

University Micro-Credentials and the Need for Agile IS Skill Development Programs

Joseph Rubleske
rubleskej1@nku.edu

Teuta Cata
catat@nku.edu

Department of Business Informatics
Northern Kentucky University
Highland Heights, KY 41099 USA

Abstract

In the face of rapid, digital technology-driven change, the IS industry has an urgent need to be able to draw from trustworthy skill development programs that teach the current IS management skills that employers need while also certifying and describing the credentials behind these skills. Traditionally, the MSIS degree and (to a lesser extent) the graduate IS certificate have aimed at addressing this need, but neither may be sufficiently agile. Indeed, there remains a market need for a graduate IS program that (1) is even more thematically focused, (2) is updated more frequently, and (3) offers a credential as an easily shareable and informationally transparent digital object. This paper argues that a graduate-level IS micro-credential program may address this need. To this end, four major characteristics of micro-credentials are proposed, and the value propositions of micro-credentials for graduate IS students, employers, and IS departments are identified. The paper concludes by discussing some of the concerns that need to be addressed by an IS department wanting to develop and offer a graduate IS micro-credential program.

Keywords: micro-credentials, digital badges, agile education, MSIS degree, information systems education

1. THE ADVANCEMENT OF DIGITAL TECHNOLOGIES AND THEIR IMPACT ON INFORMATION SYSTEMS SKILL DEVELOPMENT

The ubiquity and functionality of new digital technologies such as remote sensors, 3-D printing, autonomous vehicles, blockchain, and big data processing and analytics platforms are transforming entire industries at an accelerating pace (e.g., Nambisan, Lyytinen, Majchrzak, & Song, 2017; Svahn, Mathiassen, Lindgren, & Kane, 2017). Ongoing innovations in artificial intelligence, deep learning, and robotic technologies are leading some companies to substitute technological capital for people

(Sundararajan, 2017), while cloud computing and virtualization are helping many managers focus on business processes rather than IT infrastructures (Topi, Conboy, Donnellan, Ramesh, & van Toorn, 2014).

The information systems (IS) field – which at a high level entails efforts to develop and manage IT resources and services in order to support organizational goal attainment (Watson, 2014) – factors into this rapid, technology-driven change in two broad ways. First, IS practitioners play a significant role in *driving* this change (Topi, Karsten, Brown, Carvalho, & Donnellan, 2017). For example, one recent study found that firms possessing analytical information processing

capabilities (AIPCs) are better able to leverage customer information flows for product innovation (Saldanha, Mithas, & Krishnan, 2017), and another recent study found that the post-adoptive use of business intelligence (BI) and analytics tools is driving organizational innovation (Roberts, Campbell, & Vijayasarathy, 2016). Second, IS practitioners must regularly *adapt* to this change (Dubé, 2014). For example, in their recent case study of organizational change triggered by sales process automation, Young, Mathiassen, & Davidson (2016) concluded that employee acceptance of such change depends heavily on the development by IS workers of a shared “technology frame of reference.”

Given that IS practitioners are charged with both driving change and continuously adapting to it, chief information officers and other IS managers are increasingly compelled to adopt a more agile approach to organizing and re-organizing IS work. More specifically, IS managers face a growing challenge to *rapidly* identify professionals who possess a certain advanced skill (or set of skills) and then deploy them to an operation or project for which the skill set is needed. Simply put, the fast pace of the market limits the amount of time IS managers have to find and deploy such a person.

At the same time, this technology-driven change is pushing IS practitioners to learn new skills at a faster rate (Akhriza, Ma, & Jianhua, 2017; Topi et al., 2014). In particular, there is rapidly growing need for problem solving and communication skills in digital contexts (Spiezia, 2016), ‘soft’ skills that support effective virtual teamwork and collaboration (Ramesh & Gerth, 2015), expertise with virtual meeting and workflow tools (e.g., Trello, Slack, Google Drive), “digital fluency” skills (e.g., the ability to manipulate and present data) (Colbert, Yee, & George, 2016), and more.

In sum, the rapid diffusion of advanced digital technologies is exerting pressure on two fronts: first, on IS practitioners to acquire new skills around digital work; and second, on IS managers to rapidly identify and deploy the people who possess such skills. Accordingly, the IS industry has an urgent need to be able to draw from trustworthy skill development programs that (1) teach the *current* IS management skills that employers need and (2) certify and describe in detail the *credentials* behind these skills. The following section outlines the predominant skill development programs for IS management – namely, the MSIS degree and the graduate IS certificate – and concludes that there remains a need for more agile programs as options.

