

# Strategic Planning and Implementation of Academic Information System (AIS) Based on Website with D&M Model Approach

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**Abstract.** The purpose of the study was to strategic planning and implementation of academic information system based on website with D&M model approach. The rapid development and progress of Information and Communication Technology (ICT) today can not be dammed again. Most people follow the rhythm and flow of this development, with increasing public demand for quality of service especially in the education world such as website-based academic information system. Specialized in schools, in this case it is necessary to provide quality education services, so it is necessary to support the quality of information accurately, precisely, and quickly by using the Academic Information System (AIS) based on a good site. This study aims to analyze the implementation of web-based AIS devoted to SMK Muhammadiyah 1 Banjarmasin and its effectiveness. Qualitative methods are used that analyze needs and strategic planning and evaluate the effectiveness of implementation. Data were collected by interview, observation, and documentation study. Data were processed and analyzed using value chain analysis and SWOT analysis methods, analysis of the effectiveness of AIS application was performed using DeLone and McLean (D&M) IS success model. The conclusion of this research is SMK Muhammadiyah 1 Banjarmasin has internal strength and high chance to apply AIS based on website, and analysis result show that AIS effective with level of effectiveness equal to 81.07% from expected criterion.

## 1. Introduction

The rapid development in the era of globalization and competition today, education and advancement of ICT can not be separated and dammed again. Most of the people follow this rhythm and flow of development, with the increasing demands of society on the quality of education services. Therefore, schools always need to innovate in managing the utilization of ICT as a medium in providing services not just as a media campaign but also as a means of information and communication between school and students, parents, related institutions, as well as general public. Website is the site pages of information systems that can be accessed easily and quickly. The school site is the main attraction of the community in obtaining information about the school whose processing can be done online, because it can easily access the data without having to go to school. Especially now the people of Indonesia is also not free with the use of the Internet in everyday activities. Based on data from the Ministry of Communications and Informatics website, internet users in Indonesia are ranked sixth in the world, according to market research institute e-Marketer, netter homeland population reached 83.7 million



people in 2014. In 2017, e-Marketer estimates netter Indonesia will reach 112 million people, beating Japan in the fifth rank of internet users more and more.

Information becomes one of the main sources in an institution to improve competitiveness of its competitors. Therefore, every institution tries to apply information system or technology in order to increase efficiency and effectiveness in institutional management process, and expected to give added value that is competitive advantage in competition with similar institution. This also applies to educational institutions including schools. Implementation of AIS based on this website will be useful if its implementation in accordance with the purpose, vision and mission of an institution by determining AIS based business and website strategy. So it takes analysis of various factors that influence the formation of strategic planning system or information technology appropriate and in harmony with business strategy. In practice, the application of AIS in an educational institution requires analysis and strategic planning tailored to the internal and external conditions of the institution. Then the selection of academic information system model in accordance with the needs of these institutions. Thereafter, the effectiveness of AIS implementation is evaluated against institutional goals, vision, and mission. Irawan, H. the results of his research is to use the DeLone and McLean IS success model, where the success of information systems proxied by user satisfaction. In addition, the net benefits of implementing Enterprise Resource Planning (ERP) information systems, both advantages for individual users and companies can be explained by user satisfaction variables of 61.8% [1]. Kurniawan, Y., and Hiererra, SE use SWOT analysis in information system design with the result of his research that information system strategy must be aligned With business strategy, strategic planning is needed to get good information system as desired [2], and research from [3] and [4] also used SWOT analysis.

In terms of evaluating the effectiveness of the implementation of information systems, many studies use the DeLone and McLean methods [5-12]. In addition, Somendra Pant and Cheng Hsu use impact methodologies with value chain analysis and Critical Success Factor Analysis to analyze the strategic planning needs of information systems [13]. Research to assess information systems with other models [14, 15]. In general, however, this evaluation of effectiveness assesses the output, impact, and results of AIS implementation. In it there is a quality evaluation of a system, quality information, quality in terms of service, user satisfaction, and net benefits. As we can see, there are still many schools that do not have their own website as an academic information system. In an educational institution, especially in SMK Muhammadiyah 1 Banjarmasin, at the beginning of the study still did not use AIS-based sites, but still using the administration manually although using a computer device, not yet have a website as a media campaign as well. As information and communication for the general public, the institution itself is required to provide quality education services, so it is expected to support accurate, precise, and fast school information quality by using a good website-based information system. There is now an opportunity for schools to implement website usage policies as educational services. This is a great opportunity to plan and build an AIS for this school. Therefore, it is necessary to research the possibilities and strategies of AIS applications based on the website in its academic management, what kind of information system is appropriate to the needs of the school and how effectively its implementation.

