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Interpretative Structural Modelling for Determining Dominant Success Criteria of Information System (IS) Success at Handycraft SMEs in Yogyakarta, Indonesia

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ABSTRACT

The purpose of this research paper is to determine the dominant criteria of Information System (IS) success specific to handcraft SMEs in Yogyakarta and to establish relationship among those criteria using interpretive structural modeling (ISM). A small portion of those SMEs have started using information system. However, they face several barriers to successfully implement the information system. Therefore, it is necessary to ensure the success of information system implementation. But, no study has been done regarding the measurement IS success specific to handcraft SMEs in Yogyakarta. This research involved interview-based surveys and ISM approach to determine the dominant criteria of IS success of SMEs in Yogyakarta context. In total, 16 SMEs were involved as research objects in this research. In this research, four cluster of SME have been identified and the modified IS Success model for each cluster was developed accordingly. The modified model for each cluster has 14, 20, 16 and 30 criteria respectively. Through ISM, a relationship model among the criteria for each model was also obtained. It was concluded that "ease of use", "ease of learning", and "data accuracy" are significant criteria of IS Success model in SMEs in Yogyakarta. These criteria are considered as the dominant criteria to implement information system successfully. In addition, the desired results of successful implementation is represented by "improved outcomes".

Keywords: information system, handcraft SMEs, IS Success model, interpretive structural modeling.

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1. INTRODUCTION

Small and Medium Enterprises (SMEs) have historically play central roles in the Indonesian economy. Nationally, SMEs shared the biggest contribution to Indonesian gross domestic product (GDP) in 2012 (Handayani, 2013). Moreover, as of 2006, there are approximately 49 million SMEs active in the country, which account for more than 99.98 percent of all enterprises across all sectors and put 96.2 percent of the total workforce to work (Tambunan, 2011). Regionally in Yogyakarta, the SMEs – especially handcraft SMEs - has strategic role as catalyst of local economic growth and community participation (Suharyanti, Purnama, & Suyoto, 2009). However, handcraft SMEs in Yogyakarta face several challenges in their growth, among others are limited access to supplier and market, limited use of technology and managerial problem, which lead to inefficiency. In addition, the access to supplier and market was the most influential aspect on supply chain performance (Suharyanti, Purnama, & Suyoto, 2009). A study conducted by Wahid and Iswari (2007) on 146 SMEs in Yogyakarta reported that a small portion of those SMEs have used information system. SMEs face several barriers to successfully implement information system, which are limitation of skilled labor and financial support.

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Therefore, it is necessary to ensure the success of information system implementation of SMEs in Yogyakarta.

Information systems success measurement has received much attention and become an important issue because of the desire to measure the success of the use of information systems in an organization. This is because the increasing amount of IT spending and budget (Kanaracus, 2008) as well as the impacts of IT that are often indirect and influenced by human, organizational, and environmental factors (Petter, Delone, &McLean, 2008).

A lot of studies about measurement of information system success have been undertaken (Petter, DeLone, & McLean, 2008; DeLone & McLean, 1992; DeLone & McLean, 2003; Seddon, Staples, Patnayakuni, & Bowtell, 1998; Gable, Sedera, & Chan, 2003; Gable, Sedera, & Chan, 2008). The most influential and widely cited model is DeLone and Mc Lean IS Success Model (DeLone & McLean, 1992). It classifies IS success measures into six dimensions: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. This model was then updated after having received several criticism (Seddon, 1997). The new model, the reformulated IS Success model, still has six dimensions with the addition of service quality and the replacement of individual impact and organizational impact with net benefit (DeLone & McLean, 2003).

Other researchers (Gable, Sedera, & Chan, 2003; Gable, Sedera, & Chan, 2008) proposed IS-Impact measurement model to evaluate the success of enterprise system. Several research have been undertaken to develop the measurement model to measure the information system success in SMEs (Pujani, 2005; Alshardan, Robert, & Giselle, 2013; Ghobakloo & Sai, 2015). However, to the best of author knowledge the suitable model to measure IS Success in SME in Yogyakarta has not been found yet. Therefore, the research presented in this paper intend to fill this gap. Interpretive Structural Modelling (ISM) that was made by (Warfield, 1974) is used in this research to identify the relationship among criteria and the dominant criteria of IS success. ISM method itself has been applied in to various field of IS and information technology (IT) such as to determine the atribut of software quality (Adarsh & Gunjan, 2017), modelling of information security management parameters (Muktesh, Sudhir, & Ravi, 2013), modelling of critical risk factors in software engineering project (Chitrasen, Saurav, Siba, & Bikash, 2016), and IT-enablers for Indian manufacturing SMEs (Jitesh, Arun, & Deshmukh, 2008).

The remainder of the paper is organized as follows. Section 2 identifies relevant criteria of IS success for the case of Handcraft SMEs in Yogyakarta. Section 3 delivers an ISM model establishing the relationships between these criteria followed by discussion in Section 4. Section 5 present the conclusion.

