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Students’ Professional Certification (SCert) in IS Higher Education

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Students’ Professional Certification (SCert) in IS Higher Education

Completed Research Paper

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Abstract

An individual certification (IC) may help to improve the grades and the employability of IS undergraduate students. On the other hand, IS educators are still facing the dilemma of adopting or not IC in their computing curricula. To deal with this challenge, in this research we described and tested the Student’s Professional Certification (SCert) process. SCert introduces certification exams into the IS teaching and learning environment as an optional activity for students. SCert is an artifact derived from DevOps-based learning. We embedded two kinds of free certification exams: Scrum and DevOps. We choose Design Research to verify the following research question: does student certification increase the student’s grade? We collected historical data from 112 students from four different classes that occurred from 2019 to 2020. By adopting SCert, the main results were: i) students that achieved one certification only graded statistically better than non-certified students with a 5% ANOVA confidence level; ii) students that achieved two or three certification badges had better grades than those that achieved one certification only, although the grades were statistically better grades than non-certified students only. This research aims to contribute to the investigation of how to embed certifications into the IS higher education context; provide alternatives to the IS higher education teaching methods that may benefit students’ grades.

Keywords

IS Higher Education, Professional Certification, Scrum, DevOps, DevOps-based learning

Introduction

Individual certification (IC) has been investigated as a way to improve undergraduates’ employability and overall performance for at least the last decade (Mohammad 2014). Among the available IC, more recently there are software development methods (SDM) certifications that have gained importance in Industry, such as Scrum and DevOps certifications (Perez-Castillo et al. 2018). On the other hand, although the IC can be integrated into the IS programs, it does not often available for the students (Rob and Roy 2013). IS academic curricula often lack normalization and how to include IC in IS courses such as SDM-IC (Pang and Hindle 2020).

Within this context, IC can be seen as an alternative to motivate students while also contributing to increasing the students’ performance (Perez-Castillo et al. 2018). On the other hand, there is still a gap in how to standardize the process of including IC in the IS classes (Pérez-Sánchez et al. 2021). Thus, in this research, we propose the Student's Certification process (SCert). SCert is a subset artifact derivate from DevOps-based learning (DevOpsBL) (Grotta and Prado 2021a). SCert was initially applied to one IS undergraduate course from 2019 to 2020 and it has been evolving since then.
Therefore, this research aims to analyze SCert benefits to students’ grades in the IS Higher context and the research question is: does student certification increase the student’s grade? To reply to this question, we detailed SCert, and embedded it into two different courses from one IS higher education program: Agile Methodologies (AGILE) and Quality Assurance (QA). We then collected historical data from 2019 to 2020 from one professor and his/her 112 students, across four different modules lectured from 2019 to 2020. Thus, the main objectives of this research are i) To describe how we applied SCert with the DevOpsBL context; ii) To analyze SCert results at an IS Higher Education course, with an emphasis on the student’s grades.

We adopted the design science research methodology (DSRM) for Information Systems, exterior mode (Venable et al. 2017) in which we theorize about SCert artifact and its usage. We implemented the DSRM within six steps as advocated by (Baskerville et al. 2018; Venable et al. 2017). Thus, in this section, we addressed DSRM #1 step to identify the problem and its motivation. In the Theoretical Basis Section, we address #2 step, to define the solution objectives, and #3 step, to present how we designed SCert from the field observation. The #4 step details the research method and how it helped to solve the problem. In the #5 step, we evaluate the Results and Discussion. The #6, Conclusion Section, iterates back to design and concludes this research.

**Theoretical Basis**

This Section details the SCert artifact. We choose the DSRM exterior mode, in which we theorize about artifact usage via problem-centered research (Baskerville et al. 2018).

**Student’s Certification Process (SCert)**

IC may benefit students in different manners such as, for instance, increasing personal employability in the IS field (Anderson and Barrett 2002). The range of project management certifications is varied from general project management, such as certificates from the Project Management Institute to SDM methods, such as Scrum (Timinger et al. 2022). Most specifically, SDM-IC is relevant in Industry but the possibilities of embedding certifications into Academia are limited due to main reasons such as time and standard process for embedding this into the classroom context (Perez-Castillo et al. 2018).