## 2. Methods

The results of planning analysis and effectiveness of AIS application as stated in research questions and research objectives, then to know the results, the research method used is qualitative. The place of research is conducted in SMK Muhammadiyah 1 Banjarmasin. The selection of this location is generally based on the consideration of cooperation with the institution, the ease of reaching the location, the social situation easily observed, the cost, time, and the actors are easy to approach, and the feasibility of possible objects to obtain data and information that can support the achievement of research objectives. In this research opportunity will be collected data in a reasonable situation, directly what it is without being influenced by other elements from outside the environment. For that to do direct relationship with the situation and the source of data to be investigated. Not using numbers, but collecting descriptive data in the form of reports and descriptions to find meaning, although not rejecting the numbers as a support

in this study. The object of this research is the managers and users of the services of educational institutions, which in this case is SMK Muhammadiyah 1 Banjarmasin consisting of: (1) Chairman of the School Committee, as many as two people, in this case is the chairman and secretary; (2) as many as five people consisting of one principal, and two vice principals; (3) teachers, as many as five people; (4) administrators of the school, as many as two people consisting of one administration personnel and one person (5) parent representative students, as many as three people from parents of students from different classes attend school at SMK Muhammadiyah 1 Banjarmasin. Data collection techniques used are observation studies, interviews, and documentation. Furthermore, the necessary data sources are classified into primary data and secondary data. Primary data comes from interviews and observation of the research object. While the secondary data taken from various documents related to the research topic and support the primary data.

### 3. Results and discussion

Based on the results of observations and interviews on the leadership and staff at SMK Muhammadiyah 1 Banjarmasin obtained information that the management of all academic data become the responsibility of the principal which is executed technically by the administrative staff and supervised by the vice principals. The activities of data entry and processing of students value during this time is done directly by each teacher and consolidated by each class guardian. Implementation of each activity of data entry and processing as well as making information done in general by manual using computer help, that is using MS Excel and MS Word software. In addition, the data associated with it is stored on each computer used by each party and periodically performed its electronic data collection (back-up data process). However, electronic data storage has not been done in a structured and integrated, but rather collect and create data backup to anticipate if at some point the data in the computer concerned is damaged. So far, using the data and information management pattern in SMK Muhammadiyah 1 Banjarmasin has been able to meet the needs for school leaders, students and parents of students and to the board of the School Committee and the Education Office of Banjarmasin City. But it is also realized that the provision of data and information tend to be slow and not easy to recover data that has long been stored. Based on the analysis of data and information collected, school leaders, homeroom teachers, and staff need a way and procedure that can provide quality data processing and presentation of data and information more quickly and accurately. Because the number of students, employees, and infrastructure facilities are quite a lot, it takes a data processing and presentation of information that is reliable and thorough. The need for data processing and presentation of information can be done by using a website-based information system in the form of an AIS. AIS in SMK Muhammadiyah 1 Banjarmasin is expected to be useful as a means of about information. In this system, it is hoped that the problem focused on the data and information about the school profile, students, staffing, values, new admissions, finance, and infrastructure facilities complete with data entry module, processing and reporting, and existing data can be used for making other information in accordance with the needs of other software such as MS Excel and MS Word or others. This is consistent with the results of research conducted by [6, 7, 9, 14, 16] which states that management information systems are designed to align structure, task management, learning processes and special needs in schools or educational institutions.

In addition, with the construction of an AIS, it is expected to be useful as a tool of the school in delivering information to their students or parents/guardians quickly, accurately and uptodate, so that the performance of a work can be realized more leverage. In addition to the needs of decision making and other reporting needs. Based on the results of the research, especially the expectations of the participants who are the citizens of the school, in the design of information systems needed, should consider the requirements of a good system design, including: (1) the system should be useful, easy to understand, and later easy; (2) the system must be able to support the main objectives of school management activities in accordance with the principles of good school management; (3) the system must be efficient and effective to be able to support transaction processing, management reporting and support decisions to be made by management, including other tasks that have been done manually by each party. Analysis of AIS implementation planning is done using value chain analysis and SWOT

analysis. This analysis is based on data and information obtained from interviews to committee officials, school leaders and administrative staff, and field observations. The value chain is a series consisting of various components, namely the main activities (primary activities or major activities) and supporting activities. In this case, the value chain is shown in (Figure 1).

