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Information Technology Adoption Process within Indonesian SMEs: An Empirical Study

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Abstract

IT adoption within SMEs has been covered extensively within literature, most of which have considered IT adoption from narrow perspective such as drivers and barriers of IT adoption. IT adoption is better defined as a process which involves organisation and its components, stakeholders external to the organisation, and interactions within organisation and between organisation and its stakeholders. This paper uses multi perspective in IT adoption to build model of IT adoption. A field study involving 35 Indonesian SMEs was conducted in the form of semi structured interviews. The result from this field study were analysed and used to refine the proposed model.

Keywords

Indonesian SMEs, IT Adoption, process, multi perspectives

INTRODUCTION

Study of adoption and diffusion of Information Technology (IT) within small and medium enterprises (SMEs) have been documented in vast amount of literature, such as Mehrtens et.al (2001), Utomo and Dodgson (2001), Mirchandani and Motwani (2001), and Walczuch et.al.(2000) to name a few. Yet, majority of the research literature have looked at the adoption and diffusion of IT from the perspective of drivers and barriers. Less attention has been paid to the process of adoption (and therefore implementation). IT adoption is a complex process that involved different stakeholders. Identifying drivers and barriers to IT adoption is only identifying one part of the whole IT adoption process. It is also noted that some of the literature used the diffusion of innovation theory (DOI) that mostly stemmed from the work of Rogers (1995). Although Rogers's work is significant in explaining the diffusion and adoption of innovation phenomena, few limitations to the studies have been noted and will be covered in the literature review of this paper. Essentially it was the recognition of the complexity of both organisation and innovation (technology) and the consequences of such complexity on the process of diffusion and adoption (Lyytinen and Damsgaard, 2001; Slappendel, 1996).

It is not enough to identify drivers and barriers without looking at where and when the drivers and barriers influence the IT adoption process. Furthermore, it is insufficient to identify the acceptance of innovation as a mere mental exercise without paying due attention to the physical implementation Therefore, it is necessary to identify and to incorporate the sources of and influences that different stakeholders have on the whole IT adoption process. The whole IT adoption process started from the communication of ideas, decision making, implementation, and evaluation also need to be studied and understood. By understanding IT adoption as a process, SMEs could anticipate and accommodate the role of stakeholders into their IT adoption process.

This paper is part of an ongoing investigation into the IT adoption process within Indonesian SMEs. The study has investigated IT adoption process experienced by 35 Indonesian SMEs within furniture and handicraft industry. Since the majority of literature does not portray the adoption of IT as a process, we would like to explore this issue within Indonesian SMEs. The focus on process is to portray the complexity of an IT adoption. We look at the existence of stakeholders and their influence during the IT adoption process compared to what has been documented within literature. It is anticipated that within each stage of IT adoption process, the SMEs and their stakeholders will interact. We would like to examine this interaction from the SMEs perspective.

The paper will begin with the discussion on the multi perspectives in IT adoption to establish a theoretical foundation. Multi perspective in IT adoption gave a broader view toward IT adoption as an interactive process rather than just drivers and barriers. Based on the literature, we propose a model of IT adoption process within SMEs which include organisation component (manager, staff, and resources) and also the stakeholders from

external environment (trading partners, customers, competitors, and government) who might influence the IT adoption process. The IT adoption process is defined as a three stage model: decision, implementation, and evaluation. Within each stage, the same organisation components and organisation stakeholders exist and seen as influencing the IT adoption process. The following section will discuss the research method we used to collect, analyse and interpret data. We also discuss our method to search and select the participants in this study along with their demographic information. The findings of IT adoption process from the field study will be discussed in the findings and discussion part and the paper is ended with conclusion.

MULTI PERSPECTIVE IN IT ADOPTION

Definition of adoption

There are three different definitions of adoption of innovation. The first definition refers to the Diffusion of Innovation (DOI) theory (Rogers, 1995), where adoption means physical acquisition of technical artefacts or commitment to implement innovation with the emphasis being on the decision to adopt (Aiken, Bacharach and French, 1980; Evan and Black, 1967; Fichman and Kemerer, 1993). The commitment to use the innovation is the result of decision to make full use of an innovation (Rogers, 1995). The main objective is to convey the innovation message and make the potential adopters to accept the innovation and ignore the innovation implementation and use.