On the other hand, there are challenges to including different IC in the class context, such as selecting the most appropriate type of certification and how to embed this certification into the higher education context (Timinger et al. 2022). Thu, IS educators are still facing the dilemma of adopting or not IC in their courses. Initial findings indicate a positive step toward including certifications in IS curricula (Pérez-Sánchez et al. 2021).

There are two main options we identified on how to embed IC in a class. The first one would be to offer the SDM training and then encourage the students to take the SDC IC afterward. Anyhow, this option is often optional and thus might not have additional stimulus rather than the SCD IC itself (May et al. 2016). The second one would be encouraging the students to take the exam during the course period (Rob and Roy 2013). In this second option, it should be decided if the IC will be mandatory or not in the course context. Given not many courses in Academia are requesting IC as a mandatory part (Perez-Castillo et al. 2018), this left IC as an alternative for IS courses.

According to DevOpsBL, IS courses should not focus on the development phase only (Dev) but also on the Operations phase as well, advocacion a balance between Dev and Ops subjects during an IS course (Grotta and Prado 2021a). On the other hand, in Industry SDM certifications are often considered an Ops subject: professionals should know the SDM process to better engage in the Dev phase. For instance, a person shown learns Scrum to better perform in a Scrum team (Scrum Study 2020). Therefore, one Ops subject that could be utilized in the class context is SDM-IC. Moreover, bringing SDM-IC into the class context can be considered a didactic transposition, given it tries to transpose practices from the IS industry into the class context (Grotta and Prado 2021a, 2022).

One of the greatest benefits of the IS didactic transposition is to scaffold students becoming better professionals (Grotta and Prado 2022). On the other hand, among other information about someone’s carrier, such as educational background and experience, SDM-IC has been Industry recognized as a piece
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of unique information that demonstrates someone’s skills (Anderson and Barrett 2002; Daniels 2011; Pérez-Sánchez et al. 2021). Until the limits of our research, we have not found a systematic manner to include IC in IS non-practical modules, as proposed SCert process in Figure 1:

As seen in Figure 1, SCert starts with the Professor assessing if a student’s certification project is feasible for the course he oversees. In this phase, the Professor should choose both the certification type: for instance, should he/she include a software programming IC or an SDM-IC? The professor also should choose the certification company. If the Professor decides to include the IC, then he/she dialogues with the students, showing them the advantages that an IC could bring them as a group (thus the Collective Plan) and the advantage as individuals. Students should be oriented that IC is a student’s project. The professor should create consensus among students instigating them to embrace the certification challenge as described by the Iteration lane.

In Figure 1 we then have the Iteration lane: a phase where the student is expected to do self-study, or more specifically, the unaided zone as preconized by DevOpsBL (Grotta and Prado 2021a). Within this lane, the student should: i) establish the tactic, such as the best time to take study and take the exam; ii) study, and iii) take the exam. If the student passes the exam – and thus gets the IC badges – the student should have his/her own WOW! Moment, a moment of meaningful learning (Correia et al. 2014). WOW! moments can be illustrated as a moment a learner goes through a “knowledge portal”, by acquiring threshold concept(s) that is usually accessible to professional only. When the learner crosses this portal, often he/she achieves meaningful learning, which causes the WOW! moment to happen. It expresses surprise, and happiness, among other positive feelings in the learner (Novak 2002). Given the learning process often involves collective and contextualized aspects, others around the learner, such as classmates, professors, and the social circle also get positive WOW!s (as positive expressions) when in a collaborative and constructivist learning environment. These can be named as share moments (Beck and Kosnik 2012; Biggs and Tang 2011).

