

THE TECHNOLOGY STATUS OF MICRO-SCALE SME OF BUMIPUTERA IN KEDAH

Mazri Yaakob¹

¹*School of Technology Management and Logistics
Universiti Utara Malaysia*

Abstract

Technology and SMEs are related to each other. Technology contributes a substantial impact on an SME. For the micro-scale SMEs, ownership and use of technology deeply affects them. Technology in this study takes into account the component technology known as Technoware, Humanware, Infoware and Orgaware, as has been highlighted by the researchers. These components have its elements of its own. A total of 20 micro-scale from 51 Bumiputera SMEs in Kedah was the respondent and their data have been obtained from these directory: PKNK, FMM and SME Corp Malaysia. The data was analyzed using the approach of Analytic Hierarchy Process (AHP). Results show that micro-scale SMEs pay attention to the Orgaware, followed by Humanware, Infoware and Technoware.

Keywords: Technoware, Humanware, Infoware, Orgaware, SME, AHP

1. Introduction

The Small Medium Enterprise or commonly known as SME in Malaysia is rapidly growing. The development of SME has been supported mostly by the government of Malaysia through the involvement of governmental agencies such as Perbadanan Pembangunan Industri Kecil dan Sederhana (SMIDEC), Majlis Pembangunan PKS Kebangsaan (MPPK), Small and Medium Enterprise Bank (SME Bank) and etc. According to [1], presumably more than 12 government bureau and 40 agencies have been listed in the SME's development in Malaysia, including Kedah Regional Development Authority (KEDA) in the state of Kedah Darul Aman.

The need of the newest technology in SME is definitely undeniable by most of the SME owner. However, their funds limitation has inhibit the priority of technology [1]. The correct choice of product or service will lead to long and medium term effects to SME but it won't be efficient without any internal expertise.

The researchers [2], [3], [4], [5] and [6] defined the technology as four components that interacts to each other. These four components are; object embodied technology or *Technoware*, human embodied technology or *Humanware*, record embodied technology or *Infoware* and organization embodied technology or *Orgaware*. Each of these component has distinctive characters.

Moreover, [7] concluded that the distinctive characters of each components has not being exposed. Another approach in sensing the technology status is to understand the rating of these four components as claimed as [8]. According to [8], the evaluation of technology status in certain industries would help to achieve a better understanding thus enhance the plans in specific terms to strengthen the technology in that particular industry.

2. Objective and Scope of Research

Generally, the research objective is to measure and evaluate the current technology status of SME in Kedah. The objectives will be narrowed into making comparison of technology component perspectives (*Technoware, Humanware, Infoware* dan *Orgaware*) among micro, small and medium SME in Kedah. However, this article will only focus on the micro SME of Bumiputera in Kedah.

The study focused on the making industry and involves manager/owner of the SME management, that will also be referred as 'Research SME' further in this study. According to [9], the SME were expected to contribute a total number of 37 percent including five (5) percent to Gross Domestic Product (GDP) in 2010.

Moreover, the previous study by [10] reported that the value added of a firm is closely related to the level of the sophistication of four technology's components; *Technoware, Humanware, Infoware* dan *Orgaware* (THIO). Hence, a common criteria should be introduced to evaluate certain technology in order to increase the capability to choose the best technology for particular organization.

Despite that, [11] claimed that the understanding of the technology components is critical to face the global competition. Thus it is important for the organizations to define the technology owned by them.

Therefore, a study to identify the status or level of the technology of each organization should be done as a status investigation for the whole industry. Presumably, the result of the study will help the improvements by any organizations and industry in future.

3. The Definition of Technology and Its Component

The broad definition of technology includes knowledge and skills of products and the products making process. The technology can also be defined as a human integration, knowledge, tools and systems for the benefit of all mankind [12], [13], [14] and [15]. Figure 1 illustrates the relationship among the elements of technology, that exhibit the importance of skills to handle tools and systems via certain procedures and practices in order to generate new ideas [12].