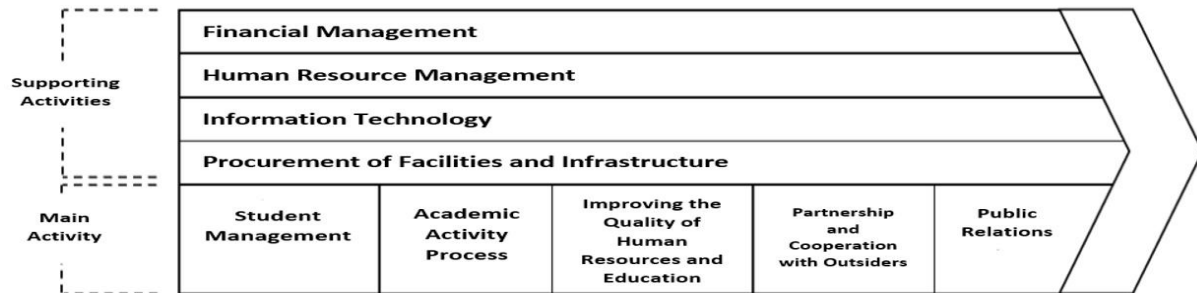


Figure 1. Strategic plan SMK Muhammadiyah 1 Banjarmasin.

From (Figure 1) of the value chain above, it can be seen that the main activities include (1) Student Management; (2) Academic Activity Process; (3) Improving the Quality of Human Resources and Education; (4) Partnership and Cooperation with Outsiders; and (5) Public Relations. While supporting activities consist of (1) Financial Management; (2) Human Resource Management; (3) Information Technology; and (4) Procurement of Facilities and Infrastructure. From the value chain analysis can be seen that student management activities, academic activities are two important activities, in addition there is a supporting activity in the form of information technology. Therefore, the implementation of academic information management system based on information technology in the form of website is a development strategy of school management that needs to get priority, so it is expected to get added value for the school. From the interviews with the heads of school committees and school leaders, and the observations made can be identified internal and external factors which are then used in the SWOT analysis as shown in (Table 1), which refer to the table format of the research undertaken by [2].

Table 1. SWOT matrix analysis.

<p><b>IFAS</b></p> <p><b>EFAS</b></p>	<p><b>Strength (S)</b></p> <ol style="list-style-type: none"> <li>Support from school committee leaders and school leaders</li> <li>Availability of adequate computer facilities</li> <li>Availability of LAN and Wi-Fi network facilities and internet</li> <li>Availability of adequate human resources</li> </ol>	<p><b>Weakness (W)</b></p> <ol style="list-style-type: none"> <li>Absence of SOP (standard operational procedure)</li> <li>Unavailability of software Academic Information System (AIS)</li> <li>The absence of specialized human resources developers and technical implementers Academic Information System (AIS)</li> <li>Academic data is still not organized and stored well</li> </ol>
	<p><b>Opportunities (O)</b></p> <ol style="list-style-type: none"> <li>Advances in information technology and supporting technology</li> <li>Cooperation and partnership with other professionals</li> <li>Demands of stakeholders</li> <li>The price of software and hardware more affordable</li> </ol>	<p><b>SO Strategy</b></p> <ul style="list-style-type: none"> <li>Commitment to improve services by implementing an AIS for SMK Muhammadiyah 1 Banjarmasin</li> <li>In collaboration with AIS software developers</li> </ul>
<p><b>Threat (T)</b></p> <ol style="list-style-type: none"> <li>The number of schools that have used the Academic Information System (AIS) Based Website let alone the cities that progress rapidly</li> <li>Government policy change</li> <li>Employees who are vulnerable to move</li> <li>Possibility of data damage</li> </ol>	<p><b>ST Strategy</b></p> <ul style="list-style-type: none"> <li>Choosing the right AIS and whose output can be processed with other software to anticipate the need for different information formats</li> <li>Choosing AIS that the security level is high enough</li> </ul>	<p><b>WT Strategy</b></p> <ul style="list-style-type: none"> <li>Evaluate and select the right AIS and have a high level of security</li> <li>Train the AIS management staff and guarantee it with a reasonable salary</li> </ul>

From internal factor (IFAS) and external (EFAS) data shown in (Table 1), it can be seen that in IFAS-S, the power factor is support from the leadership and all parties, facilities, technology, and human resource. IFAS-W, which is a weakness factor is the absence of SOPs, lacks AIS, lacks expert human resources in AIS, and lack of academic data management. Then on EFAS-O, the factors that become opportunities are technological advances, cooperation with other parties, stakeholder demands, and the price of software or hardware increasingly affordable. EFAS-T, a threat factor in the form of several schools has implemented an AIS primarily in public schools, fluctuating government policies, frequent employee turnover, and data-prone hazards. Apart from IFAS and EFAS analysis data can also be analyzed quantitatively. Results of data analysis obtained as shown in (Table 2) and (Table 3).

