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Assessing Learning Outcomes of a MOOC Incorporated into an on-Campus Management Information Systems Class

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ABSTRACT

Massive open source online course (MOOC) platform enables enterprises to introduce their new innovations and deliver basic knowledge to handle the new products. We incorporated an openSAP course into a management information systems (MIS) class. Students learned the latest development of SAP customer relationship management (CRM) solutions along with the SAP enterprise resource planning (ERP) business processes integration that they learned in the classroom. 46.2% of the students obtained Record of Achievement and Confirmation of Participation certificates, which is higher than the average success rate of MOOCs. More importantly, the students experienced a way of sustainable and lifelong learning.

KEYWORDS: SAP ERP, openSAP, MOOC, assess, learning, success rate

INTRODUCTION

Massive open source online course (MOOC) provides a platform for enterprises to introduce their new innovations and deliver fundamental knowledge to manage the new development of their products. In recent years, SAP SE has developed HANA platform, in-memory database, real-time analytics and extended applications to the cloud, name just a few. Since 2013, the company has designed and developed MOOCs – openSAP courses, which are offered on a timely basis to introduce their new products. The openSAP courses follow about the same format: video lectures, ungraded self-tests, presentation slides, course transcripts, graded weekly assignments and final exam. openSAP issues two types of certificates – *Record of Achievement* and *Confirmation of Participation*. When learners complete an openSAP course with at least 50% of the overall maximum possible score from

weekly assignments and final examination, they are qualified for *Record of Achievement* certificate. Learners can get *Confirmation of Participation*, if they work through more than 50% of the learning materials (open.sap.com).

We, the authors of this paper, use SAP enterprise resource planning (ERP) application software to teach business processes integration in our classes. To keep up with the most current innovations and evolutions of SAP solutions, the authors have taken a dozen of openSAP courses and obtained *Record of Achievement* certificates from these online courses we took. We felt some of the openSAP courses could be fitted into the business curriculum as supplement materials to keep the students' SAP knowledge and skills levels up to date. Furthermore, the students would get experience in taking MOOCs and get professional certificates. The proliferation of MOOCs is a result of rapid advancement of information communication technologies (ICTs) and social networks. Cabrera *et al.* (2017) argue that today's society considers knowledge as a key element of all areas of individuals' activity. Therefore, free universal access to education and lifelong learning have drawn more and more attention and generated increasing debate on MOOCs.

In the past decades, many university business programs started integrating SAP ERP applications into their curricula. SAP university alliance program (UAP) has offered workshops to train the trainers (i.e. the faculty). The course materials include textbooks, video demos, PowerPoint presentations, testbanks, most importantly, hands-on case studies and exercises, which demonstrate the communications of business processes across multiple functions and the financial impact of the business processes. The case studies or exercises are well designed and clearly instructed. A student takes three courses, each of which is dedicated at least 30% of class time to cover SAP, can receive a SAP issued acknowledgement certificate. Knowing business processes integration with SAP ERP often leads to better, high paying job opportunities to our graduating seniors. This paper discusses the learning outcomes of an openSAP course that was embedded as part of a management information systems (MIS) course and the findings of the experiment. It is challenging but a good opportunity to keep business students' knowledge up to date and meet the job market demand by incorporating MOOCs into business curriculum.

LITERATURE REVIEW

There are quite a few research efforts to integrate SAP ERP applications into business curriculums, but very few discussion on openSAP courses. No effort has

been reported in the literature to make openSAP part of the business curriculum, although business faculty consider any professional certificates are helpful for students to get rewarding jobs (Rob, 2014).

One of the goals of business schools is to prepare students for their careers. Hepner (2014) states there are a couple of main reasons to drive business organizations increased investment in ERP systems. First of all, there is a need to integrate information across various functional areas of an organization into one system. There is also a need to comply the 2002 Sarbanes Oxley Act demanding greater control and traceability of all transactions that impact financial statements. Research has shown that adoption of ERP improves an organization's performance (Madapusi and D'Souza, 2012).

