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MEASURING THE NET BENEFIT OF AN E-COMMERCE FOR A UNIVERSITY: A CASE STUDY OF THE UNIVERSITY OF SURABAYA'S E-COMMERCE

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ABSTRACT

E-commerce is the use of telecommunication network, the internet in particular, to conduct business activities such as purchasing, sales of goods and services, after sales services and many other kinds of business processes. Although e-commerce could deliver dramatic positive impacts for an organization, an e-commerce implementation require a considerable amount of investment and the result of that large investment is hard to measure. The objective of this study is to measure the net benefit of an e-commerce for a university using a case study of the University of Surabaya's e-commerce. To measure the net benefits, this paper will use the updated Delone and McLean Information System Success Model due to the popularity of their model among I.S. researchers. Although, this study is unable to quantify the net benefits in term of money of an e-commerce implementation, this study reveals how an e-commerce can be used by a university to generate various significant positive impacts towards its customers, to its staffs, to the organization itself and also to the environment.

Keywords: e-commerce, benefit, university.

INTRODUCTION

E-commerce is the use of telecommunication network, the internet in particular, to conduct business activities such as purchasing, sales of goods and services, after sales services and many other kinds of business processes. It is said that the use of e-commerce has the potential to cost effectively increase the organization's sales, extend their market, and reduce their operational cost at the same time. Unfortunately, although e-commerce could deliver dramatic positive impacts for an organization, an e-commerce implementation require an considerable amount of investment and the result of that large investment is hard to measured. If the e-commerce benefits can be measured then it can be compared against the investment to justify the e-commerce worthiness.

The objective of this study is to measure the net benefit of an e-commerce for a private university, specifically private university in Indonesia. A university is a not-for-profit service provider which provides education to its students. Therefore, its main business activities are mostly related to services only. For the purposes of this paper, e-commerce is defined as "the use of the Internet to facilitate, execute, and process business transactions". Business transactions in a university are any activities related to students as the customer and also lecturers as the supplier. In a university's business environment, a business transaction is not a pay for goods or services kind of transaction as usually occurs on other business. Students' tuition fees are paid at the beginning of semester or divided as installments throughout a semester. Although the amount of payment sometimes related to the amount of credit in a semester, other than delivering the enrolled courses, the university also has the obligation to provide any other services to all students for the whole semester regardless their enrollment credit. Therefore, many business transactions in a university is not directly related to cash flow activities. In this paper, any activities related to providing services for students and lecturers are considered as business activities.

To accomplish the objective, a case study of the University of Surabaya's (often abbreviated as UBAYA) e-commerce will be examined. As a leading private university in Indonesia with more than 8.000 students, UBAYA has utilized e-commerce to support their business activities and provide better services to students as the university's primary customers since early 2000s.

This paper will begin with an analysis of current literatures on university information systems and e-commerce success and benefits. Following the literature review are brief description on UBAYA's e-commerce case and discussion to identify the case's net benefits. Lastly, a summary of findings will conclude this paper.

LITERATURE REVIEW

E-commerce and University Information Systems

E-commerce is the use of information technology to support an organization's business activities. Implementation of e-commerce in a university is often named as a university information system (e.g. [1]) or campus information system (e.g. [2], [3]). This paper consider both terms as similar as both are referring to the practice of using IT to implement an information system which is capable of supporting their university's business activities.

As occurs in implementation of e-commerce in other fields, implementation of e-commerce in a university also varies in term of scope and primary objectives. Cases promoted by [1] and [4] shows how to integrate various systems used and how to avoid silos of information in a university. In Other case, Bischof *et al.*'s [3] case focus on intermediating their university's administrative system

with their learning management systems (LMS). Thus, it can be said that there is no definitive consensus regarding the scope of a university information systems as it can varies by far due to the many kinds of business activities within a university. Further, the scope and focus of an e-commerce project is also defined by each university's uniqueness and priority.

Measuring the Net Benefit of an E-commerce

The potential benefits of using computer and information technology (IT) has lured many universities to implement a systems to support their operation and grasp the offered benefits to excel the university's competitive advantage. Publication on such attempts can be found as early as 1989 where Foley [5] discuss various issues and problems related to the system's management discovered during implementing a campus wide information system on the Lehigh University, Betlehem [5]

Interestingly, despite the many cases discussed, from Lehigh University's success story in 1989 [5] and Luther College's integrated information system success in 2004 [4] until Kumar's proposal [2] on how the Fiji National University's new campus information system should be, none has discussed how to measure the benefits of the implemented (or will be implemented) system for the university.