**Table 2.** SWOT matrix analysis of internal factors.

Internal Strategic Factors	Score (S)	Weight (W)	Value (SxW)
<b>Strength (S)</b>			
<b>1. Support from school committee leaders and school leaders</b>	0.4	4	1.6
<b>2. Availability of adequate computer facilities</b>	0.3	4	1.2
<b>3. Availability of LAN and Wi-Fi network facilities and internet</b>	0.1	3	0.3
<b>4. Availability of adequate human resources</b>	0.2	2	0.4
Total Strength Values	1		3.5
<b>Weakness (W)</b>			
<b>1. Absence of SOP (standard operational procedure)</b>	0.2	3	0.6
<b>2. Unavailability of software Academic Information System (AIS)</b>	0.3	3	0.9
<b>3. The absence of specialized human resources developers and technical implementers Academic Information System (AIS)</b>	0.4	2	0.8
<b>4. Academic data is still not organized and stored well</b>	0.1	2	0.2
Total Weakness Values	1		2.5
Total Internal Factor (Strength - Weakness)			1.0

**Table 3.** SWOT matrix analysis of external factors.

External Strategic Factors	Score (S)	Weight (W)	Value (SxW)
<b>Opportunities (O)</b>			
<b>1. Advances in information technology and supporting technology</b>	0.2	4	0.8
<b>2. Cooperation and partnership with other professionals</b>	0.3	4	1.2
<b>3. Demands of stakeholders</b>	0.1	3	0.3
<b>4. The price of software and hardware more affordable</b>	0.4	4	1.6
Total Value of Opportunities	1		3.9
<b>Threat (T)</b>			
<b>1. The number of schools that have used the Academic Information System (AIS) Based Website let alone the cities that progress rapidly</b>	0.2	2	0.4
<b>2. Government policy change</b>	0.1	1	0.1
<b>3. Employees who are vulnerable to move</b>	0.4	4	1.6
<b>4. Possibility of data damage</b>	0.3	3	0.9
Total Weakness of Threat	1		3.0
Total External Factor (Opportunities - Threat)			0.9

From the data presented in (Table 2) which contains SWOT matrix data analysis of internal factors with values consisting of (strength-weakness) with final total score is 1.0 and at (Table 3) contains data on SWOT matrix analysis of external factors with the value consisting of (opportunity-threat) with the final score is 0.9, which means that in this SWOT analysis entering the value of quadrant 1 gives the meaning that SMK Muhammadiyah 1 Banjarmasin is in a strong position and has the opportunity to implement AIS-based website for improve the quality of academic services. From the above data can be described in the quadrant shown in (Figure 2).

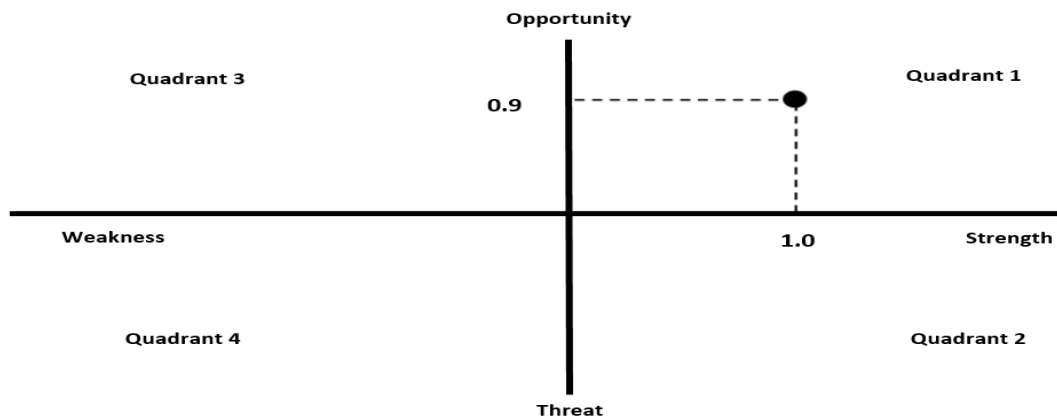


Figure 2. Quadrant SWOT analysis.