As more companies implementing ERP systems, more business courses use SAP ERP software to help students understand business processes integration and prepare skilled workers for the job market. "Using SAP, students can see the impact of an action or a decision within one business function as it affects other functions" (Iriberry *et al.*, 2015). Iriberry *et al.* (2015) adopt the technology acceptance model and conduct pre- and post-tests to evaluate the students' perceptions regarding the usefulness, ease of use, and the benefits derived from the SAP exercises. The data are collected in 2013-2014 semesters from several upper division undergraduate Management Information Systems classes. The analysis of the 230 valid paired samples indicates that respondents have positive perceptions on the usefulness, ease of use, intention to use the ERP system and the training materials. There are significant differences between the pre- and post-tests results regarding: SAP ERP is functional; SAP ERP is useful and easy to use; interaction with SAP ERP is clear and understandable; and SAP ERP tutorials are helpful for understanding how to work with SAP ERP. Faculty feel that integrating SAP software into more than one business courses engages students in the applications and reinforces knowledge gained in previous courses (Khoury *et al.*, 2012). Furthermore, prolonged exposure usually leads to longer retention and improved understanding of the software. Providing students opportunities to work with the SAP ERP software packages enables students to gain valuable skills and allows universities to promote themselves as innovators and leaders in higher education. Thus, universities are able to show prospective students that they care about preparing students for rewarding and challenging careers.

The openSAP University is a co-innovative initiative founded in 2013 by SAP SE in partnership with the Hasso-Plattner-Institute (HPI) located in Potsdam, Germany (Renz *et al.*, 2016). openSAP uses the MOOCs format to introduce new SAP products to tens of thousands of SAP users and people who are interested in learning

SAP software applications. Renz *et al.* (2016) point out that in average there are only 15-30% of the people enrolled in openSAP courses completed the courses with *Record of Achievement* and *Confirmation of Participation*. The reason for the low success rate is because there are “no shows”, “drop-ins”, “drop-outs” and “lurker / observers” enrolled in the openSAP courses. openSAP courses can be classified as xMOOCs. xMOOC is a popular type of MOOC. It divides course content into step-by-step, small learning units and pre-recorded video lectures. xMOOCs have limited assessment capabilities due to primarily employ automatically graded multiple choice weekly assignments and final exam for assessment, even though some of the xMOOCs include peer assessment approaches (Ebben and Murphy, 2014; Cabrera *et al.*, 2015).

METHODOLOGY

The authors decided to incorporate an openSAP course – Design the Future of Your CRM into a junior level MIS class. The MIS class covers some basic production and operations management (POM) concepts and quantitative methods of productivity, design of goods and services, process strategies and quality management. The class also dedicates 30% of class time to SAP ERP exercises. The openSAP course that we were interested introduced the new development in SAP customer relationship management (CRM) application solutions. CRM is the most effective and efficient approach in maintaining and creating relationships with customers. In particular, the timing of this openSAP course was good and it was appropriate for a junior level MIS class primary comprised of accounting, management, marketing, and MIS majors. The openSAP course lasted 4 weeks. Most importantly, in this f2f (face-to-face) MIS class, the students were required to complete SAP ERP hands-on exercises, including an order fulfilment (or sales and distribution) case study. The SAP CRM is about omni-channel customer experience. Omni-channel ecommerce (meaning, “all” channels) is more integrated than multi-channel (i.e., “many” channels), which unifies sales and marketing to create a single commerce experience across a brand (Orendorff, 2018).

Research Purpose

Rovio-Johansson (2016) relates sustainable learning to university students’ learning outcomes as the students strive to develop competencies they need for their careers. Adopting the online openSAP course as part of the f2f class aims to extend and update the students’ knowledge.

SAP ERP VS. SAP CRM SOLUTIONS – (1) The ERP application software focuses primary on integration of the business processes within organizations, while the CRM systems connect a company's ERP system to those of its customers. (2) The SAP ERP application software that the students in this class learn and work with is installed, customized and run on California State University – Chico server. On the other hand, the SAP CRM solution is on SAP HANA platform. SAP HANA is an in-memory data platform that is deployable as an on-premise appliance or in the cloud. It performs real-time analytics, and develops and deploys real-time applications (www.sap.com).

Research Questions

The authors expected the MOOC would enrich the students' knowledge about the new computing technologies and business processes integration. For this experiment, we would like to find answers for the following questions:

Question 1. Will the traditional on-campus students be able to get MOOC certificates? How many students in the MIS classes will complete the openSAP course and get Record of Achievement certificate?

Question 2. Based on the survey results and some other information about the students, can we build a logistics regression model to predict if a student will successfully complete a MOOC and get professional certificate?

Question 3. Have the students learned some new development of SAP application solutions by taking the openSAP course? Are they interested in participating in MOOCs?