To measure net benefits of an e-commerce implementation, this paper will use the updated Delone and McLean Information System Success Model [6], [7]. The Delone and McLean's model as shown in Figure-1 is used due to the popularity of their model among I.S. researchers. The paper that promote the model has been cited 4,238 times based on Google Scholar [8] and has been cited 1, 991 times based on Scopus [9].

As shown in Figure-1, the success model consists of the following six dimensions:

- **System quality**, focus on measuring the systems expected traits such as usability, availability, reliability, adaptability, and response time.
- **Information quality**, focus on valuing the system's content where the content is expected to be personalized, complete, relevant, easy to understand, and secure.
- Service quality, focus on the overall support provided by the system developer (i.e. could be an outsource vendor or internal IT department). This dimensions is considered as critical as it directly affects customer's satisfactions which will lead to the user's retention decision.
- **Usage**, focus on measuring the overall user experiences with the system.
- **User satisfaction**, focus on measuring the customer's opinions regarding their overall experience with the system and the vendor starting from purchase, payment, implementation, up to after sales services delivery.
- **Net benefits**, is the most important dimension which capture the total balance of the system impacts.

On top of the model's dimensions, Delone and McLean also suggest that the benefits of an information system success can benefit various levels of users starting from a single user, many users or even have affect on the whole industry depending on the scope and purpose of the implemented information system. Thus, the net benefits measurement is also organized by levels: individual, group, organization, and societal impacts.

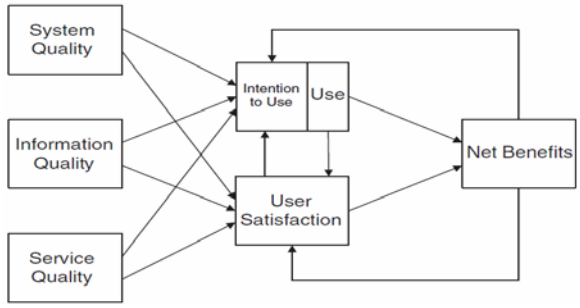

Figure-1. The Updated Delone and McLean Information System Success Model [6], [10].

THE CASE STUDY

UBAYA has used computer and networking technology since late 1980s and utilized e-commerce since early 2000s to support their business activities and provide better services to students as the university's primary customers. An important landmark to UBAYA's e-commerce occurs in 2009 when the university initiates a project to integrate numerous systems that was scattered over various units. The system integration is completed at the end of 2010 and has been continuously improved to satisfy the latest requirements.

Due to page limitation, not all parts of UBAYA's e-commerce will be discussed. There are three critical parts that will be discussed in this paper: student admission system, teaching and learning administration system and students and lecturers portal.

Student Admission System

Ubaya's Student admission system is mainly responsible to support the administration of high school students to enroll to Ubaya. After two years of pilot projects, in 2013, the university has decided that online registration through http://daftar.ubaya.ac.id as the only way to register to Ubaya.

The online registration method is considered better than the previous system which utilize several physical document posting as many of the prospective students come from other cities than Surabaya (i.e. Ubaya's Location). Furthermore, by embedding the admission rules and registration within the site, students' eligibility are automatically assessed and announced instantly. Such practice has enable Ubaya to simplify the admission process and significantly shorten the amount of time required to finish the admission process from up to several weeks (depending on the student's location) to as fast as one or two days only. Figure-2 contrasts admission

processes for admission before and after the e-commerce implementation.

As shown in Figure-2, e-commerce has eliminated several unnecessary steps which simplified and accelerated the admissions processes. Other than supporting the students, the e-commerce system has also reduced lots of paper works that previously need to be done by the admission committee.

Teaching and Learning Activities Administration

Following the admission process is the academic administration process which mainly intended to administer the teaching and learning activities. The process relates four distinct units: the faculties, the directorate of Finance, the directorate of Academic Administration, and the Directorate of Human Resource. Prior to the integration project, each unit is using their own system which includes the use of pen-papers and spreadsheets application. Since the number of teaching class in Ubaya in a day could reach up to 400 teaching activities, it is understandable that data produced by the four stand alone systems could not matched to each other. To mitigate the mismatched consequences, directorate of finance always consolidated their data with all other units especially the faculties before paying the lecturers. Such manual consolidation process is considered as consuming too much time, too much effort and yet, could not provide an accurate result. For example, Directorate of Finance and Directorate of Academic Administration never even attempted to consolidate the teaching activity data against the student attendance on each teaching activity as they consider the cost of consolidating the two data as too difficult (if even possible) and too expensive compared to its benefits.