In the framework of implementation for the AIS, conducted searches to various sources, both from the internet and other sources, obtained a variety of alternative academic management information system that can be used. And from the results of trials conducted by the leadership and staff at SMK Muhammadiyah 1 Banjarmasin, mainly related to (1) economic feasibility; (2) operational feasibility; (3) technical feasibility; (4) schedule feasibility; and (5) legal feasibility. In addition, specifically the conformity of facilities according to the needs of SMK Muhammadiyah 1 Banjarmasin, ease of use, security system (security), and ease of getting it, then the approval of the chairman of the committee and the school leadership decided to use the software system AIS, although still simple to be tested implemented directly in SMK Muhammadiyah 1 Banjarmasin. Views of the Implementation of AIS Based Website SMK Muhammadiyah 1 Banjarmasin, shown in (Figure 3).



Figure 3. Display home and staff page from AIS.



Figure 3. Cont.

The effectiveness of AIS is assessed using the DeLone and McLean models, where the quality characteristics of the information system are the composition of the quality of the systems, information, and services, this is based on relevant research which also uses DeLone and McLean models in their study by [1, 3, 5-10, 12, 13, 16]. Implementation of AIS conducted since June 3, 2016 was evaluated on 1-13 June 2017. The test used assessment instruments performed by two administrative staff, two vice principals and principals after they tested the system. Each of the above effectiveness characteristics is assigned a value of 1-4 by each respondent, so the ideal value for each item is 20, and the total ideal value is 280. The effectiveness value is the ratio between the actual value compared to the ideal value. Value, using the calculation using the formula (1).

$$\text{Value of Effectiveness} = \frac{\text{Actual Value}}{\text{Ideal Value}} \times 100\% \tag{1}$$

The results of the assessment of the effectiveness of AIS SMK Muhammadiyah 1 Banjarmasin, shown in (Table 4).

**Table 4.** Results of effectiveness assessment of AIS SMK Muhammadiyah 1 Banjarmasin.

Characteristics	The value of the respondent					Total
	1	2	3	4	5	
<b>Functionality</b>	4	4	4	4	4	20
<b>Usability</b>	4	4	4	3	4	19
<b>Reliability</b>	3	3	3	3	3	15
<b>Accessibility</b>	4	4	4	3	3	18
<b>Interactivity</b>	3	3	4	3	3	16
<b>Response Time</b>	3	3	3	3	3	15
<b>Completeness</b>	3	3	3	3	3	15
<b>Ease of Understanding</b>	3	4	4	3	3	17
<b>Relevancy</b>	3	3	3	3	3	15
<b>Security</b>	3	3	3	3	3	15
<b>Timeliness</b>	3	3	3	3	3	15
<b>Assurance</b>	3	3	3	3	3	15
<b>Empathy</b>	3	3	3	4	3	16
<b>Responsiveness</b>	4	3	3	3	3	16
Total	46	46	47	44	44	227

Because of the number of characteristics assessed there are 14 items and the number of respondents who do the assessment there are 5 people with a maximum value of 4, then the ideal value of this effectiveness assessment is  $14 \times 5 \times 4 = 280$ . Then the value of effectiveness can be calculated by the formula (1). From the results of assessment of effectiveness analysis is obtained amounted to 81.07%. This means that the effectiveness of the implementation of academic management information system using AIS Based on Website in SMK Muhammadiyah 1 Banjarmasin as a whole is 81.07% of the expected criteria. Whereas, if calculated based on each dimension of information system effectiveness from DeLone and McLean IS Success Model, then the result is: system quality equal to 84.38%, information quality equal to 75.00%, and service quality equal to 77.50%.

#### 4. Conclusion

Based on the results of the study, it can be concluded that: The results of value chain analysis and SWOT analysis, SMK Muhammadiyah 1 Banjarmasin are in a strong position and have the opportunity to implement AIS-based websites to improve the quality of academic services. From the feasibility and consideration of the completeness of the facility as needed, the ease of use, the security system, and the ease of obtaining it, the researcher approved by the principal decided to use and test AIS based on the website system with the domain <http://smkmutubjm.sch.id>. The effectiveness of AIS based on the overall website implementation is 81.07% of the expected criteria. Based on the effectiveness dimensions of the DeLone and McLean IS success model, the results are: system quality 84.38%, information quality 75.00%, and service quality 77.50%.