Sometimes, it might be had for professors to identify threshold concepts from the students’ perspective given professors have already gone through those portal for a long time (Correia et al. 2014). In this sense,
an IC might represent for both the student and the professor something we might name as a knowledge portal achieved, or simply an IC. Thus, in Figure 1, in the Presentation phase, the IC badge is shared with the classmates and thus it should stimulate other mates to focus on the Iteration lane, in a continuous loop, as preconized by the DevOpsBL (Grotta and Prado 2021a). Positive feedback from the non-classroom environment should either add more WOW! Moments as, for instance: “likes” when the badge is shared on social media; recognition from student’s jobs mates or employers. These external WOWs should be considered as additional motivational factors. In summary, these WOWs should be reinforced by the professor's reflections, feedbacking the loop SCert loop. Within the SCert process, the professor must actuate in the endpoints only (Iterative Plan and Presentation lanes), avoiding interfering in the Iteration lane to avoid any ethical concerns, such as the issue of supporting the student during the student’s self-exam. From this point on we will refer to IC only in replacement for SDM-IC given this research deals with SDM-IC only.

Research Method

This research investigates the contribution of SCert to students’ specific types of academic performance, and the students’ grades. This research is an exploratory study and it utilizes the quantitative method approach for human-related research (Creswell 2009) given we collected the students’ grades and certifications badges quantities, that although quantitative data. The following subsections described the Research Framework. Then, we described the Research Context and how it helped to solve the problem. We then described the Research Protocol, including the data collection instruments. Finally, we describe the Research Limitations and the bias avoidance procedures. This research is part of larger research regarding the DevOpsBL context (Grotta and Prado 2021a), given it investigates

Research Framework

This research has variables as detailed in Table 1:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Interval</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching methods</td>
<td>Nominal</td>
<td>SCert</td>
<td>According to the Theoretical Basis.</td>
</tr>
<tr>
<td>Course content</td>
<td>Nominal</td>
<td>Conceptual</td>
<td>The class content type is highly relevant when applying didactic translation teaching methods as per our previous research (Grotta and Prado 2021b). For this research, we choose to keep (Anderson et al. 2001) classification: Theoretical: aims at the interrelationship between basic concepts, addresses theories, models, and/or conceptual and abstract aspects.</td>
</tr>
<tr>
<td>Students</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Performance (grades)</td>
<td>Rational</td>
<td>0 ~ 10</td>
<td>Grading is almost universally present in the formal higher education system. Grades are a sum of many aspects the professor evaluates. Students' assessment occurs for basically three main reasons: to promote learning, to certify their achievements, and to provide data that can be used for quality assurance, internally or externally to the education institution (Palfreyman 2010).</td>
</tr>
<tr>
<td>• Certification [badges]</td>
<td>Rational</td>
<td>0 ~ 3</td>
<td>The total number of certifications a student could achieve with the specific course. It could not be cumulative from one course to another.</td>
</tr>
</tbody>
</table>

Therefore, we propose the Research Framework as seen in Figure 2. From Table 1, Figure 2, and the given context, the research hypotheses H1 and H2 are stated as follows:

- **H1** – SCert increases students’ grades when compared to the traditional evaluation method;
- **H2** – SCert increases students’ grades after a threshold of two or three ICs when compared to the traditional evaluation method;
Research Context

In this subsection, we describe how SCert helped to solve the problem.

- **The Campus and undergraduate course**: This research took place on a campus located in the State of Sao Paulo, Brazil, at an IS course designed to be completed in three years, named Analysis and Development of Systems (ADS). This course started in 2012 and admits every year around 40 students and around 270 students. The course objective is to provide, in a reasonable balance of time, theory, and practices, a professional that is ready to actuate in the different areas of the ADS course, with more focus on solutions development, such as software development, system analysis, and software quality assurance. Starting in March 2020, due to the COVID-19 outbreak, all classes suddenly started to be from their places, including professors, and still one year later no in-person classes occurred at the campus.

- **Courses details**: We selected modules Conceptual content modules, as follows: Agile Methodologies (AGILE) and Quality Assurance (QA). AGILE: 2 hours per week, a total of 20 weeks, a total of 2 credits. QA: 4 hours per week, a total of 20 weeks total of 4 credits. Within the context of these two courses, the IC certification where more appropriate given the syllabus of these courses was focused on SDM and its process. The student needed at least grade 6 (from zero to 10) to be approved.