The second definition of adoption was from the works of Thong and Yap (1995), where adoption of IT is defined as using IT to support business. This definition has similarity with the third definition of IT adoption, which is using the innovations as intended by the designer (Bøving and Bøker, 2003). The difference was Bøving and Bødker (2003) argued that the modification of the innovation by user in practice or re-invention (Rogers, 1995) was not supported by their findings, therefore it was concluded that not all use of innovation was equal. On the other hand Thong and Yap (1995) did not differentiate between full use and modified use of IT in their studies. Still, these two definitions argue that unless the innovation is put in use, it is not an adoption. This argument is inline with Zaltman et.al. (1973), Damanpour (1987), and Damapour and Evan (1984) that considered a new idea as innovation when implemented. Zaltman et.al. (1973) divided innovation adoption process into initiation and implementation stage. For IT adoption, we argue that the definition of adoption should include the implementation stage. IT as innovation is not only ideas but also includes artefact. It is not enough that the use of IT only be accepted or decided without paying due attention to the physical implementation. Rogers (1995) also noted in his model, that all activities until the decision is made to adopt innovation were mental activities and the implementation of the innovation required physical as well as mental activities.

Limitation of Rogers's DOI theory

Rogers's diffusion of innovation theory was drawn mainly from communication theory. Accordingly, its main idea was concerned with the process of communicating the idea of innovation to the potential adopters (Rogers, 1995). Firstly, DOI is considered as having pro innovation bias (McMaster, 2001; McMaster and Kautz, 2002). DOI's main concern is to get the innovation accepted, even if the innovation itself is neither needed nor useful. Second, DOI is focused mainly to the acceptance of an innovation as a mental exercise and does not adequately cover the implementation and use of the innovation (Bøving and Bøker, 2003; Damanpour, 1987; Damanpour and Evan, 1984; Thong and Yap, 1995; Zaltman et al., 1973). Third, DOI does not take into account the complexity of introducing an innovation into an organisation (Slappendel, 1996). Organisation consists of individuals, which are situated in the environment, and are having interactions within itself and with the environment (Robbins, 2003; Zaltman et al., 1973). DOI portray the adoption of innovation from an individual perspectives (Slappendel, 1996). Most of the studies using Rogers's DOI or other individualist perspective theories often study each individual acceptance of innovation and then make a conclusion as an "aggregate". The organisation dynamic and interaction of the organisation with its environment were not considered thoroughly.

Proposed IT Adoption model

In the light of such complexity, a combination of perspectives is needed to give a more comprehensive view of adoption of innovation phenomena. Since the research using individualist and structuralist perspectives are well established, a model using a combination of both perspectives is proposed with the following assumptions:

- As each organisation consist of individuals who interact with each others (Robbins, 2003), therefore it is necessary to acknowledge that individual characteristics and individual actions may influence the adoption of innovation. Individuals within an organisation consist of manager (Cragg and King, 1993; Fink, 1998, Ilhstrom, et.al. 2003) and staff (Chau, 1995; Drew 2003; Fink, 1998). While it

may not be actively involved, organisation resources are also a factor controlled and considered by an organisation in adopting IT (Drew 2003; Dutta and Evrard, 1999; Thong, 2001).

- Organisations are situated and interact within their environment (Robbins, 2003; Zaltman et al., 1973), therefore it is also important to acknowledge that environment and organisational characteristics may influence the adoption of innovation.The environment factor consist of competitors (Cragg and King, 1993; Drew, 2003; Fink, 1998), government (Dutta and Evrard, 1999; Utomo and Dodgson, 2001), customers (Drew 2003; Fink 1998), and trading partners (Cragg and King, 1993; Fink 1998)

Therefore in viewing the process, it is necessary to show the influence of individuals, organisational resources, and environment as depicted in figure 1.

