Diamond y Gonzalez (2016)	Who Built America Project (WBA)	City University of New York (CUNY)	United States
Copenhaver y Pritchard (2017)	Eckerd College Library Access Services Training Program	Eckerd College	United States
Dyjur y Lindstrom (2017)	Programa de capacitación profesional no nombrado	Un centro de educación superior no nombrado	Canada
Jones, Hope y Adams (2018)	Programa de capacitación profesional no nombrado	Una facultad clínica universitaria	United States
Borras Gene (2018)	Tele Education Office (GATE)	Universidad Politécnica de Madrid	Spain
Hunsaker y West (2019)	Tech with Kids	Brigham Young University	United States
Borup y Evmenova (2019)	Online Teaching Initiative	Una universidad estadounidense	United States
Keane, Otter, Oxley y Lipscomb (2016)	VIF Professional Development Program	Visiting International Faculty (VIF International Education)	United States
Dona, Gregory y Pechenkina (2016)	Carpe Diem MOOC	Swinburne University of Technology	Australia
Goodrum, Abaci y Morrone (2016)	Learning Technologies	Indiana University	United States

**Table 3**  
Most Frequently Encountered Design Principles

Category	Principle	Number of studies
Evaluation	Use of hierarchical badges	11
Acknowledgement	Use of badges to evidence skill acquisition	10
Evaluation	Use of performance-based tasks (performance assessment)	9
Acknowledgement	Outlining of a learning path that allows to set goals and visualize progress	7
Evaluation	Constructive feedback on the activities carried out by the evaluators	5
Evaluation	Use of rubrics	5
Motivation	Use different types of evaluations	5
Acknowledgement	Use of educational standards for the development of badges and activities	3
Evaluation	Use of digital portfolios	3
Motivation	Use of easily identifiable badges with roles or programs	3
Motivation	Encouragement of collaboration and teamwork among participants	3
Acknowledgement	Recognition of different types of learning (soft and hard skills)	2
Motivation	Interaction with community members	2
Acknowledgement	Endorsement from external institutions to grant validity to the badges	1
Acknowledgement	Participation of expert professionals to validate the assignment of badges	1
Acknowledgement	Assignment of academic credits and other privileges as a reward for obtaining badges	1
Motivation	Fostering the spirit of educational competition	1

traditional process of evaluation and review of learning products developed throughout the training program thanks to the technological infrastructure of digital badges, which allows for the interaction of experts, the dissemination of the work carried out, and the integration with standards and policies. Finally, the third category focuses on the use of badges as motivational elements for learning, that is, how these new elements affect participation and collaboration among students to achieve educational objectives (Hickey et al., 2014; Otto & Hickey, 2014).

The design principles were identified through the description of the functioning and application of the systems provided by the authors. For example, one project indicated that the academic products developed by the participants were reviewed and corrected by professional experts, in addition to the instructors in charge of the

course. If the experts' decision was favorable, the course was assumed to have been approved and the badges were awarded. In addition, the project's organizers had previously partnered with other institutions to review the digital profile of the participants where the badges were shown so that they could be taken into account for future recruitment processes. According to the information provided, it was assumed that the following principles were used in the project: "Endorsement from external institutions to grant validity to the badges" and "Participation of experienced professionals to validate the issuing of badges."

The most used principle was the design of badges grouped in hierarchical categories in such a way that, in order to obtain the badges of greater academic value, it is necessary to fulfill a series of prerequisites established by the system's

designers. The badges located in the lower categories do not demand much to be obtained, as they are usually assigned when the participant's attendance in any online seminar or informative session is demonstrated or with the writing of a brief report. As one wishes to obtain the badges in more advanced categories, the difficulty increases. In some cases, people are asked to prepare proposals for the practical application of the learned topics. In the projects reviewed, up to three categories were established to group the badges, which were labeled differently according to each experience, but the general idea in all cases was to represent three fixed levels of difficulty to obtain them: basic, intermediate, and advanced. Sometimes, an additional badge was issued for passing a minimum number of courses available in some of the three levels, which represented having mastered a certain subject (Cucchiara et al., 2014; Gamrat et al., 2014; Gamrat & Zimmerman, 2015; Gamrat et al., 2016; Kappes & Betro, 2015; Diamond & Gonzalez, 2016; Goodrum et al., 2016; Keane et al., 2016; Dona et al., 2016; Jones et al., 2018; Borup & Evmenova, 2019; Lius, 2016; Brauer et al., 2019; Kullaslahti et al., 2019; Hunsaker & West, 2020).