Research Method

In Fall of 2016 semester when the openSAP course on CRM software solutions was available, the primary author introduced to her junior level MIS classes some general information about openSAP and the openSAP course – Design the Future of Your CRM in particular. The students learned how to create openSAP accounts, enroll in the course, watch videos, download slides and transcripts, take ungraded self-tests, etc. The instructor emphasized importance of meeting the weekly assignments and final exam deadlines. openSAP uses UCT time, so the students learned how to convert UTC time to local time. During the first week of this openSAP course, the instructor led the students to Google search some preliminary knowledge for taking the openSAP course, such as SAP HANA platform, in-memory database, on-premise, omni-channel customer journey, to make it easier for the students to comprehend the online course content. However, the instructor did not spend too much class time to repeat the online course coverage. Because

the purpose of this experiment was to let our students get experience with a MOOC, the instructor was very cautious not to expose any questions and answers of the weekly assignments and final exam to “help” the students get better scores. Basically the students took the MOOC on their own outside the classroom.

After openSAP issued certificates for the Design the Future of Your CRM course, the authors designed and developed a 5 questions, 5 points scale questionnaire and conducted a Quatrics survey to get the students’ feedback regarding their MOOC experience. The five survey questions are:

1. *It is hard to complete weekly assignments and final exam before the deadlines.*
2. *I have learned that SAP provides cloud-based, hybrid and on-premise application solutions.*
3. *I have learned that SAP CRM solutions integrate marketing, sales, commerce and customer service processes.*
4. *openSAP certificates demonstrate my ability of learning and adapting to changes in rapidly changing business environments.*
5. *I would like to take another openSAP course and get more certificates (Does not mean in this class this semester).*

The 5 points scale is: 1 – Strongly Disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly Agree

RESULTS AND DISCUSSIONS

There were 39 students in the experimental MIS class. 36 students responded to the survey. Data analysis based on the 36 samples’ responses provides information to some of the survey questions.

Answer to research question 1. Among the 39 students in the experimental MIS class, 18 (or 46.2%) students received *Record of Achievement* and *Confirmation of Participation*. 19 (or 52.8%) students received *Confirmation of Participation* certificate. The success rate of our students is higher than the average 15 – 30% success rate of receiving both certificates upon openSAP courses (Renz et al., 2016). The *Record of Achievement* is signed by Dr. Bernd Welz, Executive Vice President for SAP Scale, Enablement & Transformation as well as the two instructors of this online course, while the *Confirmation of Participation* does not have any signature. Noticeably, there is a QR code, or quick response code, on the *Record of Achievement*, but not on the *Confirmation of Participation*.

Answers to research question 2. The authors intended to find informative variables for building a logistics regression model to predict if a student will complete a MOOC and get proper recognition, but there were not enough explanatory variables having certain correlations to the target variable. Self-regulation is supposed to be a success factor of achieving high scores in MOOCs because a number of students did not get *Record of Achievement* due to missing weekly assignment(s) and/or final exam deadline(s). The authors of this paper assumed the students with higher GPA would apply better self-regulated strategies to the online course. However, the correlation coefficient between the students' GPA and getting *Record of Achievement* certificate or not is only 0.34, which indicates not a strong positive relationship between the two variables. The authors looked into the number of students who obtained the *Record of Achievement* by discipline:

| | |
|-----------------------|-----------------|
| Management major | $8/15 = 0.5333$ |
| Marketing major | $3/8 = 0.375$ |
| Human Resources major | $4/7 = 0.5714$ |
| MIS major | $1/3 = 0.3333$ |
| Accounting major | $2/5 = 0.4$ |
| Hospitality major | $0/1 = 0$ |

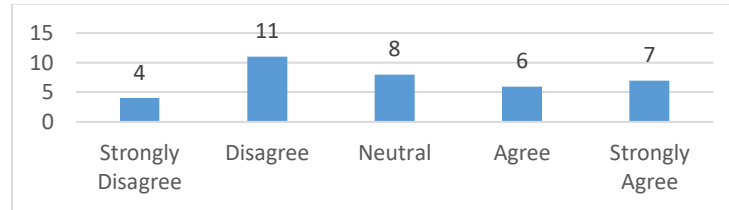
The table below summarized the correlation coefficients between the explanatory variables and target variable. The table indicates there is not enough informative variables to build a predictive model.

