Critical Success Factors of Asset Management Software Implementation in Construction Indonesia

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Abstract

The construction industry is one of the inefficient and low-performing sectors which has necessary to use information technology to increase productivity, integration, and competitiveness. This research aims to analyze critical success factors between top management support, project management, and vendor support on the successful implementation of asset management software. This research method uses a purposive sampling technique involving 20 superusers from 20 companies that implemented Asset Management Software (AMS) in construction companies located in Indonesia. Instrument tests are conducted using Structural Equation Modeling (SEM) based on Smart PLS. The results of this study top management support and vendors support an insignificant effect on the asset management software implementation. While project management has an impact on asset management software implementation successful.

Keywords

Asset Management Software, Construction Industry, Critical Success Factors, SEM PLS.

1. Introduction

The construction industry is one of the inefficient and low-performing sectors which has necessary to use information technology to increase integration, productivity, and competitiveness (Ozorhon & Cinar, 2015). Currently, the construction industry is changing to become more challenging and competitive with new advances in technology as a tool and technique to achieve goals (Al-amrib, 2019). Based on McKinsey Global Institute (2017) reports that the construction sector is one of the largest industries in the world economy with a cost of $10 trillion being spent on construction-related goods and services each year. However, productivity levels have been lower than in other sectors for decades and there is a $1.6 trillion opportunity to close the productivity gap in the construction sector. Indonesia under the leadership of President Joko Widodo has made the infrastructure sector one of the priority development programs with an average budget increase of more than 10% per year from 2016-2019 (Kemenkeu, 2021). The gap in the construction sector is data transparency, one of which is assets that move dynamically from one project to another, so asset management is needed.

The main objective of asset management is to see the value of assets and the scope of their application in general referring to various types of assets in the industrial sector (Roda & Macchi, 2016). According to David (2018) states that asset management, predictive maintenance improves operational cost savings, productivity, and safety management capabilities. Based on research conducted by Honda et al., (2017) asset management method is very helpful in finding maintenance policies at the most cost-effective. Data has an important role in making decisions regarding asset management. Quantity and quality in managing data become more relevant for asset managers to meet

reliability and efficiency requirements (Koziel et al., 2021). Therefore, the use of technology is a differentiating step to increase productivity in construction related to asset management.

The process of using technology requires stages from pre-implementation to post-implementation. Factors that will affect implementation can be mapped by analyzing Critical Success Factors (CSFs). CSFs provides an overview to the company about critical aspects of business activities and processes that will affect the company's performance in achieving its vision and mission as well as its business success. The CSFs concept was developed by Daniel (1961) and then sharpened into a Critical Success Factor (Rockart,1979), this concept is widely used in various industries including projects. According to Ward (2002) CSFs are a certain area in the company, where if the results of the area are satisfactory, it will guarantee the success of the company is competing. It is a key area where things have to go well and properly. CSFs become an important part of the implementation of Asset Management Software (AMS) as an effort to map critical factors that affect so that the potential for successful implementation becomes greater.

So far (The author) collects very little data that discusses CSFs Asset Management Software (AMS) in the construction sector especially in Indonesia, so the author wants to fill the void. The objective of this study is to analyze the CSF that can increase the chances of successful AMS implementation. The framework used in the implementation of AMS has a similar process with the process of implementing other information systems such as Enterprise System (ES) or Enterprise Resource Planning (ERP).

2.Literature Review

Top management support and commitment by Ozorhon & Cinar (2015) is the most significant parameter. One of the main goals of an AMS system is to integrate the processes that lead to changes in the business processes of the organization. It takes support and commitment from all levels, but top management's support and commitment is a very important factor. Statistical testing shows that the involvement and awareness of top management is the most significant factor of the success of ERP implementation (Al-amrib, 2019). Total 34 Enterprise System CSFs conducting by Loonam et al., (2018), Top management support is the first rank of the most important factor in the successful implementation of enterprise systems. Some other literature mentions that participation by the top management for the successful implementation of the system (Doom et al., 2010).