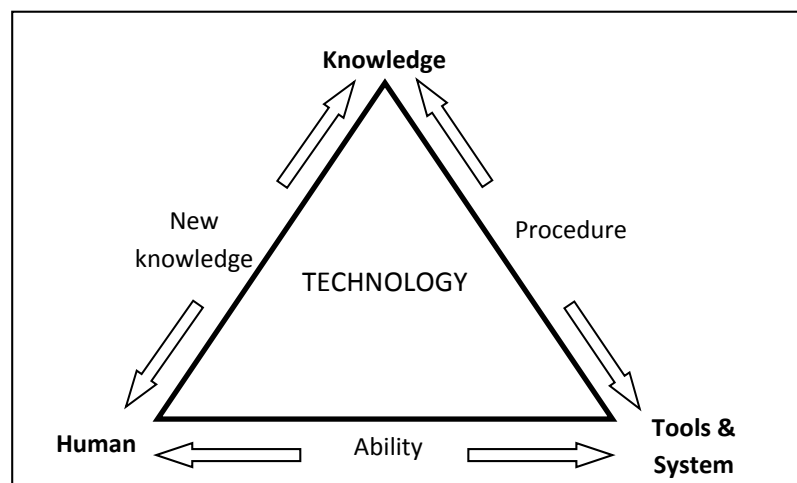


Fig. 1: Definition of technology

In the other hand, the definition of technology can be broadened into physical and cognitive perspectives to state the goal whether it is recorded or not. It can be valued through the ability of a function that determine the success of a organization. According to [13], [14] and [15], the technology is not bounded in only a physical form i.e. tools, machines and products but also includes skills, experience and knowledge.

The technology that has been used in this study include technical definition, goal oriented, contributes to the ability of function, stated in the process and derived from the same resource as other organizations. Thus, the technology can be presumed as the combination of four main basic components that relates in any transformation operation, as stated by [7]. These components are:

- i. Tools and facilities or known as *Technoware*
- ii. Expertise and experience or known as *Humanware*
- iii. Facts and information or known as *Infoware*
- iv. Organization and relation or also known as *Orgaware*

The study emphasizes the components of technology as stated by [7] as shown in Figure 2 as below:

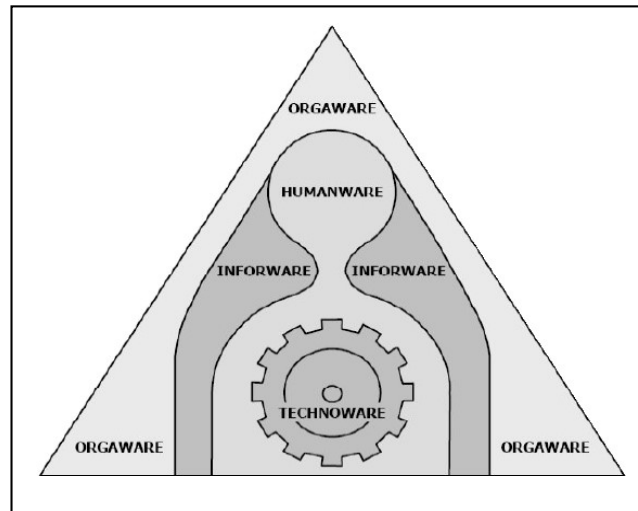


Fig. 2: The components of technology

Table 1 represents the categories of technology (THIO) by [10]. These categories has been referred in execution of this study.

Table 1: The category of technology’s components

Component	Category
<i>Technoware</i>	<i>manual facilities, powered facilities, general purpose facilities, specific purpose facilities, automatic facilities, computerized facilities and integrated facilities</i>
<i>Humanware</i>	<i>operating abilities, setting-up abilities, repairing abilities, reproducing abilities, adapting abilities, improving abilities and innovating abilities</i>
<i>Infoware</i>	<i>familiarizing facts, describing facts, specifying facts, utilizing facts, comprehending facts, generalizing facts and assessing facts</i>
<i>Orgaware</i>	<i>striving framework, tie-up framework, venturing framework, protecting framework, stabilizing framework, prospecting framework and leading framework</i>