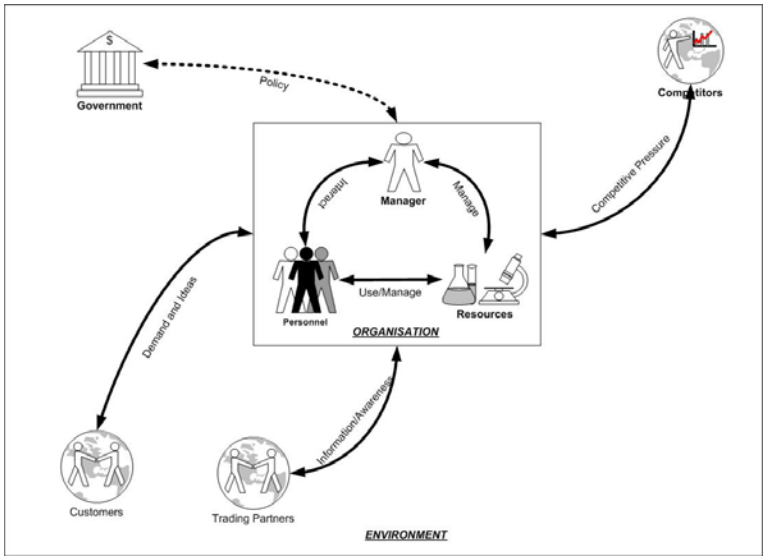

Figure 1: Multi Perspectives on IT adoption model within SMEs

The government interaction with organisation is not shown as a solid line since it is not clearly documented within the literature (Slappendel, 1996). Based on this model, the adoption of innovation is shown as a process where:

- Individuals and organisational resources are involved and interact in order to adopt innovation. In this model, the individuals are the manager and staff, while other resources are organisational resources that are used and managed by individuals.
- Customers, trading partners, and competitors might influence the adoption of innovation. While the government, although unclear, can drive the adoption of innovation indirectly through implementing policy.

Clearly, this model does not represent adoption as initiation and implementation stage as in Zaltman et.al.(1973). Rogers's (1995) model of Innovation-Decision Process Model (IDPM) also shows adoption as initiation and implementation. In IDPM, Zaltman's initiation stage is identified as three distinct processes, namely knowledge, persuasion, and decision. IDPM also have confirmation stage where the adopter reflects on the adoption. Based on Zaltman et.al.(1973) and Rogers (1995), a new model is proposed in figure 2. Note that the content of each box in figure 2 is the same as figure 1.

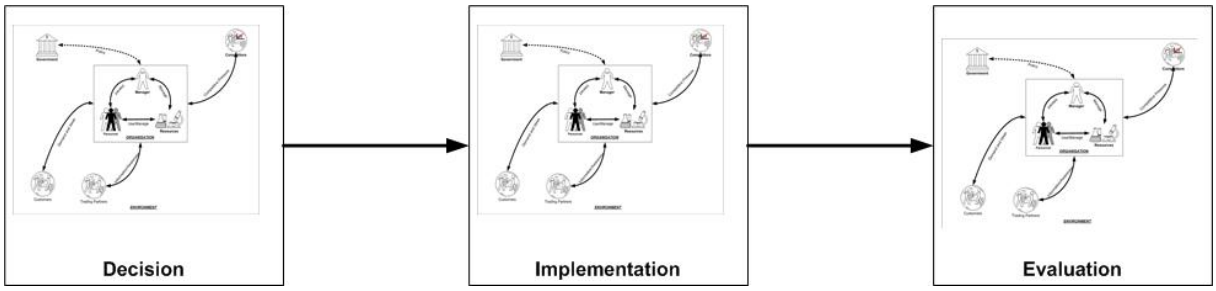

Figure 2: IT Adoption process within SMEs

Decision stage is when the decision to adopt IT is made. Implementation is when the IT has been put into works by the organisation either by internal or external parties. Evaluation is when the organisation evaluates the whole process and makes decision on potential adoption in the future. We argue that during the whole process, the interplay of individuals within organisation and with the environment will take place to influence the whole process. We used the model in figure 2 as a guide in studying the IT adoption within Indonesian SMEs. At this point, the model shows a linear flow. In reality, iterations might take place, for example that during the implementation stage a new solution come up and need to be considered for adoption. In that case, the SMEs need to make decision on whether or not the new solution needs to be adopted. In any case, data analysis from field study would reveal the existence of such iterative process.