2. THE MSIS DEGREE, THE GRADUATE IS CERTIFICATE, AND THE NEED FOR AGILE IS SKILL DEVELOPMENT

Traditionally, a master’s degree in information systems (i.e., an MSIS degree) has functioned as the primary mechanism through which IS practitioners acquire advanced and legitimized IS credentials in order to secure employment as an IS manager (Gorgone, Gray, Stohr, Valacich, & Wigand, 2006; Yang, 2012). To earn an MSIS degree, a student typically must complete 30 to 36 credit hours of coursework that historically has been broken down (on one hand) into foundational, core, and elective courses and (on the other hand) into “technical” and “business” (or sometimes “management”) courses (Gorgone, Gray, Feinstein, Kasper, Luftman, Stohr, Valacich, & Wigan, 2000; Gorgone et al., 2006).

Prior to 2000, official MSIS curriculum models [1] recommended specific courses across three categories: “general prerequisite”; “specific prerequisite”; and required (Ashenhurst, 1972; Nunamaker, Couger, & Davis, 1982). Each required course fell into one of two groups: IS Technology or IS Concepts in Organizations. For the most part, it was assumed that MSIS curricula were uniform across universities. In 2000, though, the third official MSIS curriculum model acknowledged that MSIS program administrators need more flexibility with regard to course offerings, due to unique departmental capabilities and distinctive regional industry needs (Gorgone et al., 2000). Accordingly, the 2000 and 2006 models advised MSIS programs to offer a set of specializations or “career tracks” (e.g., electronic commerce, human factors, enterprise planning) that “allow institutions to provide a more focused professional education” (Gorgone et al., 2000, p. 11). Today, most MSIS programs offer multiple specializations that allow students to customize their MSIS degree to meet contemporary market needs.

The most recent (2016) official MSIS curriculum model further promotes administrative flexibility by using competencies rather than courses as the “basic architectural building block” of the MSIS curriculum (Topi et al., 2017, p. 3). Specifically, the 2016 model identifies nine IS competencies (e.g., IS management and operations, systems development and deployment, IS strategy and governance), 11 “individual foundational” competencies (e.g., critical thinking, leadership, problem solving), and a “domain competency” (e.g., government, health care, business, a

scientific field). By recommending a competency-based curriculum, the model gives MSIS program administrators the freedom to determine which courses (or “modules”) can be used to teach the recommended competencies.

While MSIS program administrators now enjoy greater flexibility in terms of *what* content gets taught, they have struggled to increase the speed with which current, valuable IS skills are taught and credentialed (Akhriza et al., 2017; Downey, McMurtrey, & Zeltmann, 2008). While administrators have long recognized that MSIS curricula must be continually reviewed and updated (Davis & Woodward, 2006), and have endeavored to do so in a timely fashion (Apigian & Gambill, 2014), there appear to be limits to how quickly an MSIS curriculum can be revised and implemented. For example, members of the IS faculty at the Kelley School of Business at Indiana University recognized the need for curriculum redesign in October 2009 (Ramesh & Gerth, 2015). Version 1.0 of the “MSIS integrated core” was piloted in fall 2011, and version 2.0 was delivered in fall 2012. The mostly final version (v2.1) was delivered in fall 2013, nearly four years after the start of the curriculum redesign process. Moreover, new digital technologies continue to be introduced during a redesign process (Akhriza et al., 2017):

Even though schools perform periodical curriculum evaluations, the time gap between the evaluations causes the curriculum to get out-of-date easily since it is unable to cope with the tremendous and quick changes occurring in the industry. (p. 675)

Partly in response to the market need for a more agile IS skill development program, the graduate IS certificate was introduced in the 1970s and became more popular in the 1980s and 1990s (Hirschheim & Klein, 2012). In short, a graduate certificate serves as formal recognition, by a higher education institution, of a graduate student’s completion of some portion of a larger graduate curriculum (Thorsell, 2015). While graduate certificates vary in terms of the required number of credit hours and/or courses, a typical graduate certificate comprises between four and six courses (Cronan, Douglas, & Mullins, 2014). In general, a graduate certificate in IS (or in an IS specialization) is regarded as less marketable than an MSIS degree (Gallagher, 2016), but in many instances it can help an IS practitioner secure a job or promotion until an MSIS degree is earned, and in some instances it may even suffice (Chiang, Goes, & Stohr, 2012).