- **Certification companies and related SDM-IC**: ScrumStudy.com: Scrum Fundamentals Certified (Scrum Study 2020). Certification company CertiProf.com: Scrum Foundation Professional Certificate - SFPCTM (Certi Prof 2020a) and DevOps Essentials Professional Certificate -DEPC® (Certi Prof 2020b) – DEPC was free for a certain period in 2020 only.

- **SCert application**: The professor offered two alternatives for the students. First, “a traditional” evaluation process, such as professor’s exams. Second, take the certification exam. Both had the same grading values. If the student failed the certification exam, he/she could still take the traditional exam to recover his/her grade. In 2020 modules, given the arising of the CODIV-19 outbreak, the professor found a second certification company, in which the exam prices were US$ 50 per tentative before the outbreak. But it becomes free of charge for the Portuguese-Brazilian version as a contribution to attenuating the outbreak.
impacts. So, the student had two certifications to – voluntary – replace two internal equivalent exams if they wish to. And yet, a 3rd certification badge option was available for AGILE in 2020 as an additional point.

**Research Protocol**

We adopted the case study as a research strategy because the case study allows the researcher to flexibly analyze the findings of data collection (Eisenhardt 1989). The research protocol describes the selection of the College, the students’ sample, and the procedures for data acquisition and processing.

- **Student Data Acquisition:** As data instruments, we utilized the class board diary. We collected the data in the second academic semester of 2019 until the second semester of 2020 (one year) but due to the COVID pandemic semester, so it shifted forward until March 2021. The collected data were both the student’s grades and the students’ certification types. We interviewed the Professor and collected historical spontaneous feedback from students the professor has on its historical data (Eisenhardt 1989).

- **Data Processing.** We processed the data using two different techniques. First: content analysis, to categorize and interpret the data collected from classes board diaries, and we categorize the quantitative information given these diaries were not in a standard format (Neuendorf 2020). First: we class board diaries information grades and a total number of certification badges. We performed the standard analysis of variance (ANOVA), to compare the performance regarding grades between SCert and traditional evaluation methods. We did the analysis using JASP, a free statistical pack led by the University of Amsterdam. We consider a minimum of 5% ANOVA confidence level as a more than acceptable tolerance for human-related research (Creswell 2009).

**Research Limitations**

This research is valid in its context only and therefore cannot be generalized. The quantitative data is limited to the student’s grades and their certification badges, and they are human-related data (Creswell 2009). Several precautions were taken to avoid the inclusion of bias, such as a 5% confidence for convergence; the usage of qualitative data sources to confirm convergence. We also used two years of cross-sectional data (Creswell 2009). Due to the paper sizing constraints, both SCert and DevOpsBL artifacts are briefly described in favor of describing their usage, which can be considered a DSRM limitation for this research (Baskerville et al. 2018).

Another limitation is related to education research. Education is, by its nature, insert into multi-factors and non-controlled variables environment (Creswell and Clark 2013; Sampieri et al. 2013). Thus, the relation between students’ certification and their grades might be related to one factor only [the certification]. It is most possibly related to multi-factors, such as a student’s internal and external motivation to learn that will increase his/her academic engagement to study, and the will to become a better professional, among other factors (Grotta and Prado 2019) that might be stimulated by the SCert process and/or its results. To cover these gaps, we detailed the artifacts, collected data from different semesters and classes, and took the other precautions listed in this research as recommended by (Creswell and Clark 2013; Sampieri et al. 2013).

**Results and discussions**

In this section where we evaluate the solution as proposed by the DSRM #5 step. We present our results and discuss our findings. The final sample contains 112 students as seen in Table 2. We included only students that effectively ended each course.

<table>
<thead>
<tr>
<th></th>
<th>Agile</th>
<th>QA</th>
<th>Agile and QA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36</td>
<td>13</td>
<td>49</td>
</tr>
</tbody>
</table>

**Table 2. Number of students**

In Table 3 we present students’ grades by the number of certifications. QA course had no option of two or three certifications, so this range is marked with dashes. As seen, QA modules have students with one
certification only because it was offered once certification only to them, while AGILE has students up to three ICs.