#### 5. Future work

In the future, we expect increased understanding of school leaders and administrative staff about the use of AIS through training to understand all sides of the system, both functional and nonfunctional. AIS is still a simple yet complex system, because the information system is self-made, therefore the need for better AIS development must be implemented. Further research on the impact and development of AIS applications is required based on DeLone and McLean IS success model.

#### References

- [1] Irawan H 2017 "Evaluation of Implementation of Enterprise Resource Planning Information System with DeLone and McLean Model Approach," *2017 Fifth International Conference on*



- Information and Communication Technology (ICoICT)*. ISBN: 9781509049110.
- [2] Kurniawan Y and Hiererra S E 2016 “Information Systems Design for Sustainability Financial Services Company using Enterprise Architecture Framework: A Case Study Approach,” **4**(c), pp. 168–173.
- [3] Noprisson H, Husin N and Utami M 2016 “The Use of a Mixed Method Approach to Evaluate m-Government Implementation,” *2016 International Conference on Information Technology Systems and Innovation (ICITSI) Bandung*, pp. 1–5.
- [4] Gufroni A I 2011 “Information Systems Strategic Planning at the Siliwangi University Tasikmalaya,” *International Journal of Advanced Engineering Sciences and Technologies* **6** (1), 053 – 059.
- [5] Zuama R A, Hudin J M, Puspitasari D, Hermaliani E H and Riana D 2017 “Quality dimensions of Delone-McLean model to measure students' accounting computer satisfaction: An empirical test on accounting system information,” *Cyber and IT Service Management (CITSM), 2017 5th International Conference on 8-10 Aug. 2017*.
- [6] Symeonaki E, Papoutsidakis M, Tseles D and Sigala M 2017 “Post-implementation evaluation of a University Management Information System (UMIS),” *Proceedings - 2016 3rd International Conference on Mathematics and Computers in Sciences and in Industry, MCSI 2016*, pp. 14–19.
- [7] Tjong Y 2016 “Successful measurement of Content Management System implementation,” *Proceedings of 2016 International Conference on Information Management and Technology, ICIMTech 2016*, (November), pp. 311–314.
- [8] Tingliao L 2016 “The IT audit research based on the information system success model and COBIT,” *Proceedings of the 10th International Conference on Intelligent Systems and Control, ISCO 2016*.
- [9] Sandjojo N and Wahyuningrum T 2016 “Measuring e-learning systems success: Implementing D and M is success model,” *Proceedings of the 2015 4th International Conference on Interactive Digital Media, ICIDM 2015*, (Icidm), **12**(1) pp. 4–9.
- [10] Montesdioca G P Z and Maçada A C G 2015 “Quality Dimensions of the Delone-McLean Model to Measure User Satisfaction : an Empirical Test on the Information Security Context,” *48th Hawaii International Conference on System Sciences*, 5010–5019.
- [11] Oztekin A, Nikov A and Zaim S 2009 “UWIS: An assessment methodology for usability of web-based information systems,” *Journal of Systems and Software*, **82**(12), pp. 2038–2050.
- [12] Jafari S M, Ali N A, Sambasivan M and Said M F 2011 “A respecification and extension of DeLone and McLean model of IS success in the citizen-centric e-governance,” *Proceedings of the 2011 IEEE International Conference on Information Reuse and Integration, IRI 2011*, **12**(2), pp. 342–346.
- [13] Wang H and Hu Z 2009 “Applying DeLone and McLean information system model to online consumer behavior in China,” *2009 International Conference on Management of E-Commerce and E-Government, ICMecG 2009*, (1), 74–77.
- [14] Herlambang A D, Rachmadi A and Saputra M C 2017 “Measureable Organization Value (MOV) on the Implementation of Quality Management Information System of Vocational Schools,” **11** (2), pp. 131-138.
- [15] Nurhayati S 2009 “Strategic Analysis of Information Technology System with SWOT Analysis Approach,” *Proceeding of National Seminar of Informatics 2009*, **45**(2) pp. 149-154.
- [16] DeLone W H and McLean E R 1992 “Information Systems Success: The Quest for the Dependent Variable,” *Information Systems Research* **3** (1) pp. 60-95.

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