Technology Implementation Barriers of Malaysian Herbal Industry: A Case Study in Northern Malaysia

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Abstract: Technology is an essential component in all organization. And most organizations have a reason to implement the new technology. The most fundamental justification for technology implementation is the technology must contribute to strong competitive advantages and also must increase or create long-term profit. However, in most small and medium enterprises (SMEs), there are barriers or obstacles in implementing these technologies. This paper reports the qualitative study aimed in investigating barriers facing by Malaysian herbal industry in implementing technologies in their business. Most of local herbal manufacturing firms are categorized as SMEs which usually considered to be lagged behind larger companies in technology usage. As this is an exploratory research, case study method is used as it gave us the in depth exploration in order to develop and understand the importance of the identified variables. Our qualitative results suggest that the main constraints in implementing technologies are lack of technical specialist and capital, and also internal managerial problems.

Keywords: Technology implementation, herbal industry, technology barrier.

1. INTRODUCTION

The trend of going back to nature is gaining popularity in Malaysia. Demand for natural health supplements increases over the years. The market for traditional medicines and other health foods, such as herbs, foods and beverages are estimated to be worth RM4.55 billion with an annual growth rate of 15 to 20 percent (Abd. Aziz, 2003). However, the local production is still very low and the herbal industry is still in its infancy stage (Pharmabiz, 2004).

In today's competitive market, local herbal manufacturing companies can no longer hope to compete on price alone but must now be faster, better and as well cheaper from competitors. In order to compete, technology implementation is undoubtedly one of the important elements to be considered. Despite the fact that technology implementation closely related to gain productivity, slash production errors and boost profits, yet not many companies use technologies extensively (Baldwin et al, 2002, and Sabourin, 1999). There are a lots of barriers and problems that hindered these companies to implements technology which is mostly perceived as too expensive and lack of expertise (Estrin et al, 2003).

This paper focuses on the obstacles faced by the Malaysia herbal manufacturing companies in implementing the technology. It also highlights the extent of technology utilisation of Malaysian herbal manufacturing companies. It also highlights the. This research is based on an in depth case study of three selected local traditional medicines manufacturers. The responses were recorded during comprehensive interviews with top management and during company site visits. The interview information was tabulated and results are presented.

1.1 Background of the herbal industry in Malaysia

There is a growing trend of Malaysian moving from synthetic allopathic drugs to herbal cures. At present the domestic market of herbal and natural products is currently estimated to be worth RM4.55 billion with an annual growth rate of 15 to 20 percent (Abd. Aziz, 2003; Industry Canada, 2002). Abd. Aziz (2003) mentions that the key driving forces for the growth of the global herbal industry in Malaysia include; changes in lifestyle, the growing emphasis on health and the growing cost of synthetic medicines. Despite of its huge potential, the local production of herbal industry in Malaysia is still very low and is still in its infancy stage (Industry Canada, 2004; Pharmabiz, 2004). And Malaysia is still highly dependent on its imports of health supplements especially from US, which the brands are well accepted and perceived to be high quality.

For food and pharmaceutical industries such as herbal manufacturing companies, the manufacturer policies and quality assurance or quality assessment protocol must strictly adhere to the Good Manufacturing Practices (GMP) guidelines which set forth by National Pharmaceutical Control Bureau, Ministry of Health Malaysia and conform to standards of World Health Organisation (WHO) (Kementerian Kesihatan Malaysia, 2003). GMP is a set of important elements that established an effective and systematic working environment. A plant layout must meet GMP requirements in order to avoid any risks of contamination to end products. The manufacturing facility must be designed specifically to manufacture products from the receipts of raw materials to the final shipping of the end products. For companies which applied GMP, the manufacturing facility should have the specifics areas allocated for the production process such as specific receiving and quarantine area; warehouse for the storage of raw materials; quality control laboratory; separate pharmacy for blending and formulating of products; staging area for the holding material in the middle of production; specific production area for the various manufacturing processes including forming tablets, encapsulation, powders and liquids; and labeling and packaging.

