

# READINESS FACTORS FOR AMT IMPLEMENTATION: A CONCEPTUAL STUDY

Hafini Suhana Ithnin<sup>a</sup>, Sitinor Wardatulaina Mohd. Yusof<sup>fb\*</sup>

<sup>ab</sup>Faculty of Technology Management and Technopreneurship,  
University Teknikal Malaysia Melaka, Melaka 75300, Malaysia

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of Journal of Technology Management and Technopreneurship

## ABSTRACT

*Nowadays the advanced manufacturing technology (AMT) becoming significant for large and small manufacturing companies operation. Especially for small and medium enterprise (SMEs) by implementing AMT it is a value added that will ensure them to sustain and competitive among rivals. However, most of the AMT implementers are failure to adapt with AMT due to lack of knowledge, skill and capital. The aim of this research is to recognize the readiness factors for SMEs in adopting the AMT in southern Malaysia. This research proposed a conceptual model for SMEs to highlight readiness factors before AMT implementation happen.*

**Keywords:** *Advanced manufacturing technology (AMT); small and medium enterprise (SMEs); readiness factor*

## 1. INTRODUCTION

The objective of this paper is to perform a conceptual framework for SMEs pointed in Malaysia to implement the advanced manufacturing technology focusing for readiness area which is initial process before implementation happen. Adopting of AMT is crucial for SMEs to bear in business field and be more profitable. AMT provides the solution for increasing the volume of product revenue. This accordance with AMT definition that defined as technologies that connected with application of mechanical, electronic, and computer- based systems to operate and control production (Koc & Bozdog 2009). It applied to be one of the key strategies for long term competitiveness. Implementing AMT required high knowledge and deep understanding about the organizational

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\* Corresponding author.

capabilities, technology accessibility and employees availability. Lacking of it will cause huge trouble. Some studies indicates that implementing AMT not fully give benefits to those firm which adopt it. Some may stick cause of the system capabilities (Small and Yasin 1997). Using the literature review techniques, various journals and articles are collected to endorse the data and support the framework.

### **1.1. Background of study**

SMEs playing significant role towards achieving sustainable economic growth in developing and developed countries. Some advanced economies have succeeded because SMEs form a fundamental part of the economy, comprising over 98% of total establishments and contributing to over 65% of employment as well as over 50% of the gross domestic product (SME Info, 2011). However, over half of small businesses fail within three years of starting (Reiss, 2006). Much evidence collected before stated that to increase the productivity level, SMEs need the technical skills and buying new technology, most of them reluctant and refuse to do so (Thomas et al, 2008). Focusing in manufacturing, most of them are desired to implement the technology but many projects are failed to meet the expectation (Hottenstein, et al, 1992). Same goes to manufacturing SMEs, they are struggle to implement the technology but most are based on intuition not the information that they can use during decision-making process (Koc and Bozdag, 2009). Implementations of AMT already happen in SMEs several years before. This happen because SMEs realize the important of AMT beneficial towards their firm's performance and profit in long term period. The used of AMT can be ease the electronics, mechanical as well as computer based system in term of control production and operation (Koc and Bozdag, 2009). Adopting the AMT in manufacturing industries give advantages for the production including for good handling and logistic and heavy production, make the process faster, cope with rapid change in demand and solve environment problems and long term health (Mannan and Khurana, 2012).

Although we can see many research conducting on barriers and challenges adopting AMT in SMEs but little attention has been paid to observe how ready the SMEs towards AMT implementation. The main purpose of this study is to understand more the readiness factors for implementing Advance Manufacturing Technology (AMT) in SME manufacturing within southern Malaysia. By assessing the readiness

factors for change, the clearly and defining gap that could exist between our own expectation and the real situation might be eliminating (Daniel et al, 2011). Assessing the readiness factors can serve as guidance for implementing AMT later. These drives to the following research questions: What are the readiness factors for implementing AMT within manufacturing? What are the perceived benefits of implementing AMT within Malaysia manufacturing SMEs?