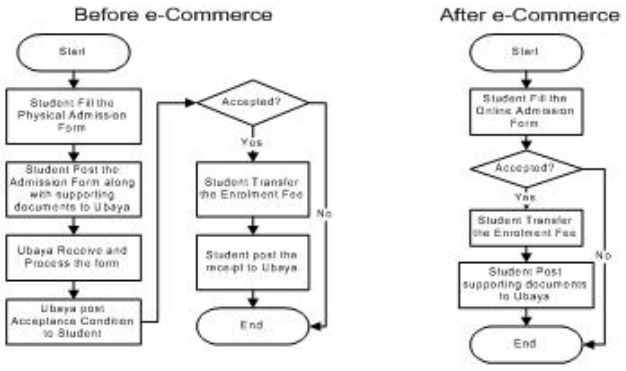

Figure-2. Admission processes before and after e-commerce implementation.

After the new system implementation, instead of redoing the same things, the four units are aligned in a sequential system where each unit could use and validate other units' data. Figure-3 shows how the new system could produce better data quality will less effort on all of the four units.

As shown in Figure-3, prior to the era of e-commerce integrated system, teaching activity data is recorded three times by three different units: the Faculties, the Directorate of Finance and the Directorate of Academic Administration. On the new system, the teaching activity data is recorded once by the faculties, the data is then validated by the Directorate of Finance and is reused by the Directorate of Academic Administration to record the students' attendance. The latest practice has significantly reduced work load of staffs in the three units. Such validation practice has also eliminated the need of consolidation process as the recorded data is validated immediately by the sequencing independent unit. Therefore, any invalid data can be detected and be corrected immediately.

Student and Lecturer Portal for Students' Score Submission

Ubaya created a portal named my.ubaya.ac.id to provide easy access for their students and lecturers to various data that they may need. Students are able to monitor their tuition fee information, view the enrolled course, attendance and grade for each course, fill survey about teaching quality on each course until register for graduation ceremony. On the other side, Lecturers could use the portal to view their personal information, track record on academic and non-academic activity, monitor list of his/her class on each semester, submit students' score up to monitor their attendance and details on the monthly take home pay.

Again, due to page limitation, this paper will only discuss one of the most significant part of the portal: the students' score submission system. Figure-4 shows a simplified diagram of the submission process before and after the e-commerce implementation. Indeed, there is only two activities involved in this score submission process and the two processes does not related to any cash activities. However, this process can be considered as a kind of "product" delivery process since the students' scores are quantitative representation of products delivered by the university to its student.

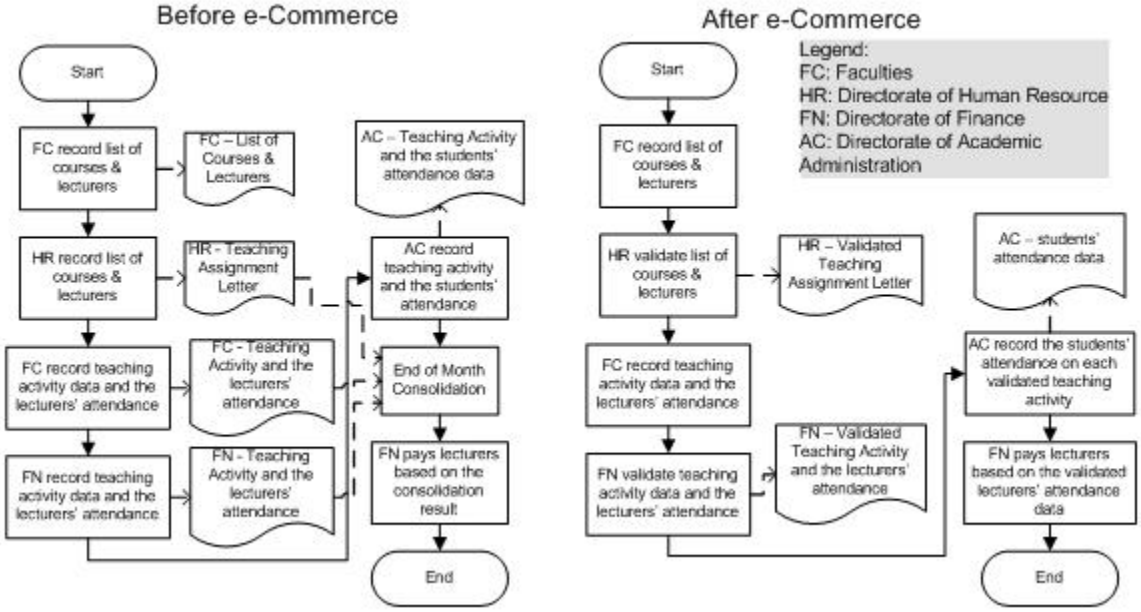

Figure-3. Teaching and learning activities administration processes.