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2. IDENTIFIES RELEVANT CRITERIA OF IS SUCCESS FOR THE CASE OF HANDYCRAFT SMEs IN YOGYAKARTA

The interviewed-based surveys, herein after referred to as identification surveys, were conducted to identify the criteria that are relevant to the context under study. The model that was used in this research, IS Impact Model, was originally developed in the Australian context. Therefore, the Identification survey is used to assess the suitability criteria of the original IS-Impact Model in a context that was different from the context of the original Model. The Identification survey also identifies which criteria of the original model that are not applicable in the new context. This survey followed several steps, which were question design, interview and observation, response scoring, and cluster analysis.

The design of survey questions was based on operational definition of criteria of Gable IS Impact Model (Gable, Sedera, & Chan, 2008). The original model comprises 37 criteria (measures) along four dimensions. Each question that was designed was an open question and it related to a criterion of that model. All questions were used to determine whether each of the criteria was applicable in the SMEs surveyed.The interview-based surveys were administered to several handcraft SMEs in Yogyakarta province. In total, 16 SMEs were involved as research objects in this research. Interview were conducted against the owners and employees of those SMEs. During the interview, in each SME, any question related to a criterion was asked in each business process. Business processes are classified according to the primary function of an organization, namely marketing, finance, production and warehouse. On each of the criteria, the answers of the interview were then tested its validity to obtain data in accordance with the actual conditions that exist in each SME. Validity of the answer was tested by matching the answers with the observation results and existing documentation that the SME own.

After having the valid answer, any answer given was then scored on scale 0-4. The criteria that have rating of 4 were used as the criteria to measure the information system success while the others were eliminated. A relevant criterion for a SME was chosen if that criterion was scored of 4 at least in one business process. In this step, a mapping of relevant criteria per SME was developed. The last step on the survey was a cluster analysis. The purpose of cluster analysis is to group the SMEs under study based on specific characteristic. Basic Sequential Algorithmic Scheme (BAS) has been used. By using mapping of relevant criteria per SME, comparison matrices per criteria for all SMEs was then derived. Inter-SME proximity matrix was calculated afterward. From that matrix some values of 0.7568, 1.0000, and 0.8649 were come up with to indicate the minimum proximity, the maximum proximity, and the median respectively. By using a threshold value of 1.5000, then 4 clusters of SME was created.

Table 1. Relevant criteria of IS success

Dimension	Criteria	Cluster #1	Cluster #2	Cluster #3	Cluster #4
Individual Impact	[II1] Learning				
	[II2] Awareness				
	[II3] Decision Effectiveness				
	[II4] Individual Productivity				
Organizational Impact	[OI1] Organization cost	▪	▪		▪
	[OI2] Staff Requirement				
	[OI3] Cost Reduction				
	[OI4] Overall Productivity				
	[OI5] Improved outcomes				
	[OI6] Increased capacity				
	[OI7] e-Business				
	[OI8] Business Process Change				▪
System Quality	[SQ1] Data accuracy				
	[SQ2] Data currency				
	[SQ3] Database contents				
	[SQ4] Ease of Use				
	[SQ5] Ease of Learning				
	[SQ6] Access				
	[SQ7] User requirement				
	[SQ8] System features				
	[SQ9] System accuracy				
	[SQ10] Flexibility				
	[SQ11] Reliability				
	[SQ12] Efficiency				
	[SQ13] Sophistication				
	[SQ14] Integration				
	[SQ15] Customization				
Information Quality	[IQ1] Importance	▪	▪	▪	▪
	[IQ2] Availability				
	[IQ3] Usability				
	[IQ4] Understandability				
	[IQ5] Relevance				
	[IQ6] Format				
	[IQ7] Content Accuracy				
	[IQ8] Conciseness				
	[IQ9] Timeliness				
	[IQ10] Uniqueness				

After forming the four clusters, then the relevant criteria of IS Success model for each cluster was determined. The relevant criteria for each cluster were chosen from the SME that has the most complete criteria. The first cluster has 14 criteria, while the second, the third and the fourth cluster have 20, 16, and 33 criteria respectively. The detail of relevant criteria for each cluster can be shown in Table 1.

3. ISM MODEL ESTABLISHING THE RELATIONSHIPS BETWEEN CRITERIA

In this research, ISM was used to identify the relationship among criteria and the dominant criteria. The series of steps that lead to the development of ISM model are: 1) Developing a structural self-interaction matrix (SSIM) for criteria; 2) Developing Reachability matrix; 3) Developing Level Partition; 4) Developing Conical Matrix; 5) Developing Digraph and ISM Model.

There are 4 digraph and ISM models resulted from this ISM steps where each model is purposed for each SME cluster. After finding the ISM model for each SME cluster, a MICMAC analysis was performed. The objective of MICMAC analysis is to analyze the driving power and dependence power of criteria of interest and to plot those criteria on MICMAC graph. This was done to identify the dominant criteria of IS success for each SME cluster. The result from MICMAC analysis are presented in Figure 1 – 4.