## **2. LITERATURE REVIEW**

### **2.1. The concept of AMT readiness**

The factors that have been choose to examine the AMT readiness in manufacturing SMEs were review from different resources and theoretical. Several theory were utilized to make the technology readiness is suit with AMT implementation. It include technology readiness index (TRI) (Parasuraman, 2000; Ekonomisi and Say, 2014) and technology organization environment (TOE) (Xenos, 2006; Darbanhosseiniamirkhiz and Ismail, 2012). The TRI theory is suitable to test the people behaviour intention to embrace with new technology (Parasuraman, 2000). Meanwhile for TOE, it is to see the within the organization itself whether it influencing the readiness factors for implement the AMT. For this study, AMT readiness factors are classified into three categories which are people, organization and technology.

### **2.2. Advance Manufacturing Technology (AMT)**

AMT presenting the modern technology with wide variety of computer based system that mainly for improving manufacturing production. The existing of AMT has been introduced within the past two decade (Mannan and Khurana, 2012; Bessant, 1991). It can be seen as the important tools for manufacturing industries that facing the challenges in production process (Mannan and Khurana, 2012). The used of AMT can be facilitating the electronics, mechanical as well as computer based system in term of control production and operation (Koc and Bozdog, 2009). Adopting the AMT in manufacturing industries give advantages for the production including for good handling and logistic and heavy production, make the process faster, cope with rapid change in demand and solve environment problems and long term health (Mannan and Khurana, 2012). In a specific way, AMT include the technology such as computer-aided design (CAD), computer-integrated manufacturing

(CIM), flexible manufacturing cells/systems (FMC/FMS), computer-aided process planning (CAPP) and computer numerical control (CNC) machines that will help much in new comers to market , quick repond to customer demand and offer high quality of product and service (Small and Yasin, 1997).

### **2.3. Barriers of AMT implementation**

The beneficial and positive impact given by AMT performance have encourage organization to implement this such high technology as a key condition to compete with other competitors. SMEs are included to embrace this technology to increase high speed of productivity. But implementing AMT is not a simple solution. Many AMT implementers fail to achieve the goals and more tragic is they start to face many difficulties (Koc and Bozdag, 2009). The barriers of AMT implementing are always discussing in many study. The main barriers for SMEs to adopt AMT are lacking of financial and limited available resources (Koc and Bozdag, 2007). Other than that, SMEs are management resources, lack of long term strategy (Dangayach and Deshmukh, 2005), lack of technology, level of skills, flexible organizational structure and new of planning, managing and training made SMEs still in the same level (Rosnah et al, 2004).

Some of the SMEs companies are not concerned with the advantages and beneficial impact bring by AMT because of less capabilities available in organization cause of investment shortage (Thomas, et al, 2008). Instead of resources, planning is the main strategy to ensure the implementation success. Some other factors drive to the AMT failure are irregular preparation for AMT implementation, lacking of top management support, unskilled workers and less focus on long term planning for other consequences that may appear in AMT installation (Rahardjo and Yahya 2010). It starts from planning until implementing take place. Less concern about this strategy will guide to failure.

### **2.4. Readiness driver**

Regarding on several of literature reviews, some drivers are detected contribute to the readiness driver for AMT implementation namely people (Parasuraman, 2000), organizational and technology (Xenos, 2006; Darbanhosseiniamirkhiz and Ismail 2012). People factor is abstract from TRI theory which examine most for individual perception to embrace new technology include optimism, innovativeness, discomfort

and insecurity (Parasuraman, 2000). Two of these elements which are optimism and innovativeness captured positive attribution to the acceptance of new technology while discomfort and insecurity commit for negative or resist with adoption.

*Optimism - They believe that technology provided people flexibility, efficiency and increased control in their daily live*

*Innovativeness - Its liability towards leader characteristics and eager becoming a technology pioneer*

*Discomfort - A perceived lack of control over technology and a feeling of being overwhelmed by it*

*Insecurity - Distrust of technology and scepticism about its ability to work properly*

Study indicates that firm that able to develop the higher level of individual may achieve more benefit of AMT rather than other complement (Small and Yasin, 1997).