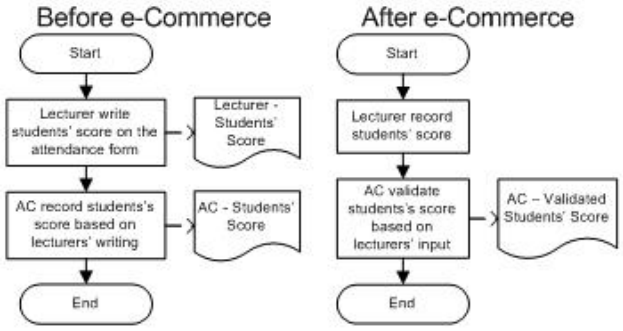

Figure-4. Students' score submission process.

The e-commerce implementation has successfully increase the process' output quality and at the same time, significantly reduce the amount of work. First, before the e-commerce, lecturers and staff of the directorate of Academic Administration are redundantly recording the students' score which is not only consuming unnecessary effort but also prone for human error. Within the new system, lecturer as the rightful owner of the students' score is the only person who can determine the students' score. However, the Directorate of Academic Administration along with the faculties' management could monitor the students' score data to ensure that all scores are accounted on schedule.

Secondly, the new system also reduced the amount of papers required. Prior the e-commerce, the attendance form which was also used to write the students' score, is printed on set of three carbon copy paper sheets. The first copy is for the Directorate of Academic Administration, the second copy is for the lecturer and the third copy is for the faculty. After the e-commerce, the attendance form is no longer used as a media to write the students' score; therefore it is now printed on set of two carbon copy paper sheets only. The first copy is for the Directorate of Academic Administration and the second copy is for the faculty's documentation.

RESULTS AND DISCUSSIONS

The previous sections has briefly described how the e-commerce implementation could deliver many significant positive impacts for the University, students, staffs and lecturers by removing redundancies, simplifying processes and enabling independent data validation. In this section, the success case will be identified using the e-commerce success dimensions and metrics as proposed by [6].

System Quality

The system quality dimension focus on measuring the expected traits of the e-commerce system. Table-1 shows list of the system quality metrics along with evidences from the case that match each metric.

Table-1. System Quality Metric.

Metric	Sample of evidence from the case study
Adaptability	All e-commerce systems were build as open source web based applications on top of open source operating systems and open source database servers which guarantee system scalability and easy customizations to adapt any future requirements.
Availability	• Prospective students could do the admission process any time from any location with internet access. • Lecturers could submit students' score remotely (i.e. no need to be physically present at the campus) at any time within the agreed schedule.
Reliability	All Ubaya's e-commerce systems are hosted on centralized servers maintained by the Directorate of Information Systems. To increased the systems' reliability, critical servers are mirrored and automatically backed up on daily basis.
Response Time	• The admission system has reduced the time required to finish the admission process from several weeks to two days. • The student's score submission has reduced the time required by the Directorate of Academic Administration to process the students' score from five days to two days.
Usability	The admission system is designed to be user friendly not only for computer users but also for mobile device users by providing a separate layout specifically designed to be accessed from mobile phones or tablets with smaller screen.

Information Quality

The information quality dimensions focus on the system's content issue. Table-2 shows list of the information quality metrics along with evidences from the case that match each metric.

Table-2. Information quality metric.

Metric	Sample of evidence from the case study
Completeness	• All systems are integrated starting from the new student admission system until the student graduation system. All necessary students' details are collected at the admission system, reused and updated as required. • The system record history of critical data update such as update on the students' score, tuition fee payment, and academic status are recorded in details.
Ease of understanding	• All systems are designed to have a simple and consistent behavior. • Proper testing by a group of users has been done to ensure that the system is easy to be understood by any targeted users with no prior knowledge on the system.
Personalization	Each user is grouped based on their roles including lecturers, staffs, students and prospective students. Specific layouts and menus were then assigned to each group.
Relevance	Based on their user's group, a user will be able to view and do only things that are relevant for him/her.
Security	The directorate of information systems applied a standardize security procedure to all servers including enforcing several rules of programming that need to be complied by all system developers to avoid security breach.