3.1 The Analytical Hierarchy Process (AHP)

The factors that taken into the consideration in AHP to evaluate alternatives are arranged in a hierachy. AHP itself is a notorious method in problem solving. Through AHP, the pairwise comparison (pc) will be performed by the decision maker (DM) and the matric pairwise comparison (Mpc) will also be formed. Therefore the eigen vector will be counted to determine the weightage of each parameter in the problem. However, it is tougher to execute DM when facing more than one choice. The counted weightage finally will help the DM to decide the best alternative. In the other hand, AHP can also be used in in multi-criteria decision making in a particular focus group, as reported by [16] and [17]. Based on the results of the previous studies, AHP is a wide decision tehcniques and enable the DM to measure the consistency and stability of a decision that has been made [16], [17] and [18]. Moreover, AHP has

been proven as the determinants of the level of priority of an alternative [19]. It is also considered not only as the weightage of a factor but also the comparison integrity and the accuracy verifier [20].

[21] stated that AHP is a measurement theory that takes into account tangible and intangible factors. AHP is a flexible approach in combining the qualitative and quantitative aspects in a work frame regarding analytical [22]. Despite of that, [23] reported that AHP is rarely been used in maintainance. The AHP somehow, is widely used in bank’s decion making [24] and [25], in choosing the right model of a flexible manufacturing system [26] and [27], in the evaluation and selection of simulation software [28], in the supply chain that support the management of strategic logistics [29] in the problem solving i.e. organization strategic plan [30], evaluator of strategic alternative [31] and justification towards new manufacturing technology [32].

The study and research by [33] highlights a number of 33 specific studies that used AHP as their research methods. These includes five researchers in five (5) distinctive fields which are: location, performance, technology, strategy and operation.

4. Methodology

There are several steps in the process of collecting data;

i. Database

The information about SME can be obtained via SMIDEC, PKNK and FMM directories. These directories have been chosen based on their complete adn updated information.

ii. Population

The total number of population found is 1170. Prior observation of SME’s has been executed. As a result, most of non-Bumiputera owner were reluctant to cooperate. Thus, this study involved only Bumiputera in the manufacturing sector. Therefore, the cleaning or eliminitaion process has been done in order to create 1 number of 305 short-listed SME Bumiputera in manufacturing sector (refer Table 3).

iii. Sample size

The table framed by [34] is referred in determining the sample size from a population as a field study. According to [34], the sample size need for this study is around 169 SME.

iv. Sample selection

The sample selection derived from a random simple sampling method that allows each SME to get equal opportunity to be selected as a sample. According to [35], this method allows generalization by numbering the subjects listed. The subjects were chosen using the Random Number concept, generated from Microsoft Excel.

Table 3: The population and sample of research

Directory	Total SME in Kedah	Total Bumiputera SME in manufacturing *
SMIDEC	313	82
PKNK	647	200
FMM	110	23
Total	1170	305

*after elimination (roughly)

The observation continued with 38 owner/manager or those who involved in SME being interviewed. Hence, three form of research data have been obtained:

- a. Demographic data
- b. Quantitative and qualitative data
- c. Level of importance (questionnaire – Saaty method)

All these three data were obtained via structured interview and questionnaire that has been answered personally by research subject (with help and explanation by the researcher). The questionnaire form were distributed by mail and the information has been gathered through directories as stated above. The consideration has involved resources limitation, the possibility of incomplete answers and the total number of sample for research purposes using AHP. Thus, 150 questionnaire has been mailed and only 13 respondent returned the complete answers.

Therefore, the total number of samples obtained in this study was 51 respondent. According to [36] and [37], big amount of sample is not mandatory in AHP research. Furthermore, big sample size will cause arbitrary answers and triggers inconsistency [37] and [36]. The previous studies by [36] and [37] involved only eight (8) and nine (9) experts respectively to get critical success factor (CSF) in construction sectors.

The evaluation of the elements is to determine the most important emelent in the industry. The method introduced by Saaty plays a big role to find a relative weightage value for each elements as well as arranging the elements according to priority. First step of the Saaty method is shown in Figure 3.