Other driver that important for AMT readiness factor is organizational. Organizational can be define as an authority of making decision, responsibility towards organizational roles and work procedures within the organization that been control by the organizational members (Teixeira, et al., 2012). Others definition is a group of chain that connect all the organization roles (Grossi et al., 2007). The other named of organizational can be called as authority structure, vertical differentiation as well as hierarchy (Grossi et al., 2007).

Under organizational factor it consists of three sub factors which are top management, organizational rules and organizational structure. Defining top management support clearly describe that the effort of technology implementation is promoted by the top management of the organization (Raymond & Croteau 2006). Management support which creating much effort is one of the significant factors for readiness of change (Susanto, 2008). While organization a rule is significant to filter all the activities that will enter and use within the organization. Rules in the organization are categorized as the political aspect within the firm itself. According to Johnson (1989) state that the organization is the political combination and the entire executive in side it are the political broker. Last sub factor is organizational structure which in organizational structure there are three main types that can be considered which are

centralized, decentralized and integrated. Centralized is a structure where as the authority of decision making is transferring to the higher level of organization (Moriya, F., 2011). Moreover, centralized also recognize when decision are mainly make only at one level of the firm as whole (Siggelkow and Levinthal, 2003).

Technology context refer to both internal and external technology that exist in organization and technology that already in marketplace but do not practice within the organization but relevant to the firm characteristics (Oliveira and Martins, 2011). The existing of technology will help the SME to speedy their production and ease some activities. Three main constructions will be discussed in these parts which are relative advantage compatibility and complexity. Compatibility refer Relative advantage can be relate as the level of improvement from the past technology that give an advantages and beneficial impact to the new application. The higher the degree of relative advantage the easier for new technologies are embedded into the organization. Compatibility refer to the innovation perceived is consistent with the existing technology, past experience and need of the receiver (Roger, 2003). In this research the compatibility is used to see whether the new technology implement is fit with the existing technology that has been adopted before. Complexity is the degree to which innovation is perceived to be relatively difficult to understand and use (Roger, 2003). Higher level of complexity will indicate the uncertainty of implementation successful.

## **2.5. AMT readiness in manufacturing SMEs**

Technology readiness can be referring as people's intention to adopt and make of use of technology proposing to achieve their work and life target (Parasuraman, 2000). This construct well be said as overall view of human mental that usually react as inhibitors that refuse to adopt with new technology.

Readiness can be happen when structure, environment and employees within organization are welcoming the new technology adopted in their organization (Holt, Armenakis and Feild, 2013). Besides that, readiness technology involving the entire organization includes horizontal and vertical level of workers. One of the advantage by considering readiness factors is we can observe the gab and closely the existing gab that might absent between the actual situation and early prediction (Holt, Armenakis and Feild, 2013). If these gaps are not covered in an initiation

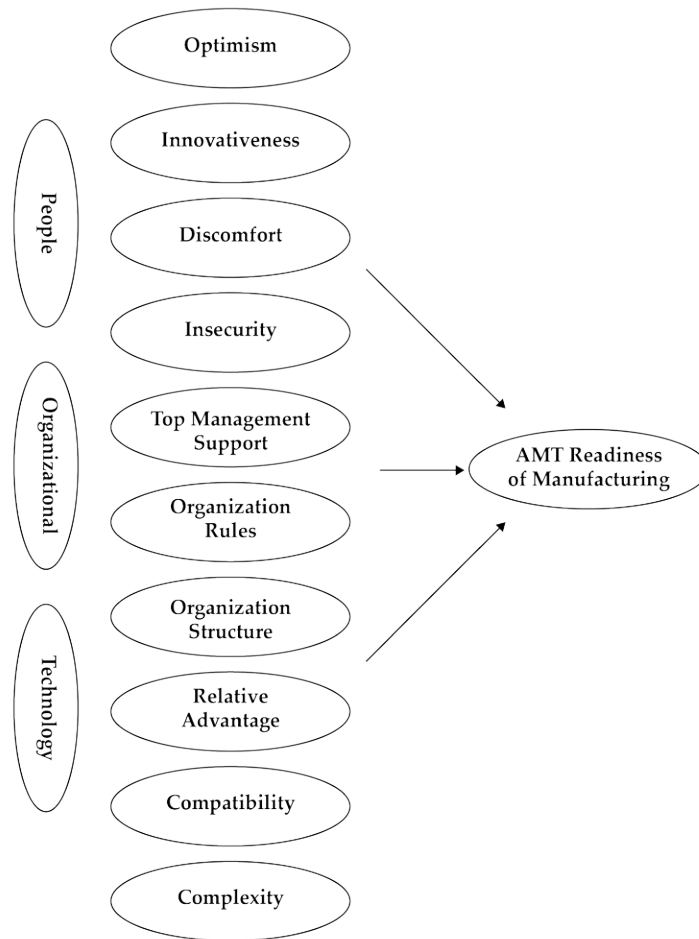
stage, that implementation is hard to happen and cause failure in the middle stage (Holt, Armenakis and Feild, 2013).