RESEARCH DESIGN

The model in figure 2 illustrating IT adoption process within SMEs was used to design and conduct a semi structured interview. A set of questions was developed to obtain data regarding the experience of Indonesian SME managers during their IT adoption. The questions were designed to explore the participants' IT adoption experience. The questionnaire was originally developed in English and then translated into Indonesian by the first author who is native Indonesian speaker. The Indonesian language questionnaire version was tested by a few Indonesian students in Australia to verify correct translation and remove potential ambiguity.

Once the final version of the semi structured interview was ready, the field study was conducted by the first author between the months of December 2003 and February 2004. The participants were selected from a list of Indonesian SMEs in the furniture and handicraft industry and situated in Yogyakarta and Surakarta region in Central Java. The list was compiled from data provided by Indonesian Yellow Pages and Indonesian furniture and handicrafts council and association. In Indonesia, an SME is defined as any business organisation which possesses assets less than US$ 1 Million (excluding land and building) and has annual sales turnover less than US$ 5 Million (SMIDEC, 1998). The furniture and handicrafts industries were chosen because they are a significant local industry in which one of the authors had experience as IT consultant. As a manufacturing industry in an area of low labour cost, they are not obviously information intensive, but as most of their customers are international they need IT based communications. They also use IT in their internal business operations, but usually do not have a dedicated IT department. All the participants already used basic computer applications for their business, such as office applications (for administrative functions, reporting, and book keeping), internet applications (for simple business intelligence, email, simple marketing and order tracking), and graphic manipulation applications for product design. The chosen (adjacent) regions of Central Java are considered as one the main centres of furniture and handicrafts in Indonesia; as all the SMEs are from the same region they face similar business environments (transportation, raw materials sources, export market, etc.).

Potential participants were invited to participate by mail, phone, facsimile, and email. Follow up telephone calls, face to face meetings, and email were used to secure an interview appointment. Thirty five participants accepted the invitation and were involved in this study. The interviews were conducted at the participants' premises. All the interviewees were the manager; twelve participants were also the owner of the SME, while the rest reported directly to the owner. The managers were selected because in SMEs almost all decisions are made by the manager and they are often directly involved in the IT design and implementation. (Fink, 1998; Thong and Yap, 1996).

All the interviews conducted in Indonesian Language were recorded and transcribed. From the transcripts, a content analysis (Boyatzis, 1998; Neuendorf, 2002; Weber, 1985) was conducted to extract the factors influencing the manager's decision for IT adoption. Similar phrases and sentences spoken by the participants were grouped into categories and then a factor name was assigned for each group. From time to time the original recorded interviews were played to ensure the consistency of the data extracted.

FINDINGS AND DISCUSSION

From the list of more than 300 companies, 42 were unable to be contacted by any means. It is possible that the companies are already closed down or simply relocated without leaving contact details. Fourteen companies refused to be interviewed because either they did not use IT or the have stopped using IT. Further persuasion still did not change their mind. Thirty six companies accepted the invitations to participate and the rest of the companies on the list refused to participate with various reasons. In the end only 35 companies can be included since the 36th company did not fit into the definition of Indonesian SMEs.

Participants' responses were analysed by searching answer to the semi structured interview guide questions. The answers were grouped and mapped under a particular question. Further analysis was conducted to find any participants' account regarding their IT adoption experience. Once all the relevant responses were grouped, the similarity between components from model in figure 1 and 2 and respondents' experience was identified. The differences on factors affecting IT adoption between literature and Indonesian SMEs have been documented in

Sarosa and Underwood (2005). Essentially it confirmed the presence of influence of organisational components and organisation external stakeholders toward IT adoption process. The model of participants' IT adoption process experience can be seen in figure 3 - 5.