Project management is an approach or method to manage a project effectively and efficiently. According to (Loonam et al., 2018) project management is ranked 3rd CFSs affecting ES implementation. Some studies state that project management is a merger of several CSFs that involve effective planning, control, business justification, and skill compatibility with the necessary expertise as project requirements (Akkermans & Helden, 2002)., (Umble et al., 2003).,(Zhong Liu & B. Seddon, 2009).

According to Susanty, Aries and Fernando (2015) Vendor support shows the most vital factors affecting the success of ERP implementation. Vendor support is another significant factor related to technology. Several research findings suggest that Enterprise System or ERP software vendors should work with construction professionals to create better solutions for organizations (Somers & Nelson, 2004).,(Tatari et al., 2008).,(Tatari & Skibniewski, 2011).

To measure the successful implementation of an information system, some previous research such as Delone & Mclean (2014) Success model as a framework for measuring complex dependencies. Given the growing development of service-oriented information systems and increasing use in inter-organizational settings, an update is possible. (Urbach & Müller, 2012). According to Garcia Cruz & E Ramirez Correa (2014), The parameters for the success of ERP implementation are increasing the achievement of work productivity and decreasing the error rate. According to Zhang et al. (2005) success in ERP implementation is to increase accuracy in work activities and reduce error rates. Based on the above literature, this research proposes several hypotheses as follows:

H_1: Top management support affects the successful implementation of asset management software
H_2: Project management affects the successful implementation of asset management software
H_3: Vendor support affects the successful implementation of asset management software

3. Methods

The instrument testing is carried out using a structural equation model based on Smart PLS which is used for data analysis based on variables with reflective indicators to test the validity and reliability for several samples that are considered relevant to the research and include inner model testing (Leguina, 2015). Measurement of the outer model

by testing the validity and reliability test. The validity test uses the loading factor value > 0.70 and the Average Variance Extracted value > 0.70. Then the reliability test uses Cronbach's alpha value > 0.70 and the Composite Reliability value > 0.70. Meanwhile, the measurement of the inner model includes R square and Path coefficient (hypotheses testing). The hypothesis is accepted if the bootstrapping result value of the T statistic is more than 1.96 and the P-value is less than 0.05 (with an error rate of 5 percent). The conceptual framework of this research can be seen in Figure 1.