### **3. CONCEPTUAL FRAMEWORK**

This particular section discusses the research design and research methods which provide a foundation for the data collection process. This study will improve and advance research in AMT implementation areas in Malaysia by developing a new framework using new construct and methodology. Specifically, it aims to examine the readiness factors for manufacturing SMEs to adopt with AMT usage, which covers selected SMEs manufacturing sector in southern Malaysia. It also verifies the perceived benefits given by AMT while applying AMT in SMEs practices. To achieve this purpose, this study uses questions developed from previous literature and adapted by a few studies that relate to drivers of readiness factors in manufacturing SMEs that influence the AMT implementation.

After a rigorous review of the literature, it was found that scholars have suggested many readiness factors that drive SMEs manufacturing companies to adopt with AMT practices. The theory applies to readiness studies where believed to influence the AMT implementation. It is also predicted that other factors such as firm size, duration of practice and industry type can moderate the readiness of AMT implementation. The complexity of this relationship can be illustrated in the research framework in Figure 1.





**Figure 1:** Conceptual Framework for AMT Readiness Factors

The population of this study comprises of three region located in southern Malaysia which is Melaka, Negeri Sembilan and Johor. These three regions were chosen based on the contribution of high contribution of manufacturing industries located in there. The sample is selected using a stratified random sampling method according to industry. The respondents are drawing from different types of products by using this sampling method in order to gain a greater variance in the outcome.

The questionnaire is use as a primary data and method data collection. For more specific, the questionnaire will be distributed by postal, email and direct to the respondent. This questionnaire will be distributed among top management only. Questionnaire method is choosing to avoid bias among the data collected. For the secondary data include the



information gathering from various journals, articles, internet website and books.

All items in the questionnaires are develop by referring to previous literature. They are five-point Likert-scale questions. Data will be collected by post and e-mail, and the respondents should be able to answer the questions within 15 minutes. Data collected will be keyed into a computer for further analysis using SPSS 21.0. To see the relationship between independent variables and dependent variable multiple regression will be apply. To test which factor is more significant towards dependent variable correlation is used.

#### **4. CONCLUSION**

Implementing AMT within manufacturing SMEs is not a new issue in Malaysia. This contributes to benefits that AMT provided to the output of the production. However, risk of failure still there and always kill many implementers. Many studies had indicated the barriers that SMEs faced when they implement the AMT itself. This research will provide information for SMEs that newly and had intention to adapt with AMT whether they are well prepared and ready in term of individual and organizational readiness. Secondly, SMEs manufacturing also will acknowledge the perceived benefits that they might get when implementing AMT practices. Based on this framework also can help SMEs to well prepared to face with AMT challenges before and after SMEs implement the AMT. The level of failure even can be reduce and avoid if the SMEs understand the AMT risk and benefit. At the end of AMT practices, SMEs are able to accelerate the national economy. The next stage of this study aims to construct a data collection instrument to be tested and piloted with SMEs manufacturing organizations. Apart from theoretical and academic contributions, we hope that the proposed framework will be further validated to unveil their practical implications towards the industries explored.

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*Readiness Factors for AMT Implementation: A Conceptual Study*

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