<table>
<thead>
<tr>
<th></th>
<th>Agile</th>
<th></th>
<th>QA</th>
<th></th>
<th>Agile and QA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Certs</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Certs</td>
</tr>
<tr>
<td>0</td>
<td>7.729</td>
<td>0.739</td>
<td>24</td>
<td></td>
<td>7.750</td>
</tr>
<tr>
<td>1</td>
<td>8.850</td>
<td>0.973</td>
<td>20</td>
<td></td>
<td>8.584</td>
</tr>
<tr>
<td>2~3</td>
<td>9.360</td>
<td>0.650</td>
<td></td>
<td>5</td>
<td>8~2</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

Legend: Certs = Certifications achieved by the student; SD = Standard deviation; N = Number of students; Dash = certification not applied

Table 3. Students’ final grades by the number of certifications

Finally, Table 4 details the post hoc comparations with adjustments of the turkey method for a family of 3 estimates. As seen, students that had one, two, or three certifications had a better performance when compared to students with no certifications at all with a 95% confidence level. On the other hand, those students that had two or three certifications achieved the highest score of 9.36 grade. Thus, students with two or three ICs had a better performance than their classmates that had one certification only. Anyhow, this difference was not significant with a 5% confidence range.

<table>
<thead>
<tr>
<th></th>
<th>Agile</th>
<th></th>
<th>QA</th>
<th></th>
<th>Agile and QA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Certs</td>
<td>MD</td>
<td>Lower</td>
<td>Upper</td>
<td>SE</td>
</tr>
<tr>
<td>none</td>
<td>1</td>
<td>-1.121</td>
<td>-1.735</td>
<td>-0.507</td>
<td>0.254</td>
</tr>
<tr>
<td>none</td>
<td>2 or 3</td>
<td>-1.631</td>
<td>-2.628</td>
<td>-0.634</td>
<td>0.412</td>
</tr>
<tr>
<td>1</td>
<td>2 or 3</td>
<td>-0.510</td>
<td>-1.524</td>
<td>0.504</td>
<td>0.419</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Certifications</th>
<th>MD</th>
<th>Lower</th>
<th>Upper</th>
<th>SE</th>
<th>t</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>1</td>
<td>-0.834</td>
<td>-1.309</td>
<td>-0.359</td>
<td>0.238</td>
<td>-3.508</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>none</td>
<td>2 or 3</td>
<td>-0.930</td>
<td>-1.330</td>
<td>-0.529</td>
<td>0.169</td>
<td>-5.514</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>1</td>
<td>2 or 3</td>
<td>-0.692</td>
<td>-1.639</td>
<td>0.256</td>
<td>0.399</td>
<td>-1.735</td>
<td>0.197</td>
</tr>
</tbody>
</table>

Legend: MD = Mean Difference with 95% confidence level; SE = Standard Error; * P-value and confidence intervals adjusted for comparing a family of 3 estimates (confidence intervals corrected using the Tukey method).

Table 4. Post hoc comparations by the number of certifications

In summary, SCert students that had at least one IC had higher grades. Thus, it is plausible to infer in this context that including IC as an alternative assessment instrument was beneficial for the student. For those that acquired two or three IC, if their grades were not higher than their classmates that achieved once IC only, initial findings indicate that these certifications were relevant for them as a professional based on spontaneous statements from participant students.

Figure 3 summarizes visually the students’ grades by the number of certifications. Beyond the quantitative data, qualitative data also converged to point out benefits. For instance, three students, S1, S2, and S3, had two certifications. These findings are aligned with the literature IC may improve undergraduates’ employability (Pang and Hindle 2020). These are three samples of students’ spontaneous endorsements:

S1: “The Scrum certification was awesome to me! I presented it to my HR department, they congratulated me and now I felt more accepted by the team I have just joined since they have been working with Scrum for a long time.”

S2: “Professor, let me please share awesome news. I had just got promoted to Project Leader. I have been working on it for a while. But now... I am not sure if the has a relation with the Scrum certification I presented them [company] last week, but now... I just got promoted! Wow! And I am very happy... and a little bit scared. But now I have this new opportunity was I working for”.