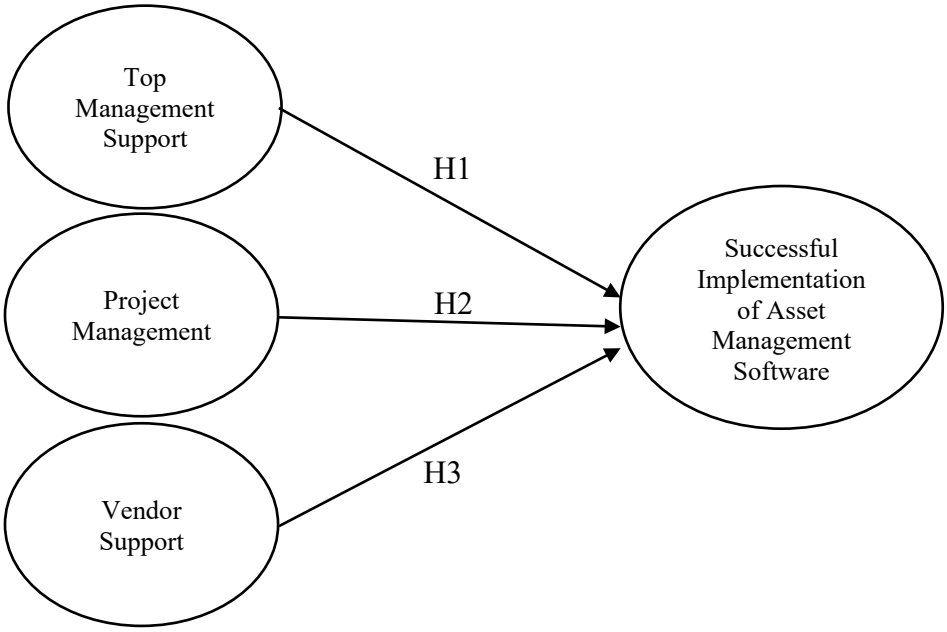

Figure 1. Research Framework

4. Data Collection

This research collection data was collected in a construction company located in Indonesia with a purposive sampling technique involving 20 superusers from 20 companies that implemented Asset Management Software (AMS). The determination of the sample has special considerations so that it is worthy of being a sample, in this case only superusers who use and are responsible for the use of asset management software. The number of samples used in this study is the same as the population census where the entire population is 20 superusers from 20 companies was implemented AMS. The details of 20 companies and respondents are as follows:

Table 1. Sample Data

Location	Company	Respondents
Jakarta	7	7
Balaraja	1	1
Bogor	2	2
Bekasi	2	2
Surabaya	5	5
Bali	2	2
Malang	1	1
Total	20	20

5. Results and Discussion

5.1. Validity Test

The results of the validity test on the indicator questionnaire from Top Management Support (TMS1, TMS2, TMS3, TMS4, TMS6, and TMS) found that the questions TMS5, TMS7, and TMS9 were invalid (Loading Factor < 0.7), so they had to be deleted. After the TMS5, TMS7, and TMS9 items are deleted and all indicators become valid (Loading Factor > 0.7). The validity test on the Project Management support indicator questionnaire (PM4, PM5, PM6, PM7, PM8, and PM9) found that the questions PM1, PM2, and PM3 were invalid (Loading Factor < 0.7), so they had to be deleted. After PM1, PM2, and PM3 items are deleted and all indicator results become valid (Loading Factor > 0.7). then the results of the validity test on the Vendor Support indicator questionnaire (VS1, VS2, VS3, VS4, VS5, VS6, VS7, VS8, and VS9), and the successful implementation of AMS (SISMA1, SISMA2, SISMA3, SISMA4, SISMA5, SISMA6, SISMA7, and SISMA8), were all valid (Loading Factor > 0.7).

After testing the validity using the loading factor value, then the validity test is carried out using the Average Variance Extracted (AVE) value. The AVE value describes one latent variable that can explain more than half of the indicator variance with a value > 0.5 as shown in Table 2.

Table 2. Validity Test

Variable	Average Variance Extracted (AVE)
Top management support	0.802
Project management	0.651
Vendor support	0.707
Successful Implementation of asset management software	0.720

5.2. Reliability Test

The results of reliability testing can be seen in table 3.

Table 3. Reliability Test

Variable	Cronbach's Alpha	Composite Reliability
Top management support	0.951	0.960
Project management	0.894	0.918
Vendor support	0.950	0.956
Successful Implementation of asset management software	0.944	0.954

The results of the reliability test on all variables obtained data values of Cronbach's Alpha and Composite Reliability > 0.7. From these results, it can be said that all indicators are reliable variables.

5.3. R Square

The R Square test results are as the table below:

Table 4. R Square Test

Matrix	**R Square**
Successful implementation of asset management software	0.695

The results of the R Square test of 0 695 can be interpreted that the constructs of the top management support, project management, and vendor support models have a value of 69.5% is included in the fairly good category, while 30.5% is influenced by other variables.

5.4. Hypothesis Testing

The results of hypothesis testing can be seen in Table 5.