More than a decade ago, Catanio (2005) described the market forces behind LaSalle University’s development of an IT Graduate Certificate program:

Many of these companies [in the Philadelphia region] find the [MSIS degree] inadequate to fulfill their needs in a timely fashion. Graduate level degrees often take many years to complete and do not provide a quick enough return on investment. (p. 19)

Since then, the number of graduate IS certificate offerings has increased substantially (Thorsell, 2015). The growth of graduate IS certificates has been particularly rapid in the areas of business analytics and business intelligence (e.g., Chiang et al., 2012; Cronan et al., 2014).

The Need for More Agile IS Skill Development Programs

While graduate IS certificates have served as a mechanism for developing certain IS skills more rapidly, they are still limited in terms of their agility. Specifically, there remains a market need for an IS skill development program that (1) is even more thematically focused (in terms of the skill being learned) than the graduate IS certificate and (2) is updated more frequently (as a result of closer engagement with employers) than the graduate IS certificate. Such a program could comprise as few as one, two, or three courses, or even a handful of modules.

Moreover, neither the graduate IS certificate nor the MSIS degree serves as an easily shareable or informationally transparent digital object, except perhaps in a limited number of exploratory or trial instances. Put another way, there is a market need for *credentials as digital objects* that can easily be shared with others (e.g., via e-mail or posted on a web site or social media platform) and can link to metadata such as the issuing university’s (and department’s) name, the courses constituting the credential, the assessments used in these courses, and so on. Along these lines, in the proceeding section we introduce micro-credential programs and identify the ways in which they can address these market needs. After describing micro-credentials and outlining their value proposition for graduate students, employers, and IS departments, we consider some of the concerns and challenges they pose to these three groups.

3. MICRO-CREDENTIALS AND THEIR POTENTIAL FOR IS GRADUATE PROGRAMS

In a recently published book titled *The Future of University Credentials*, Gallagher (2016, p. 106) argues that there is “a general trend toward work-oriented lifelong learning” and “new, shorter forms of credentials and certificates that unbundle, or break apart, the constructs of the traditional degree.” While the MSIS degree does not appear to be in jeopardy of being replaced by such forms – because, among other reasons, they signal an individual’s “ability to stick with something and get it done” (Gallagher, 2016, p. 2) – micro-credentials and mini-certificates may be here to stay as options that meet the shorter-term needs of students and employers.

Much as an MSIS degree serves as evidence of having successfully completed an MSIS curriculum, a micro-credential signifies having successfully completed a small cluster or sequence of courses around a specific area of expertise (Casilli and Hickey, 2016). Gallagher (2016) concedes that most micro-credentials, at this point at least, are issued by independent companies (e.g., Coursera, Udacity, Udemy) rather than universities. Nevertheless, a handful of university-based, IS-related micro-credential programs can be found online. For example, Columbia College offers four micro-credentials around geographic information systems, including a micro-credential on geographic databases. And as reported by Damast (2016), the Coles College of Business at Kennesaw State University has developed a micro-credential program for online executive education students.

Perhaps the most high-profile example of a university-based, IS-related micro-credential program, though, is the University Learning Store. Launched in March 2016, the ULS is billed as a skills-based credentialing system involving six university partners: Georgia Institute of Technology; University of California-Davis; University of California-Irvine; University of Washington; University of Wisconsin; and University of California-Los Angeles. As of late July 2017, ULS students can earn seven “technical,” business-oriented micro-credentials, including Managing Supply Chain Risk, Performing a Cost-Benefit Analysis in Project Management, and Mapping the Business Supply Chain. ULS students do not have to be enrolled at one of the partnering universities; indeed, anyone can earn a ULS micro-credential. One limitation of this model, though, is that ULS micro-credentials

are not recognized for graduate or undergraduate college credit.

At present, few if any *graduate* IS-related micro-credentials are being offered. As Gallagher (2016, p. 144) stated one year ago, “it is still quite rare to find examples of higher education institutions issuing [micro-credentials].” Nevertheless, the core characteristics of university micro-credentials could make them quite attractive to IS graduate students, employers, and IS departments, which in turn could accelerate their adoption in the coming months and years.

Four Characteristics of University Micro-Credentials

A review of the small but growing micro-credential literature reveals that university micro-credentials possess four key characteristics. First, each university micro-credential typically focuses on a specific area of expertise – even more so than does a graduate IS certificate. For example, the aforementioned University Learning Store offers a micro-credential in Creating a Work Breakdown Structure in a Project. In contrast, a graduate IS certificate would likely broaden its focus to encompass all of project management or, at the most, project planning.