Service Quality

Service quality dimension focuses on assessing the overall support provided by the service provider. In Ubaya, the Directorate of Information Systems are responsible to maintain and secure servers that hosting many integrated systems and databases. Those systems were developed and maintained by various development teams. The directorate also coordinates and manages security privilege regarding cross-database access from one to other systems. Under that scheme, the directorate will push all development teams to satisfy the agreed level of service quality.

Usage

Usage dimension focuses on assessing the overall systems' usage. Table-3 shows list of the usage metrics along with evidences from the case that match each metric.

Table-3. Usage metric.

Metric	Sample of evidence from the case study
Nature of use and Navigation patterns	The admission system is mainly designed for prospective students to easily complete the whole admission processes. Therefore it is designed to provide intuitive layout regarding the overall admission sequence, the student's current admission status, and details regarding what need to be done next.
Number of transactions executed	• In academic year 2013, the admission system is used by 4,095 prospective students. • In the first semester of 2013, the students' score system is used by 285 users to record 98,880 students score data (including score updates if exist).

User Satisfaction

User satisfaction dimension focus on capturing user opinion regarding a particular e-commerce system. Table-4 shows list of the usage metrics along with evidences from the case that match each metric.

Table-4. User satisfaction metric.

Metric	Sample of evidence from the case study
Repeat visits	my.ubaya.ac.id as the students and lecturers portal were visited 564,876 times within April 19, 2013 to May 19, 2014. It is important to note that students are visiting the portal on voluntarily basis. In other words, many students are repeatedly access the portal because they wanted to do so.
User Surveys	A qualitative survey regarding the online students' score submission was done during the first semester of its implementation by gathering representations from all departments in Ubaya. All input regarding the systems were discussed and all necessary updates has been successfully applied at the end of the second implementation semester.

Net Benefits

The net benefits dimension is the most critical dimension which measure total balances of the e-commerce impacts to the organization. Table-5 shows list of the net benefits metrics along with evidences from the case that match each metric.

Table-5. Net benefits metric.

<table>
<tr><th>Metric</th><th>Sample of evidence from the case study</th></tr>
<tr><td>Cost saving</td><td>• The admission system has reduced the cost of posting documents by half. The cost reduction affected both students and the admission committee (impact to individuals and organization).
• The online students' score system has reduced the required carbon copy sheets by 33% (impact to organization and environment).
• Lecturers payment data are more accurate than ever before, this fact has significantly reduce the amount of loss due to miscalculated payments (impact to organization).</td></tr>
<tr><td>Expanded markets and incremental additional sales</td><td>Facts regarding the new students origin show a significant market expansion after full e-commerce implementation (impact to organization)
<table>
<tr><th></th><th>2010 (before)</th><th>2011 (partial)</th><th>2012 (partial)</th><th>2013 (full e-commerce)</th></tr>
<tr><td>Schools of origin</td><td>482 schools</td><td>545 schools</td><td>595 schools</td><td>745 schools</td></tr>
<tr><td>Cities of origin</td><td>126 cities</td><td>150 cities</td><td>157 cities</td><td>183 cities</td></tr>
<tr><td>New students</td><td>3,265</td><td>3,415</td><td>4,006</td><td>4,593</td></tr>
</table></td></tr>
<tr><td>Time savings</td><td>• The admission system reduced the time required to complete the whole admission processes from several weeks to two days (impact to individuals).
• The online students' score system has reduced the time required to prepare student academic results from five days to two days (impact to group of users).
• The new system has eliminated the need for consolidating process which could take several days (impact to group of users).</td></tr>
</table>

CONCLUSIONS

Results of this study confirmed Ubaya's e-commerce as successful as it has managed to successfully satisfy all six dimensions of the model: system quality, information quality, service quality, usage, user satisfaction, and net benefits. Focusing on the net benefits of the e-commerce implementation, this study has captured firm evidences of the e-commerce having positive impacts on individual users, group of users, organization and environment. Despite the many positive impacts occurs after the e-commerce implementation, those impacts are unlikely occurred solely due to the e-commerce implementation.

In the end, the McLean and DeLone's model of IS Success could not clearly quantify the net benefits in term of cash of an e-commerce implementation. Nevertheless, the model does help to identify and measures various ways for an e-commerce to positively affected individual, organization and the environment. It is hoped that findings of this study could provide insight on how an e-commerce could benefit a University and perhaps other similar organization such as schools or other education providers. More education providers able to utilize e-commerce to reduce their cost and extend their service area will sequentially cause more people able to obtain education.

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