Table 1: Correlation Coefficients between the Explanatory and Target Variables

| Correlation coefficients | Between explanatory and target variables |
|--------------------------|--|
| -0.11984943 | Responses to Q1 on survey and target |
| 0.064820372 | majors and target |
| 0.272156087 | Responses to Q4 on survey and target |
| 0.315249315 | GPA's and target |
| 0.412568499 | Responses to Q5 on survey and target |

Answer to research question 3. The results of the end of openSAP course survey that we conducted reflected the students' self-assessment of their xMOOC learning outcomes. The data collected from the survey and data analyses are reported as the following:

1. It is hard to complete weekly assignments and final exam before the deadlines.



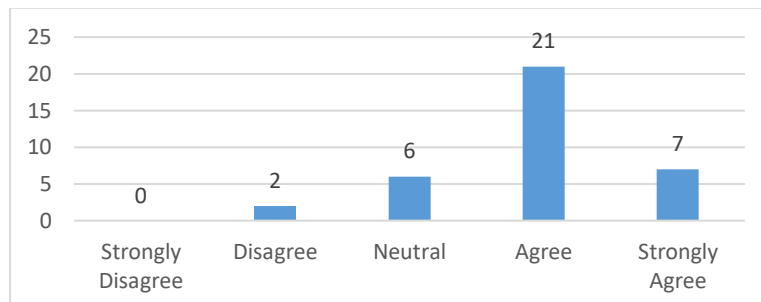
| # | Answer | % | Count |
|---|-------------------|--------|-------|
| 1 | Strongly Disagree | 11.11% | 4 |
| 2 | Disagree | 30.56% | 11 |
| 3 | Neutral | 22.22% | 8 |
| 4 | Agree | 16.67% | 6 |
| 5 | Strongly Agree | 19.44% | 7 |
| | Total | 100% | 36 |

Descriptive Statistics

| Mean | median | Mode | Standard deviation | Count |
|---------|--------|------|--------------------|-------|
| 3.02778 | 3 | 2 | 1.3199 | 36 |

About the same number of students (around 37.11 – 41.67%) agreed or disagreed that it was difficult to meet the weekly assignments and final exam deadlines, although most of the students did not get the *Record of Achievement* due to missing weekly assignments or final exam.

2. I have learned that SAP provides cloud-based, hybrid and on-premise application solutions.



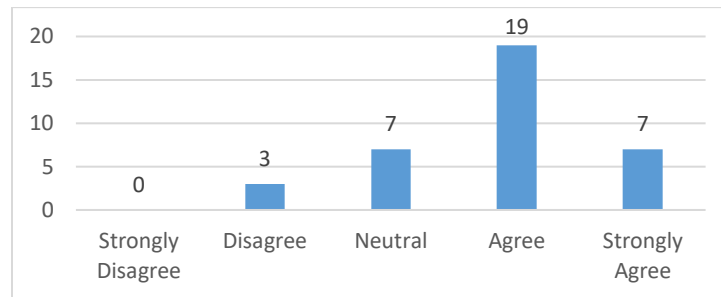
| # | Answer | % | Count |
|---|-------------------|--------|-------|
| 1 | Strongly Disagree | 0.00% | 0 |
| 2 | Disagree | 5.56% | 2 |
| 3 | Neutral | 15.79% | 6 |
| 4 | Agree | 57.89% | 21 |
| 5 | Strongly Agree | 19.44% | 7 |
| | Total | 100% | 36 |

Descriptive statistics

| Mean | Median | mode | Standard deviation | Count |
|---------|--------|------|--------------------|-------|
| 3.91667 | 4 | 4 | 0.76997 | 36 |

Only about 5% of the students did not learn the very basic knowledge that SAP provides cloud-based, hybrid and on-premise solutions.

3. I have learned that SAP CRM solutions integrate marketing, sales, commerce and customer service processes.



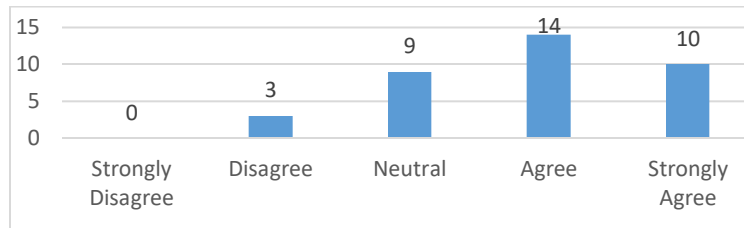
| # | Answer | % | Count |
|---|-------------------|--------|-------|
| 1 | Strongly Disagree | 0.00% | 0 |
| 2 | Disagree | 8.33% | 3 |
| 3 | Neutral | 19.44% | 7 |
| 4 | Agree | 52.78% | 19 |
| 5 | Strongly Agree | 19.44% | 7 |
| | Total | 100% | 36 |

Descriptive statistics

| Mean | Median | mode | Standard deviation | Count |
|---------|--------|------|--------------------|-------|
| 3.83333 | 4 | 4 | 0.84515 | 36 |

Responses to questions 2 and 3 show that the students in the junior level MIS class more or less have all learned something from the openSAP course. It seems easier to learn the three versions of SAP CRM solutions than understand how the CRM solutions integrate business processes.