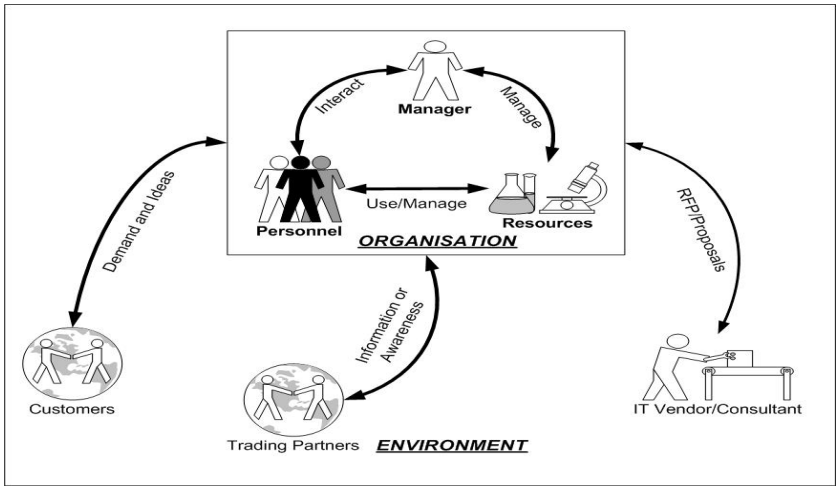

Figure 3: Decision stage of IT adoption by Indonesian SMEs

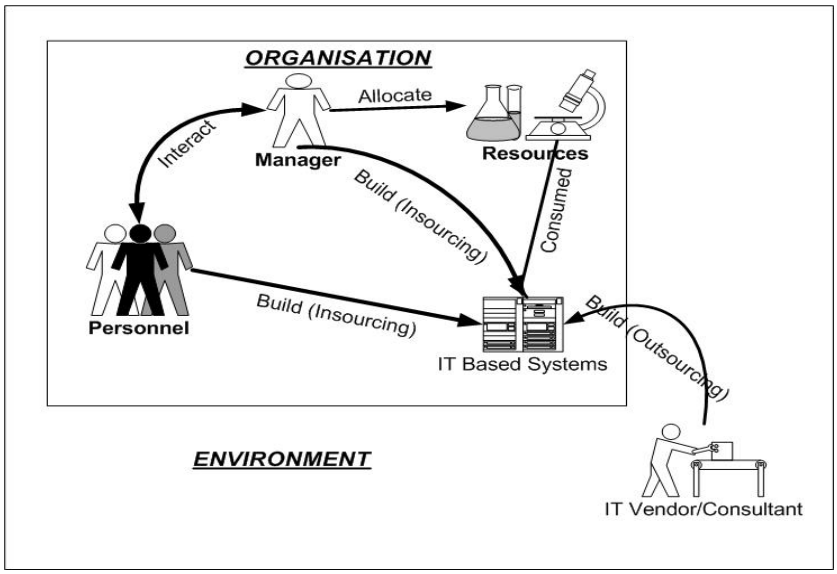

Figure 4: Implementation stage of IT adoption by Indonesian SMEs

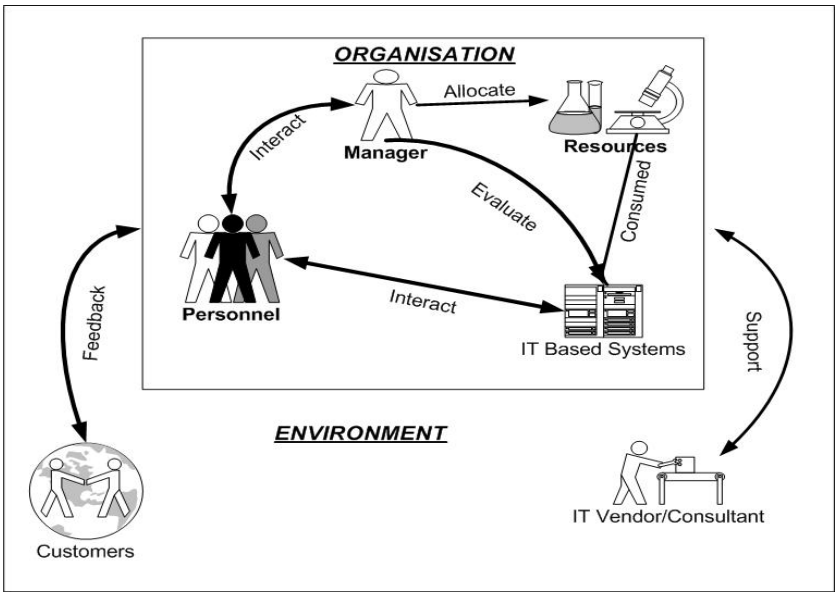

Figure 5: Evaluation stage of IT adoption by Indonesian SMEs

It is apparent from figure 3 to 5 that internally, Indonesian SMEs' IT adoption was influenced by elements that made up the organisation, which are individuals and organisational resources. With external elements, only those who have direct and tangible relationship with the organisation were influencing the IT adoption, namely customers, trading partners, and IT vendors or consultants. Government and competitors, on the other hand, did not seem to have any influences on the process. The process will be discussed in detail in the following section.

Decision stage

In the decision stage, the idea of IT adoption found to be originated from the manager, staff initiatives, pressure from customers, and advice from trading partners. Within organisation, the idea and the subsequent decision was made as a result of interaction between manager and staff. The interaction often appears as a process of discussion to reach a decision on IT adoption, although the final decision was made by the manager as expressed by the following two participants:

> *"…so basically the decision was predominantly from us with some input from staff who want computers for their job"*, Participant 24 (P24)

> *"We discussed and negotiated the requirements from each department and then I decided what to buy…"*, P18

Customers, especially international customers, often imposed email as the preferred communication method. Since most of the participants were export oriented companies, customers' wish becomes their command. It is also noted that some of the participants initiated the Internet technology adoption into their organisation in order to gain international customers. Either way, electronic communication with international customers often found to be a deciding factor for participants to adopt IT in the first place.

As noted in figure 3, government and competitors seemed to have no influence. In fact, government was not seen as an important factor considered for IT adoption. Most of the government initiatives were aimed mostly for SMEs in their early year of business, which included working capital, basic management training, and basic accounting training. Meanwhile, competitors did not appear to be a significant consideration for IT adoption. In other words, participants adopt IT to cope with their own business rather than to stay competitive.