The second most common principle was the use of digital badges as a means of communication, through which participants have the opportunity to show their community the skills and knowledge they have acquired. They have the power to decide which badges to show, for how long, and who can view them. Participants had the opportunity to share their achievements from a virtual space within the user profile provided by the platform, or also through social networks. In some cases, they could include the badges in their curriculum in electronic format. It is worth mentioning that this functionality must be properly explained to promote its use. In some projects, the percentage of users who did not know or were not interested in making their achievements visible was surprisingly high (Cucchiara et al., 2014; Gamrat et al., 2014; Gamrat & Zimmerman, 2015; Gamrat et al., 2016; Bondie, 2015; Goodrum et al., 2016; Keane et al., 2016; Borrás-Gené, 2018; Dyjur & Lindstrom, 2017; Jones et al., 2018).

The digital badge system must allow the student to elaborate his own learning path,

understood as an orderly and systematized sequence of courses or educational activities that the student must complete in order to obtain certain knowledge. Seven studies that implemented a number of features aiming to facilitate this task were analyzed: making available a wide range of activities so as not to limit the range of choices (Lius, 2016; Brauer, 2019; Kappes & Betro, 2015), allowing participants to set their own objectives and goals in accordance with their professional interests (Gamrat, 2014; Bondie, 2015), and providing complete and detailed information on the course contents in order to facilitate a rigorous selection. In addition, participants should be able to not only monitor their learning progress, but also add or remove courses according to their interests and the schedule for completion (Cucchiara, 2014).

Another principle identified was the use of different types of tasks based on student performance to decide on the issuing of badges. The participants had to successfully solve different types of tests, not only online, but they also had to write assignments, prepare materials for the teaching of courses, design multimedia objects, prepare application projects, etc. Even the issuing of badges for participation, which take into account participatory attendance at previously scheduled activities (asynchronous forum discussions, online chats, etc.), was sometimes considered as part of the evaluation. A wide range of academic products allows for a more granular and accurate assessment process to determine the student's level of success (Cucchiara et al., 2014; Gamrat et al., 2014; Gamrat & Zimmerman, 2015; Gamrat et al., 2016; Bondie, 2015; Goodrum et al., 2016; Keane et al., 2016; Kappes & Betro, 2015; Diamond & Gonzalez, 2016; Dona et al., 2016; Dyjur & Lindstrom, 2017).

Providing participants with feedback and formative comments about their performance in the courses represents a significant contribution for their successful completion. Usually, specialized teachers worked with a type of tutoring, advising the participants and reviewing the teaching products, making suggestions to improve the results. The participants had the possibility to answer to these comments, which fostered discussions that allowed to build

knowledge aimed at earning a badge with the highest possible level of excellence (Gamrat et al., 2014; Gamrat & Zimmerman, 2015; Gamrat et al., 2016; Bondie, 2015; Diamond & Gonzalez, 2016; Borup & Evmenova, 2019; Lius, 2016; Brauer et al., 2019; Kullaslahti et al., 2019).

In five studies, different tools were used to assess learning outcomes, such as automated computer test correction or coursework review by other students. The evaluation of coursework by an expert teacher who acted as a tutor for the students throughout the course was also considered. It should be noted that no study established any type of self-evaluation or self-criticism (Cucchiara et al., 2014; Gamrat et al., 2014; Gamrat & Zimmerman, 2015; Gamrat et al., 2016; Diamond & Gonzalez, 2016; Goodrum et al., 2016; Borrás-Gené, 2018).

Three studies used competency and ability standards previously validated within the academic and/or educational world. In this way, the design of badge systems obtains professional support recognized by the community, in addition to the fact that the contents represented by the badges can be much more familiar to the participants. The projects studied used various types of educational standards: national governmental (Brauer, 2019), international (Borup & Evmenova, 2019). In some cases, it was even necessary to develop their own guidelines, taking up to five different standards as a starting point (Bondie, 2015).