4. openSAP certificates demonstrate my ability of learning and adapting to changes in rapidly changing business environments.



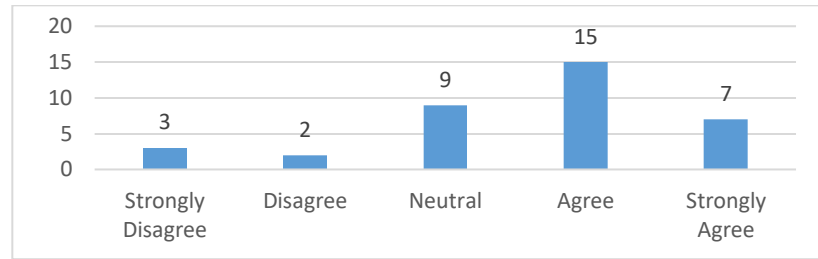
| # | Answer | % | Count |
|---|-------------------|--------|-------|
| 1 | Strongly Disagree | 0.00% | 0 |
| 2 | Disagree | 8.33% | 3 |
| 3 | Neutral | 25% | 9 |
| 4 | Agree | 38.89% | 14 |
| 5 | Strongly Agree | 27.78% | 10 |
| | Total | 100% | 36 |

Descriptive statistics

| Mean | Median | mode | Standard deviation | Count |
|---------|--------|------|--------------------|-------|
| 3.86111 | 4 | 4 | 0.93052 | 36 |

The students seem to understand the importance of professional certificates and this motivated them to participate in the openSAP course.

5. I would like to take another openSAP course and get more certificates (Does not mean in this class this semester).



| # | Answer | % | Count |
|-------|-------------------|--------|-------|
| 1 | Strongly Disagree | 8.33% | 3 |
| 2 | Disagree | 5.56% | 2 |
| 3 | Neutral | 25% | 9 |
| 4 | Agree | 41.67% | 15 |
| 5 | Strongly Agree | 19.44% | 7 |
| Total | | 100% | 36 |

Descriptive statistics

| Mean | Median | Mode | Standard deviation | count |
|---------|--------|------|--------------------|-------|
| 3.58333 | 4 | 4 | 1.13074 | 36 |

From responses to questions 4 and 5, we are concerned that although most of the students agreed that openSAP certificates demonstrate their ability of learning and adapting to changes in rapidly changing business environments, not as many students were interested in taking another openSAP course. Maybe this is because there was no proven record showing the value of openSAP certificates.

With that being said, the authors conducted a series of two sample paired T test to investigate if there are statistically significant differences between the variable means. The significance level to accept or reject the null hypothesis is $\alpha=0.05$ for one-tailed T test and $\alpha/2 = 0.025$ for two-tailed T test. Table 2 below shows the results of two sample paired T tests:

Table 2: The Results of Two Sample Pared T Tests

| Sample 1 | Sample 2 | H ₀ | H _a | P (T ≤ t) |
|-----------------|-----------------|-----------------|--------------------|-------------|
| Responses to Q2 | Responses to Q4 | $\mu_2 = \mu_4$ | $\mu_2 \neq \mu_4$ | 0.623883922 |
| Responses to Q3 | Responses to Q4 | $\mu_3 = \mu_4$ | $\mu_3 \neq \mu_4$ | 0.74398182 |
| Responses to Q4 | Responses to Q5 | $\mu_4 = \mu_5$ | $\mu_4 \neq \mu_5$ | 0.086353989 |

The three two-sample paired T tests fail to reject the null hypotheses that the 3 population means are equal at 5% significance level. This means there is no statistically significant differences among students' positive perception levels regarding they have learned new development in SAP solutions, the perceived value of openSAP certificates and their interest in taking openSAP courses.

CONCLUSION

The experiment of incorporating an openSAP course into a MIS class shows that openSAP courses are learning opportunities to gain knowledge about new SAP products for undergraduate business students. However, to incorporate xMOOCs into business curriculum can be challenging, in part because traditional business students are used to f2f (face-to-face) in class learning environment. The experiment of incorporating an openSAP course – Design the Future of Your CRM into a junior level MIS class proves that the business students can keep up with the most current innovations and evolutions in the business world through MOOCs. For traditional business students to take MOOCs, it demands additional time and effort outside of the classrooms. The authors got some valuable experience in this experiment, but more research is needed in terms of how to appropriately help students understand the online course materials; how to assess students' learning outcomes beyond automatically graded assignments and final exam, etc. Above all, MOOCs are invaluable and important means for sustainable and lifelong learning.

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