A number of 24 elements has been categorized (start from T1-T7 for *Technoware*, H1-H3 for *Humanware*, I1-I7 for *Infoware* and lastly O1-O7 for *Orgaware*) as below:

- i) *Technoware*
 - T1: *manual facilities*
 - T2: *powered facilities*
 - T3: *general purpose facilities*
 - T4: *specific purpose facilities*
 - T5: *automated facilities*
 - T6: *computerized facilities*
 - T7: *integrated facilities*
- ii) *Humanware*
 - H1: *operating abilities*
 - H2: *setting-up abilities*
 - H3: *repairing, reproducing, adapting, improving and innovating abilities*
- iii) *Infoware*
 - I1: *familiarizing facts*
 - I2: *describing facts*
 - I3: *specifying facts*
 - I4: *utilizing facts*
 - I5: *comprehending facts*
 - I6: *generalizing facts*
 - I7: *assessing facts*

- iv) *Orgaware*
 - O1: *striving framework*
 - O2: *tie-up framework*
 - O3: *venturing framework*
 - O4: *protecting framework*
 - O5: *stabilizing framework*
 - O6: *prospecting framework*
 - O7: *leading framework*

Every research SME evaluate these elements according to the degree of importance using the scales above. The evaluation is to identify most important element based on the type of industry. The relative weightage value for each element and the arrangements based on the priority were achieved using Saaty method. The steps in Saaty method is as shown in Figure 3.

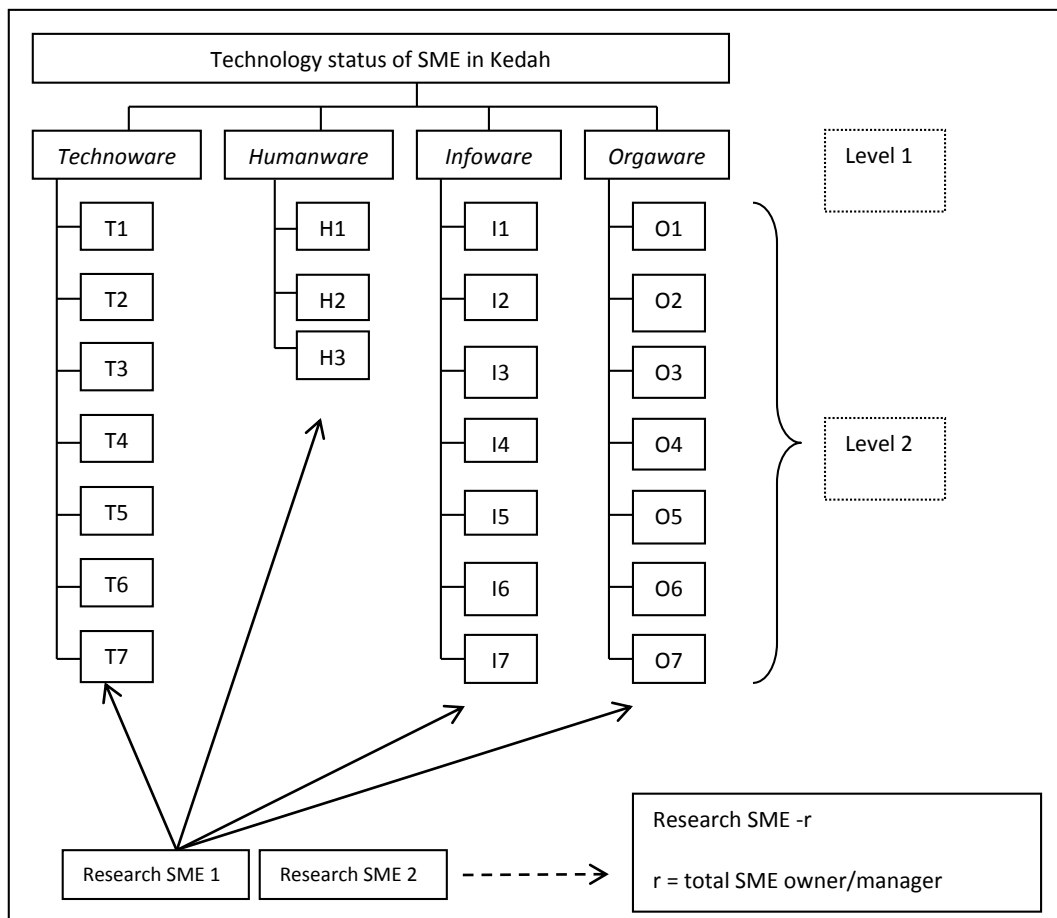


Fig. 3: Hierarchy structure

5. Analysis and Research Finding

The 'Research SME' stated that technology is closely related to sophisticated tools that is time saver and facilitate tasks towards manufacturing better products. The research subjects might not be aware of the four main elements included in this study.