The use of digital portfolios as a complementary tool was reported in three cases. The digital portfolios (e-portfolios) are online platforms where participants can store the materials, documents, and evidence they produced throughout the course, so that they can demonstrate all their achievements to the community. These portfolios are usually publicly accessible, although participants can decide the level of access to the content (Cucchiara et al., 2014; Gamrat et al., 2014; Gamrat & Zimmerman, 2015; Gamrat et al., 2016; Keane et al., 2016).

It is recommended that badges have a familiar name that is descriptive enough for participants to easily associate it with a role, post, or position of interest. It is important that these names have some kind of correlation with actual titles and that

they also provide some kind of information about the skills involved in that position, such as Master Builder, Journeyman Builder, Apprentice Builder, TechGuru, Common Core Writing Specialist, or History Geek. Badges from other projects referred not only to the position, but also to the level of mastery achieved, such as a Specialist Expert or Social Media Novice (Cucchiara et al., 2014; Diamond & Gonzalez, 2016; Lius, 2016; Brauer et al., 2019; Kullaslahti et al., 2019).

Badges are awarded for activities that prioritize group achievements or foster teamwork. This occurs when all program activities are focused on promoting collaborative seminars or online discussions. The objective was to enable participants to share their knowledge through contact with their peers to achieve a shared learning experience. The badges became a means to motivate participants to establish a solid connection with their peers by providing spaces for communication, collaboration, and cooperation. Other projects formed work groups of four or five people to interact regularly in discussion forums and share their expectations and ideas about the course, as well as other collaborative activities, such as reviewing submitted work or talking to release tension, in order to form a trustworthy learning community (Gamrat et al., 2014; Gamrat & Zimmerman, 2015; Gamrat et al., 2016; Diamond & Gonzalez, 2016; Borup & Evmenova, 2019).

The creation of badges that also recognize soft skills such as leadership, empathy, interpersonal communication, teamwork skills, etc. should be allowed. These competencies are usually not considered by traditional evaluation systems, which is why the use of digital badges represents a valuable opportunity to give them visibility (Cucchiara, 2014; Bondie, 2015).

Badges are awarded if, during the learning process, participants interact with peers or community members, as in the Who Built America project, where "Community Badges" are awarded when there is a contribution to the professional community in general by exchanging teaching materials, providing feedback, or commenting on forums (Diamond & Gonzalez, 2016; Lius, 2016; Brauer et al., 2019; Kullaslahti et al., 2019).

The participation of expert professionals during the badge issuing process is a necessary

added value to reinforce the validity of the skills and knowledge learned. The Teacher's Learning Journey project, aimed at training teachers specialized in natural sciences, was supported by NASA professionals who were responsible for advising and counseling the participants throughout the courses, which dealt with topics on engineering, the environment, and astronomy. Their successful completion was evaluated by the expert, who finally decided if awarding the badge was pertinent (Gamrat et al., 2014; Gamrat & Zimmerman, 2015; Gamrat et al., 2016).

As well as the participation of experts, obtaining recognition from entities external to the project increases the possibilities of benefiting from the digital badges. To this end, the institution responsible for the project must make the necessary coordination and partnerships with interested employers to initiate the formal recognition of the badges obtained by the participants. Only the VIF Professional Development Program project was able to obtain the support of state educational administrators, who usually consult the participant database to monitor the teachers' performance and occasionally consider them for a job opportunity. In addition, this project got the district's schools to agree on the recognition of a total of ten hours of professional development for each course successfully completed so that the badges would have some equivalency in the teachers' formal credit system (Keane, 2016).

Finally, to encourage the spirit of competition among participants, grading systems and rankings were designed to be open to the public in order to encourage the earning of badges. For example, in the Learning Online project, as progress was made in the course, a list of all badges earned by participants was published as a way to encourage competition among work groups (Lius, 2016; Brauer et al., 2019; Kullaslahti et al., 2019).