Table 5. Hypothesis Test

Matrix	T-Value	Conclusion
H1: Top management support influence successful implementation of asset management software	0.915	Not Significant
H2: Project management influence successful implementation of asset management software	2.848	Significant
H3: Vendor support influence successful implementation of asset management software	0.536	Not Significant

The T-Value value is obtained by bootstrapping through smart PLS with the following details:

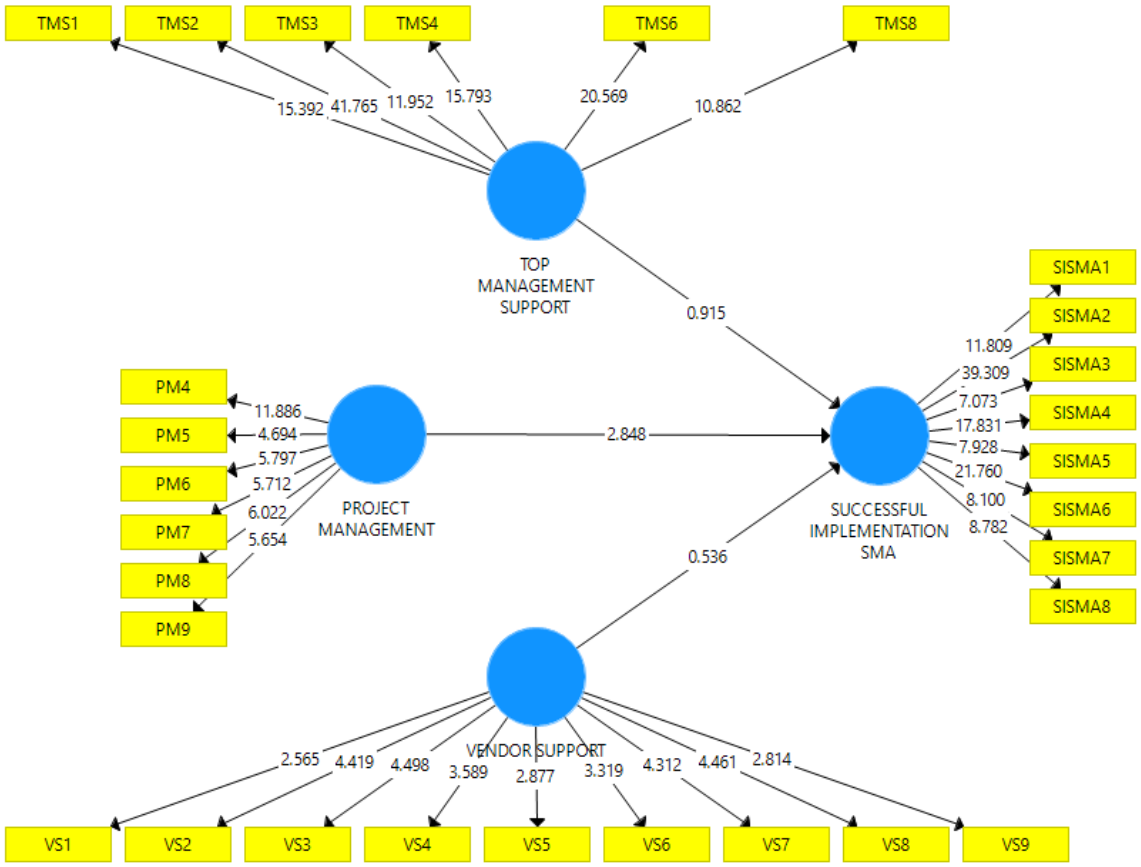

Figure 2. Bootstrapping Test

6. Conclusion

This research concludes that top management support has no significant impact on the successful implementation of asset management software. Project management has a significant impact on the successful implementation of asset management software. Meanwhile, vendor support has no significant impact on the successful implementation of asset management software. Based on the conclusions of this study, the authors recommend that companies or management consider project management factors as aspects that need to be considered because they have a significant impact on the success of AMS implementation. Some suggestions in this study are for further research to expand the object or research variable and sample size to strengthen and increase the level of confidence in the results and findings of this

study because there is still a gap of 30.5% for other factors for the research variable construct model that can be considered. In addition, more data are needed for companies that already use asset management software, not only one type of software but can be combined with various types or brands of software.

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