Second, a university micro-credential can be earned relatively quickly because it typically comprises one to three or four courses (Hall-Ellis, 2016), while a graduate IS certificate typically comprises four to six courses (Cronan et al., 2014). Third, university micro-credentials are typically part of a program in which employers are engaged very closely with universities – to a greater degree than with MSIS degrees or graduate IS certificates. As Gallagher (2016, p. xvii) observed, employers are “hungry for universities... to collaborate more closely with them” on “shorter forms of learning.”

Fourth, when used in concert with a digital badge, a micro-credential can be easily shared while offering informational depth and transparency (Gamrat, Zimmerman, Dudek, and Peck, 2014). In effect, a *digital badge* is a digital, graphic icon or token that represents the attainment of a micro-credential (Casilli and Hickey, 2016). As a digital object, users can click on a digital badge to access details about the credential, including the earner’s name, the name of the credential, the issuing university’s (and department’s) name, the date the credential was issued, the courses constituting the credential, the major assessments used in these courses, and metrics indicating how well the earner performed.

Because digital badges enable users to access such information, they are said to offer informational *depth* (i.e., details about the credential) and *transparency* (i.e., openness). Digital badges have been used for many years in gaming as a means of signifying levels of accomplishment (McDaniel and Fanfarelli, 2016), but they have also been used by K-12 teachers, librarians, nurses, legal aides, and other professionals (Casilli and Hickey, 2016). At present, there are several open and proprietary applications (e.g., Credly, Canva, Digitalme's makewav.es) that enable educators to create digital badge programs, many of which use the Open Badges platform developed by Mozilla in 2011 (see <https://openbadges.org>). Thus, universities can choose to purchase an existing badge-creation application or use the Open Badges platform to develop their own.

Once a digital badge program has been implemented, a micro-credential earner can embed the badge (as a digital object) within any compatible digital medium. Depending on the technical affordances of the badge application, sharing options might include e-mail, an employer's job application portal, and/or certain social-networking platforms (e.g., LinkedIn). Upon receipt of the digital badge, the employer can then click on it to access detailed information about the credential.

4. THE VALUE PROPOSITIONS OF UNIVERSITY MICRO-CREDENTIALS

Through the four characteristics identified in the preceding section, university micro-credentials yield certain value propositions for graduate IS students, employers, and IS departments. These value propositions are outlined for each of these three groups as follows.

Value propositions for graduate IS students

University micro-credentials yield at least four major value propositions for graduate IS students:

- 1) Through university micro-credential programs, students can learn and acquire the skills that employers *currently* need. As discussed above, MSIS degree programs are less agile, and as a result they may be less effective at teaching the current management skills needed by employers.
- 2) Students can draw from the digital-badge functionality (described above) to more easily and effectively market themselves to employers. Paper-based university transcripts do not offer

such functionality, though shareable digital transcripts could be developed in the future.

- 3) University micro-credentials can help students manage their academic and professional identity. Several articles have considered how digital badge-based micro-credentials allow students to maintain an *e-portfolio* of micro-credentials (e.g., Gallagher, 2016; Gamrat et al., 2014).

- 4) To the degree that earning a micro-credential is similar to playing a skill-based game, university micro-credentials may be more effective than degree programs at motivating students (Abramovich, Schunn, and Higashi, 2013). Much of the evidence for this argument draws from emerging theory around game-based learning. For example, Colbert et al. (2016, p. 735) contend that "games motivate us by providing clear goals and real-time feedback that helps us track progress toward our goals."

Value propositions for employers

University micro-credentials yield two major value propositions for employers:

- 1) As the number of IS-based micro-credential programs increases, the supply of individuals with the requisite current skills may increase. As a result, employers' effectiveness at *finding* suitable IS management candidates may improve.

- 2) Digital badge-based micro-credentials may improve employers' ability to *evaluate* applicants effectively. As described above, such functionality allows employers to click on a digital badge and access details about the student and the underlying IS skill/credential.

Value propositions for IS departments

Simply put, university micro-credentials can help an IS department better meet the needs of graduate IS students and employers (in ways identified above). To the extent that students and employers are satisfied with IS micro-credential offerings – the skills that are taught, the rigor with which they are taught, the ease with which informational details are shared, etc. – then demand for university micro-credentials may grow, and revenues may increase for IS departments.

5. CONCERNS AND CHALLENGES POSED BY UNIVERSITY MICRO-CREDENTIALS

While university micro-credential programs propose value for IS graduate students,

employers, and IS departments, certain concerns and challenges must be addressed in order to actually realize value. First, IS departments must address concerns about the *credibility* of the IS micro-credential. As one executive at “a large publicly traded company” remarked (Gallagher, 2016, p. 108),

The danger with [a micro-credential] is... what did it take to get it – and was it a series of 3-day seminars, or is it a collection of 5 credit-bearing classes? What is behind it?