## Discussion

First, after reviewing the selected documents, it is clear that the majority of the reported experiences took place in the United States and in several European countries. It is necessary to mention

that, in the case of Latin America, Pontificia Universidad Javeria (Colombia) and Tecnológico de Monterrey (Mexico) have already begun to offer digital badges as learning certifications in several of their professional continuing education programs. As expected, the badges comply with the inclusion of basic metadata: course name, student name, date of issue, course description, and skills learned. Badges can be issued through various means, including email, and can be shared on social networks such as Facebook, Twitter, or LinkedIn. There is also the opportunity to publish them on websites, blogs, and even generate a QR code for much faster access (Postgraduate and Continuing Education, 2017; Continuing Education and Javeriana Consulting, 2019). No additional publications or studies on the results of this implementation have been found, which would allow us to evaluate the impact on the educational plans of both institutions and its reception by users. There is only information found in the institutional communication channels from both universities.

Apart from the geographical distribution of the projects studied, it is necessary to mention that the great majority of them were aimed at teachers in elementary and higher education, researchers in science, and university administrative staff. There were no specific experiences aimed at professionals in other areas. This situation has already been noticed by Roy and Clark (2019), who indicate a high concentration of digital badge projects, mostly in academic contexts in STM (science, technology, and medicine), social sciences, and humanities. Therefore, there is a potential market not yet explored in other professional areas where the usefulness of badges and micro-credentials could be applied and publicized.

Regarding the response of employers to the effectiveness of these programs, we can speak of a mostly positive reception, which coincides with the findings made by Raish and Rimland (2016), whose study determined that the vast majority of employers agreed to use digital badges to identify skills, as long as they have detailed and accurate information about the operation of the system. In addition, it is necessary to increase the number of institutions and companies that participate in badge programs, so that there is a critical mass

of participants that exchange information and experiences with respect to this new technology.

Therefore, in order to design an effective program of labor incentives, such as promotions or salary bonuses for their workers, it is necessary for employers to be able to know in detail the skills and knowledge that the workers may have acquired within formal education settings or through experience obtained when carrying out the assigned tasks. The possibility of increasing the visibility of these skills by sharing digital badges on social networks or internal work platforms is perhaps the most attractive feature of the entire system, so it is not strange that this is the principle most frequently implemented in all experiences. Although the participants have the option of making their achievements public within the entire global academic community, the main target of this task will always be the employers or human resources managers of the companies, who are the ones making the decisions regarding promotion or labor mobility.

The use of hierarchical badges allows for better identification and structuring of the skills learned, since by establishing different levels of badges, it is possible to determine with precision the level of knowledge that participants have obtained. In addition, if the system allows some flexibility in choosing the topics for specialization, participants can adapt the way they take the course to their work expectations and objectives. This feature was also one of the most used in the experiences reviewed and it is closely related to the abovementioned aspect of visibility: it is possible to increase the granularity in the identification of skills required by employers by facilitating the creation of a professional profile that fits the job requirements and includes those skills that are traditionally difficult to evaluate.

The validation of the contents learned is granted in three instances: evaluation of learning results by professional experts, institutional endorsement of the organizations involved (educational or corporate), and, finally, the use of educational standards and/or rubrics. In order to consider badges an adequate replacement for traditional certifications, it is necessary to build a network of academic reliability that facilitates the acknowledgement of the true

value of the contents represented by the badges. In addition, there is an implicit need to involve multidisciplinary teams made up of professionals with experience in various areas in order to build an optimal system at all levels: design, usability, content, and technical support. It is necessary to promote the collaboration of engineers, teachers, librarians, graphic designers, and subject matter specialists according to the contents of the courses to be taught in order to offer an attractive educational product for both workers and interested institutions.

The implementation of a learning path that helps monitor the participant's progress and the fulfillment of objectives was a feature used in few studies. Similarly, the recognition of soft skills in the courses taught was not a priority feature during the activities. This situation is unusual because both are precisely functionalities that are exclusive to digital badge systems and should, in theory, contribute significantly to the teaching and knowledge production process. One possible reason for this low incidence level may be the lack of information on the functioning of the badge systems. As a new technology, it is necessary to provide users with as many guides, tutorials, and online support services as possible to help them learn how to use and exploit to the fullest extent the benefits they can obtain from digital badges. In case of lacking an informative tutorial service, many functionalities may not be understood by the students. Therefore, they cannot take full advantage of the features offered by the platform.

The most used design principles were those focused on the recognition and visibility of competencies, a situation easily explained by the interest of the participants in making known the available job skills in the form of an online curriculum verified by reliable institutions and continuously updated. As for the principles focused on the motivation process to achieve objectives during the learning process, they may acquire greater relevance when there is a greater number of tangible rewards directly related to the labor reality within the organization.