Implementation stage

In implementation stage, participants had to put the IT in use. The activities involved in this stage, among others, were acquiring hardware and software, installation, customisation, and training. Software acquisition could be done through in house development or outsourcing. Only six participants developed the software in house, and the rest of them outsourced their software.

> *"I developed the production integration application myself along with the rest of IT staff…."* P6.

Mostly, the outsourced-software was in the form of Commercial Off-The-Shelf products (COTS). Within implementation stage, IT vendors and consultant were introduced into the adoption process by SMEs to assist with the technical implementation. IT vendors and consultant could be classified as trading partners in the decision stage model. However, since they have a special interaction with the organisation, they have been represented as a separate party in figure 3 and 4.

During the implementation, the role of IT vendors and consultant became more apparent as they were responsible for acquisition, installation, and training for the manager and staff to use the systems.

> *"The application was made in three weeks and then the programmer was visiting us daily to resolve any issues rose during the first week."* P11

Evaluation stage

In this stage, the manager would make an informal evaluation. There were no similarity found on the extent and depth of evaluation. Some participants were quiet happy to see that the application working, the others were looking further to the next improvement, and also there were participants who failed in their implementation stage and tried to figure out what went wrong and how to deal with the failure. There were two different reactions toward failure, one who acknowledge their failure and try to recover from it by using all the hardware and software investment for other functions and the other who just let the systems alone and kept the maintenance for self image reason (Sarosa and Zowghi, 2005)

During this stage, the staff would also give feedback and reaction. In one extreme case, the staff of P5 did not like the attendance record and inventory systems build by the manager at all and went straight to the owner. The owner agreed and asked the manager to terminate the systems. The manager considered resigning.