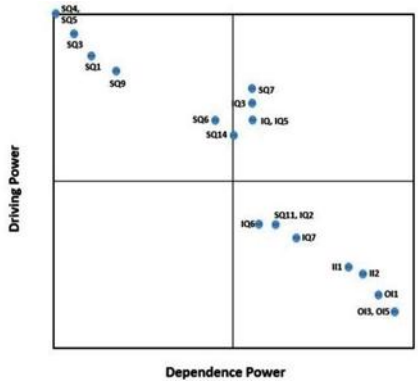

Figure 1. Categorization of criteria of IS Success for cluster #1

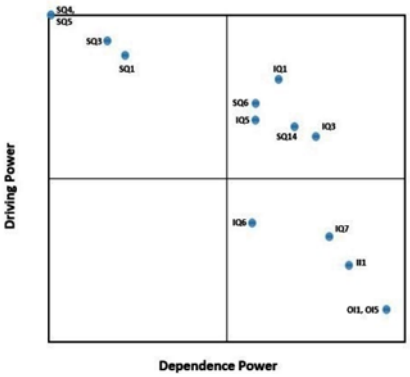

Figure 2. Categorization of criteria of IS Success for cluster #2

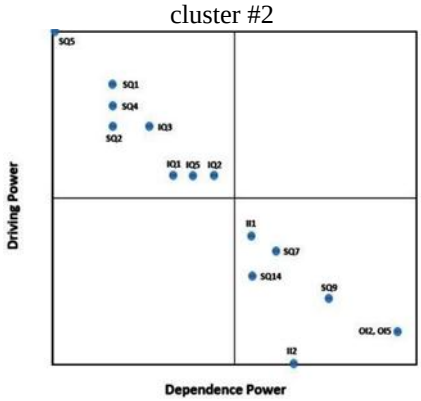

Figure 3. Categorization of criteria of IS Success for cluster #3

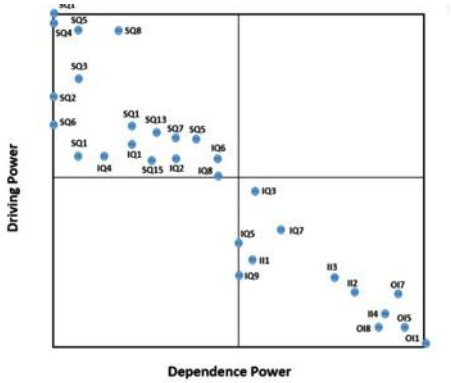

Figure 4. Categorization of criteria of IS Success for cluster #4

In this research, MICMAC analysis was also used to eliminate the criteria that were considered not have significant influence. These criteria were the ones that are plotted on the autonomous category, which have weak driving power and weak dependence power. From the Figure 1 – 4 above, such kind of criteria were only in cluster #4. Therefore, these three criteria (SQ12, SQ14, IQ10) were dropped from IS success model.

4. DISCUSSION

The main objectives of this research are to determine the dominant criteria of IS success and to find out the relationships among these identified criteria that help in the successful implementation of information system in handcraft SMEs in Yogyakarta context. These objectives achieved by developing ISM model to analyze the interactions among different criteria so that care can be taken on those criteria to focus on for the successful IS implementation. It is seen from Figure 1 – 4 that the criteria belong to the autonomous quadrant only exist in cluster #4. These criteria have weak dependence power and weak driving power. In this research, such sort of criteria was eliminated and not considered as the relevant criteria for IS success model. Criteria such as “data accuracy” (SQ1), “ease of use” (SQ4) and “ease of learning” (SQ5) were found in all cluster. All of these criteria is independent variable that have strong driving power and weak dependency on other criteria. They may be regarded as the key criteria that enable the successful implementation of information system. In addition, It is shown from Figure 1 – 4 that “ease of use” plots at the bottom of ISM hierarchy and has the strongest driving power. So that, this is the most important criteria for successful implementation of information system in all cluster. Meanwhile, there are criteria like “organization cost”, “learning”, “awareness”, and “improved outcome” were plotted in the dependent quadrant. The first three criteria existed in 3 cluster, while the last found in all cluster. This criteria considered as the dominant criteria. One criterion, “improved outcome”, exist was in all cluster. This criteria was the most dominant criteria and considered as the resultant outcome for successful implementation of information system.

5. CONCLUSION

In this research, a modified IS Impact model for each cluster of SME has been developed . Through ISM, a relationship model among the criteria for each model has also been obtained. A major finding of this research is that the "ease of use", "ease of learning", and "data accuracy" are significant criteria of IS Success model in SMEs in Yogyakarta. These criteria are considered as the dominant criteria to implement information system successfully. This findings are very crucial for the developer of information system and the owner of SME to focus on those criteria which leads to the desired results of IS implementation. The desired results are represented by criteria such as "improved outcomes". These criteria indicate the objectives IS implementation.

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