Hickey and Chartrand (2020) claim that digital badge programs have a greater chance of success when the following conditions are met: maintaining real expectations about the scope

of student performance evaluation that allows for efficient management of academic results; fostering learning and recognition in a socially appropriate dimension that favors dialogue and the exchange of ideas among participants; and awarding badges once the correct completion of courses, workshops, and projects has been verified through the presentation of tangible learning objects instead of rewarding attendance or participation alone. The application of the trends mentioned in this study favors the implementation of these scenarios and represents a basic starting point for any project of microcredits recognition and use, especially when it is a relatively new technology in the region.

In the present study, a review and analysis of the parameters in the design of digital badge systems applied in continuous professional training programs was carried out. The sources reviewed were the results of research on programs aimed at updating and improving programs taught at the technical-professional level. The studies were published in journals indexed in the Web of Science and Scopus databases until the third quarter of 2019. As mentioned above, there is an evident geographic bias due to the lack of data on experiences in Latin American countries.

In the medium term, a greater number of empirical studies on digital badges are expected to emerge, which will allow new systematic reviews and meta-analyses to be carried out in order to statistically evaluate and validate the findings and evidence produced by these studies.

## Recommendations

Every technological implementation requires not only requires getting economic resources, both for the acquisition of adequate hardware and for the design or purchase of adequate software. It is necessary to consider if the community of users that will benefit from this implementation is able to take advantage of the computer resources to which they will have access. Even more so, if such implementation is relatively new, the risk of not taking full advantage of its potential increases.

Digital badges provide human resources

managers with an additional tool to facilitate decision-making at the human resources level. As for the workers, they now have the possibility of building a digital portfolio that can serve as a display case while looking for any kind of work condition improvement. In order to guarantee adequate conditions for the correct development of a new and disruptive technological project, the following observations should be considered:

Convince the authorities and/or managers of the importance of investing in continuous professional training programs as a tool to increase the well-being of workers and, therefore, favor the organizational climate in a positive way. It is important that the workers observe that their company cares about their training and professional development with programs and plans that fit their objectives. The digital badges have the capacity to gradually identify the competencies that the workers need to strengthen, as well as those that can be used for similar tasks.

The design of digital badge programs requires the participation of a multidisciplinary team composed of educators, programmers, designers, librarians, human resource managers, technicians, and subject matter specialists. Each one of these professionals can contribute to the construction of a friendly interface with revised contents and adequate instructive information designed to favor not only the workers, but also the company's goals.

It is necessary to structure the courses according to the competencies and skills the companies find relevant in order to meet the objectives set by each area. It is necessary to establish a fluid communication channel between the responsible instances.

It is necessary to mention that the success of these programs depends also on an induction program that properly details and explains the use of the platform. Digital badges are a new technology and most participants are likely to not know their real usefulness. The programs studied included documentation, support manuals, and online advice that allowed participants to learn how to use the platform and understand its benefits. If not, the tools may not be used properly and may cause confusion among course participants.

The current context of confinement and social isolation implemented for sanitary reasons in the

vast majority of countries has led to the temporary closure of physical spaces and the cancellation of events involving physical contact. While it is not possible to determine with certainty when we will get back to "normality," activities such as teleworking and distance education have had to be implemented on a large scale with varying levels of effectiveness. As a consequence, companies have had to prioritize a series of competencies in their workers that are required to face this new scenario in the medium and long term: creativity, innovation, critical thinking, emotional intelligence, leadership, and digital competencies. Companies must then design training plans aiming to strengthen these soft skills, and it is even suggested to budget funds for training as a priority in the strategic plan. The sooner procedures to integrate and develop the workforce's cognitive, digital, social, and emotional skills are established, the faster companies will respond to any innovation or redesign of work processes, framed in a fully digital environment (Agrawal, et al., 2020; Marr, 2020).

The scenario is propitious to relaunch continuing training programs as an essential and vital element for organizations. As it has already been demonstrated, digital badges have the capacity to identify, promote, and make these soft skills visible, which are not traditional in current evaluation schemes, and which would be of vital importance to adapt to the new digital reality.

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