From the research sample, the measurement of a weightage for each components of *Technoware* has been successfully obtained as shown in Table 4.

Table 4: The maximum, minimum and average value of a weightage for each of *Technoware* component in micro-scale SME

SME	Weightage value	Element						
		T1	T2	T3	T4	T5	T6	T7
Micro	Maximum	0.529	0.273	0.231	0.529	0.290	0.206	0.206
	Minimum	0.030	0.111	0.056	0.128	0.050	0.023	0.023
	Average	0.209	0.184	0.159	0.281	0.129	0.062	0.053

Based on the average value as shown in Table 4, the fourth element (T4) that is related to facilities for specific purposes such as loom has been given more attention by micro-scale industry. However, the facilities for specific purposes must be fully controlled by the worker or operator. The first *Technoware* element (T1), the fully manual operated facilities i.e. screwdriver etc has also been given equal attention as the fourth element (T4). Meanwhile, the least elements used are consists of integrated facilities such as robot with almost zero man's contribution (T7) and computerized facilities (T6). The use of each of other elements in the table has also been scattered equally. Hence, the most important element in micro-scale industry is the facilities for specific purposes.

From the research sample, the measurement of a weightage for each components of *Humanware* has been successfully obtained as shown in Table 5.

Table 5: The maximum, minimum and average value of a weightage for each of *Humanware* component in micro-scale SME

SME	Weightage value	Element		
		H1	H2	H3
Micro	Maximum	0.818	0.474	0.500
	Minimum	0.056	0.091	0.053
	Average	0.544	0.293	0.163

Based on the average value in Table 5, the first elements of Humanware (H1) that involves skilled and semi skilled labor is the highest value among micro-scale industry, followed by H2 (skilled labor and technician). Meanwhile, the value for H3 which consists of experts is not as high as H1 and H2 and rarely used in the micro-scale industry. Therefore, it can be concluded that the most significant element in the micro-scale industry eliminates the need for high skilled labor.

From the research sample, the measurement of a weightage for each components of *Infoware* has been successfully obtained as shown in Table 6.

Table 6: The maximum, minimum and average value of a weightage for each of *Infoware* component in micro-scale SME

SME	Weightage value	Element						
		I1	I2	I3	I4	I5	I6	I7
Micro	Maximum	0.167	0.300	0.182	0.227	0.250	0.250	0.184
	Minimum	0.067	0.105	0.028	0.028	0.033	0.105	0.045
	Average	0.124	0.161	0.137	0.154	0.144	0.174	0.108

Based on the average value as shown in Table 6, the involvement of all elements are almost equal. However, more attention has been given to the sixth element (I6) that use facts to improve the planning and facility i.e. R&D about product and process expansion.

From the research sample, the measurement of a weightage for each components of *Orgaware* has been successfully obtained as shown in Table 7.

Table 7: The maximum, minimum and average value of a weightage for each of *Orgaware* component in micro-scale SME

SME	Weightage value	Element						
		O1	O2	O3	O4	O5	O6	O7
Micro	Maximum	0.346	0.109	0.216	0.237	0.237	0.237	0.304
	Minimum	0.053	0.024	0.079	0.109	0.115	0.132	0.033
	Average	0.191	0.062	0.145	0.155	0.164	0.181	0.126

Based on the average value, the Table 7 above concludes that micro-scale industry meet the criteria of a small industry that operated with small capital and less workforce (O1). The micro-scale industry were also market their own product and has not become sub-contractor to any bigger industry, as resulted from the second element (O2). In general, the micro-scale industry is continually improving the market of their product, as shown by other *Orgaware* elements.

The maximum, medium and minimum average value is critical to determine the users tendency in the micro-scale SME. Table 8 showed the value obtained for each tehcnology component.