In general, except for P5, the overall reaction from the participants after the implementation was positive, they were pleased with the result. Some of the participants felt that they have dedicated enough time and resources to adopt IT and would not engage in any IT investment for foreseeable future.

> *"I won't invest in IT again, unless it is absolutely necessary."* P1

While other participants said that they were looking forward to developing new application to support their business.

> *"We would like to improve the inventory management by moving to computerised systems too"* R17

And one particular participant, P32, the manager was eager to learn the current trend in IT and then tried to implement it into his company.

> *"I have a habit to discuss the new IT trend with my suppliers at least once a year and see if I can use it here."* P32

In regards to iterative process, there was no apparent pattern of iterative process existence. Once decision was made it would flow through until the evaluation. There were evidences of evolutionary systems development approach within implementation stage, however it was part of iterative implementation process (and also systems development) rather than an iterative IT adoption process.

CONCLUSIONS

In majority of the research literature, the adoption and diffusion of IT was focused mostly on drivers and barriers factors. Less attention has been paid to the process of adoption (and therefore implementation). Furthermore, IT adoption is often seen only as acceptance of the innovation (which is the IT). The actual implementation and usage of the innovation idea is often overlooked.

Based on the Slappendel (1996) multi perspectives on innovation, a model of adoption innovation is proposed as in figure 1. The model acknowledges the influence and interaction within organisation (SMEs) and its environment. Based on Zaltman et.al. (1973), Damanpour (1987), and Damanpour and Evan (1984), we have argued that IT adoption is not only acceptance of the idea but also involves the implementation and evaluation. Our proposed model identified IT adoption within SMEs as 3 stage process, namely decision, implementation, and evaluation. The model also incorporates the multi perspective from Slappendel (1996) as in figure 2.

Field study involving 35 Indonesian SMEs within furniture and handicraft industry has been conducted to see if the model drawn from literature fit the reality. Semi structured interviews were used to collect participants' experience in IT adoption. Content analysis was used to identify patterns of IT adoption from the data. The

pattern was mapped to the model drawn from literature to see if it shows any differences in the participants' experience compared with the literature.

We conclude that although in general the process of IT adoption followed the literature model, the influence and interaction among the stakeholders are different. The most apparent is the absence of the influence from government and competitors at all three stages. Slappendel (1996) has already highlighted the indirect influence of government, yet the participants in this study did not show or were aware of it. Competitive pressure still has not been felt as an influence for IT adoption mostly due to the fact that the market share might be too high to create competition within the region studied.

In decision stage, the idea of IT adoption found to be originated mostly from the manager, staff initiatives, pressure from customers, and advice from trading partners. Within organisation, the idea and the subsequent decision was made as a result of interaction between manager and staff. The interaction often appears as a process of discussion to reach a decision on IT adoption. While in implementation stage, participants had to put the IT in use. The activities involved in this stage, among others, were acquiring hardware and software, installation, customisation, and training. In this stage, the manager would make an informal evaluation. The evaluation itself was often informal and ad hoc. Some of the participants who succeed already looked at the future improvement and development while others were quite content with the result. Participants who failed in their implementation stage tried to figure out what went wrong and how to deal with the failure either by retry the development or using the equipment for other purposes. There were also cases where the participants kept the failed systems for self image. It is also noted that manager is a central figure in all stages of IT adoption process. The manager seems to have made all the decision regarding IT adoption.

By understanding the IT adoption process, including which stakeholders influencing the process, Indonesian SMEs could be more prepared in adopting IT. They could make an informed decision based on their knowledge of their organisation condition, the availability external support, and customers' demand. Indonesian SMEs could anticipate and plan to resolve any conflicts that might arise during the IT adoption process.

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