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Figure 3. Composite raincloud plots of students' grades by the number of certifications

Student S3 scored an “almost perfect” (9.36/10.00) grade and said:

S3: “After gaining these two certifications, I felt confident to apply to a new internal project in my company. During the interview, the interviewers asked if I knew the Scrum method. I told him that I knew it at an introductory level, but I had recently a certification badge. Then he asked if I knew DevOps. It told him that it would be the same situation, an introductory level but I also got certified in DevOps recently. He smiled and told me: you are probably hired thus. After a week, I was invited to start the new project I was dreaming of. Thanks a lot, Professor, for your support regarding these two certifications!”.

Even and student (Student S4) that achieved one IC only, five months later, spontaneously sent an email stating:

“Thanks to the course [faculty course] I got a Scrum Master job opportunity at [suppressed] Company, by the way, I appreciate the support and indication with the management courses, even I got the basic scrum [certification], because of that I’m finally lifting off as a scrum master”.

According to the Professor’s statements, many students that had one certification only were proud to share their ICs badge on their preferable social media and with their workmates either. Considering that each certification exams cost around US$ 50.00 per tentative – but they were free of charge for the in-developing country the faculty is located in – we can infer that local society gained in terms of added-on education values as seen in Table 5:

<table>
<thead>
<tr>
<th>Year</th>
<th>Agile</th>
<th>QA</th>
<th>Agile and QA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>Value in US$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>36</td>
<td>1,800.00</td>
<td>1,750.00</td>
</tr>
<tr>
<td>2020</td>
<td>13</td>
<td>650.00</td>
<td>1,400.00</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>2,450.00</td>
<td>3,150.00</td>
</tr>
</tbody>
</table>

Table 5. Estimate the value in US$ that SCert aggregated to the local community

Regarding the research hypothesis H1 – SCert increases students’ grades when compared to the traditional exams process: It was confirmed, that if a student had one IC only, he/she could perform better in terms of grades when compared to the classmates that decide to take the internal exam. But students that achieved two or three IC did not perform better than students that had one certification only. In other words, SCert might not linearly increase students’ grades, but IC should be considered a valid alternative with similar results when compared to the traditional grading results.

Finally, regarding hypothesis H2 – Regarding the hypothesis that the two or three certifications can increase the students' grades when compared to the traditional evaluation method, it was confirmed partially for the given context, given the threshold of two or three ICs might not show correlation with continuous growing grades. Therefore, one of the most important finds of this research is, beyond the final grades, the fact that SCert could be used as a plausible evaluation instrument within this IS Traditional Curricula context and yet contribute to the students’ carrier. But SCert increased the final students’
performance in this context that few students had previously IC before these courses. Historical data also shows that at least four students were promoted in their carrier as they spontaneously reported it.

**Conclusion**

In this paper, we present the SCert artifact. SCert is an artifact that scaffolds the creation and adoption of didactic transposition methods that might be adaptive and module-based according to each teaching need and was scaffolded on DevOpsBL. Our research question was: does student certification increase the student's grade? To answer this question, we used the DSRM research methodology and attained the two main research objectives: i) To describe how we applied SCert with the DevOpsBL context; ii) To analyze SCert results at an IS Higher Education course, mainly regarding students’ grades.

As result, we confirmed hypothesis H1, given students that who had one IC performed higher grades rather than those students that choose the traditional exams. H2 was partially confirmed given that SCert increased the students’ grades. Students that had two or three IC did not perform better than their classmates that achieved IC only. In both cases, it is reasonable to infer that SCert scaffolded students not only to get higher grades but also stimulated them to explore their vocational experiences in classes by obtaining, in most cases, their first IS certification ever.

We highlight three contributions of this research: i) the SCert artifact; ii) the application of SCert in real context and its results; iii) shreds of evidence that IS educators and IS undergraduate courses should consider including IC in Traditional Computing Curricula. In future research, we plan to apply SCert in new contexts and make it easier to integrate into the class context, based on the DevOpsBL perspective.

**References**


Mohammad, R. A. 2014. “IT Certification: Demand, Characteristics and Integration into Traditional University MIS Curriculum,” *Communications of the IIMA* (14:1).