Table 8: The maximum, minimum and average value of a weightage for each of component of technology in micro-scale SME

SME	Weightage value	Component of technology			
		<i>Technoware</i>	<i>Humanware</i>	<i>Infoware</i>	<i>Orgaware</i>
Micro	Maximum	0.250	0.422	0.369	0.689
	Minimum	0.101	0.070	0.066	0.234
	Average	0.204	0.218	0.217	0.359

There are significant differences between these three categories as shown above. The micro-scale SME emphasis the *Orgaware* components, followed by *Humanware*, *Infoware* and *Technoware*.

6. Conclusion and Recommendation

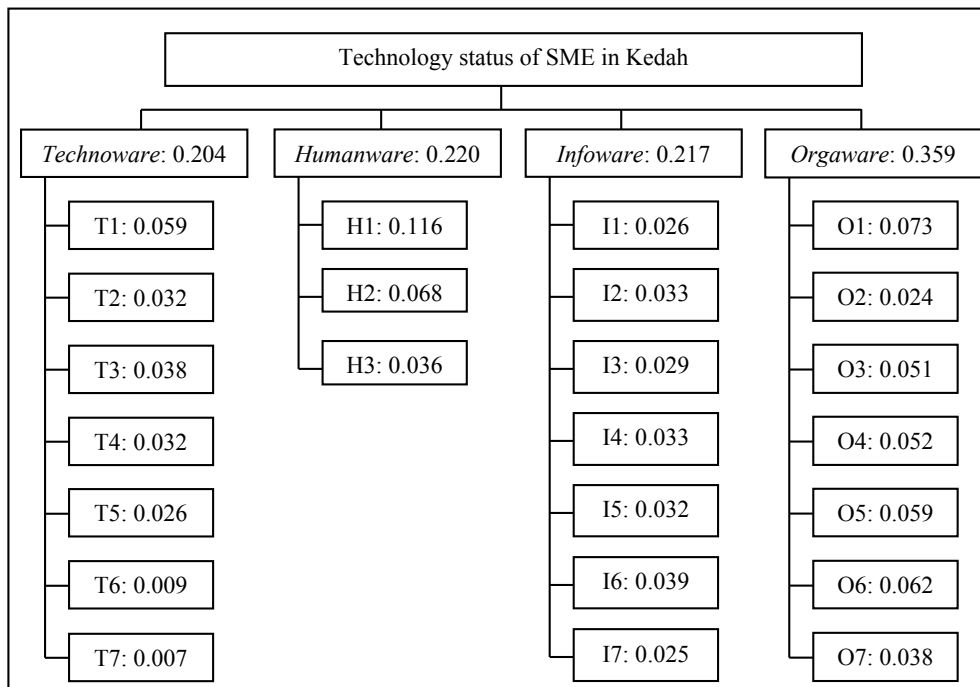


Fig. 4: Hierarchy for micro-scale SME

The hierarchy in Figure 4 conveys that the micro-scale SME focused on *Orgaware* and followed by the other three technology components, proved that SME newcomer should oblige more efficient in their management system, especially in marketing and organization structures (*Orgaware*). The micro-scale

SME will absolutely in a need of great workforce to manage the industry (*Humanware*). Furthermore, any information should be acquired via *Infoware* to ensure operational consistency while *Technoware* that emphasis facilities is also a mandatory component in an industry.

However, there are inevitable limitations for the micro-scale SME i.e. small capital whereas most of the micro-scale SME owners cannot afford sophisticated technology. As a result, they used alternatives such as traditional or manual tools. Thus, it is strongly suggested that they could apply some sort of technology in their strategically approach such as electronic marketing in global competition.

The terminology like E-business, E-marketing and E-commerce represents identical meaning in the industry. Generally, these three terms refers to the internet utilization in developing industry. Internet could increase marketing efficiency as well as providing chances and opportunities [38]. Previous study by [39] revealed that IT utilization enhance the efficiency, functions and the ability of an organization to face rivalry. Furthermore, [1] reported that current study in China stated that IT consumption contributes about 38 percent of productivity and 21 percent of GDP.

As a conclusion, internet utilization as a rivalry strategy is the right option for SME. However, the application of the internet should stress the development of technology components, THIO. For example, the internet application must operate through computer equipments (*Technoware*), skills to manage a company's website (*Humanware*), knowledge and information about marketing strategy (*Infoware*) and capital management etc via *Orgaware*.

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