In short, employers want to be confident that a candidate actually possesses the skills implied by the micro-credential. To some degree, these concerns can be addressed through the digital-badge functionality described above. However, it is quite possible that the credibility of an IS micro-credential program will be determined in the same way that the credibility of an MSIS degree program is determined, namely, by the ability of the credential’s earners to perform IS management tasks effectively. In other words, the credibility of the IS micro-credential may be determined (and re-determined) over time according to the reputation of the IS micro-credential program.

Second, IS department faculty members, and especially graduate program administrators, may have to engage more frequently and more intensively with employer representatives in order to realize the agile potential of an IS micro-credential program. This degree of engagement may take time away from other activities.

Third, an IS department wanting to support their micro-credential program with digital-badge functionality will have to address technical challenges around how such functionality will be developed and provided. Specifically, the IS department must first choose between developing digital-badge functionality internally (perhaps with the help of the university’s IT unit) or purchasing the services of a third-party provider. (Customizing a third-party provider’s services may be a third option.) If the second option is chosen, then vendors must be identified and evaluated. If the first option is chosen, then the IS department will have to plan for and undertake a software development project. In either case, a digital badge administrator will be needed.

Fourth, to the extent that micro-credentials are earned through courses or modules that are taught in shorter time spans (e.g., four weeks

rather than 16 weeks), IS departments may have to re-organize faculty member schedules. Indeed, the shift from courses to modules could prove problematic given the predominant paradigm of course loads.

Fifth, an IS department that offers a micro-credential program may find that it is competing not only with other IS departments, but with online educators such as Coursera and Udacity. Moreover, these online educators have first-mover advantage, and there is typically a learning curve associated with competing in a new market (Kerin, Varadarajan, and Peterson, 1992). Thus, universities may have to demonstrate how a university-based micro-credential program is superior.

Finally, and in a related vein, employers and graduate IS students may be faced with having to sort through and evaluate IS micro-credentials from a variety of institution types, in a variety of forms, and based on a variety of standards. As Gallagher (2016, pp. 170-1) noted,

A more standardized taxonomy and a common language for naming, describing, and communicating new forms of credentials would be helpful in accelerating market adoption and ensuring value for both students and employers. As exciting as the proliferation of new forms of credentials [is], it is also dangerous in that the wide range of terminologies potentially dilutes the value and utility of credentials...”

Indeed, some employers may ultimately choose to develop and offer their own micro-credential programs.

6. CONCLUSION

In order to adapt to and drive rapid digital change, IS managers are challenged with regularly and rapidly identifying professionals who possess certain advanced skills and then deploying them to an operation or project for which the skill set is needed. At the same time, technology-driven change is pushing IS practitioners to learn new skills at a faster rate. Thus, the IS industry has an urgent need to be able to draw from skill development programs that teach the *current* IS management skills that employers need while also certifying and describing the credentials behind these skills.

Historically, the MSIS degree and (to a lesser extent) the graduate IS certificate have

functioned as the chief mechanisms through which IS practitioners acquire advanced and legitimized IS credentials in order to secure employment as an IS manager. While the graduate IS certificate serves as a response to the market need for a skill development program that is more agile than the MSIS degree, there remains a market need for a program that (1) is even more thematically focused, (2) is updated more frequently, and (3) offers a credential as an easily shareable and informationally transparent digital object.

A graduate-level IS micro-credential program may address these needs. A micro-credential can be defined as a credential that signifies having successfully completed a small cluster or sequence of courses around a specific area of expertise. Informational details about micro-credentials are typically shared through digital badges.

At present, there are few if any *graduate* IS micro-credential programs, and most IS-related micro-credential programs are offered by independent companies (e.g., Coursera, Udacity). Nevertheless, the core characteristics of university micro-credentials could make them quite attractive to IS graduate students and employers.

Based on these characteristics, university micro-credentials yield certain value propositions – identified herein – for IS graduate students, employers, and IS departments. In order to realize value, though, IS departments will have to address certain concerns, including the credibility of micro-credentials, technical issues around the digital-badge platform, the re-organization of teaching labor, and the challenge of competing in a new and uncertain market.

7. ENDNOTES

[1] The official 1972 and 1982 MSIS curriculum models were approved by the Association for Computing Machinery (ACM) and published in *Communications of the ACM*. The 2000, 2006, and 2016 MSIS curriculum models were approved by the ACM and by the Association for Information Systems (AIS) and published in *Communications of the AIS*.

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