Unfortunately, poor manufacturing process technology could limit the development of herbal industry. The local herbal industry usually perceived as traditionally or manually processed. In order to break away from this perception, the herbal manufacturers need to be more proactive. They must find and utilize technology that can improve the product quality in order to penetrate overseas market especially Europe, USA and Japan which have stringent regulation on foods and herbal products (NST Quarterly, 1998).

1.2 Technology implementation

In order to maintain or achieve competitive and profitability, a manufacturing firms or enterprise must respond to a range of challenges, including rapid improvements in technology, declining employment and output, globalization of markets and environmental requirements (Kennedy and Hyland, 2003). New technologies can build new production capabilities and competencies that enable the firm to adapt quickly to changing opportunities (Krajewski and Ritzman, 1998).

In technology implementation, there are three components involve in the implementation process; (a) develop an intricate understanding of the technology, (b) understand the development process of the new technology by studying how other organization use the technology, and (c) adaptation of the selected technologies, products, process and system to meet the specific needs of the organization. In order to ensure successful implementation, the success factors include firm’s absorptive capacity, communication skills, managing expectation, managing risk and general wisdom (Rouse, 2000).

The implementation of technology brings about many benefits. The most important benefits are reduce cycle time, market share growth, increase or create long term profit, improving productivity, reduce costs,

improve product quality, reduced labour and increased product/process flexibility (Swamidass and Kotha (1998), Rouse (2000), Ghobadian et al (2000), Zhao and Co (1997), and Sabourin and Beckstead (1999)).

1.3 Barriers in technology implementation

However, according to Kennedy and Hyland (2003), the small firms especially will continue to struggle to compete to large companies, and they either unwilling or unable to invest in improvement programs and activities and new technology as a result of lack of financial resources, business experience and knowledge, and human resources. Moreover, these small to medium-sized enterprises (SMEs) feel forced to apply these technologies due to pressure from government, associated companies and customers. Rhouse (2000), Walker et al (2003), and Sabourin and Beckstead (1999) report that the main factors that hindered a manufacturing company to implement new technologies despite of the benefits are high equipment cost, cost of capital, lack of skilled workers, management resistance to new technology, lack of adequate technical support, and low number of adequately trained managers to deal with technology-related decision.

For manufacturing companies in newly industrialized countries (NIC), Zhao and Co (1997) and Nouri (1997) state the reason of low technology uptakes in these countries are due to barrier in the transfer of technology, lower wage rate, size of firm and paradigm of competition.

As far as Malaysian herbal industry concern, there are few researches have been done in the technology implementation area. Most of studies been done in other industries such as automotives and electronics. Generally, the manufacturing technology in local herbal industry is perceived as traditional and low technology. In 1998, it is reported that the production system in Malaysian herbal industry is at low level compared to other industries (NST Quarterly, 1998). And until today very few researches have been done to investigate what are the barriers faced by the herbal manufacturing firms in implementing technology.

2. METHODOLOGY

This research is an exploratory, the used qualitative methods were used because the issue on technology implementation in local herbal industry is hardly written by scholars. By exploring the topic, the researchers expect to formulate more precise questions which future research can answer. Case study method gave the authors the in depth necessary so that the variables are not only could be identified, but also developed and understood the importance of the identified variables (Eisenhart, 1989). The methodology for this research was done as suggested by Yin (1994). Figure 1 shows briefly the case study methodology recommended by Yin.

2.1. Sample selection

The primary goals of the research were to identify the level of technology utilisation in herbal industry and also the obstacles face by the industry in implementing the technologies. Even though there are many researches have been done in technology implementation especially advanced manufacturing technology (AMT) of other manufacturing industries, but very few investigation has been done in herbal industry. Currently we are not sure of the technology level in the industry and the technology usage if compared to other industries such as pharmaceutical, automobile and electronics. Therefore, in order to identify and understand the extent of technology application in herbal industry, three herbal firms from Northern Malaysia; NXD, APH and TAMF were selected from SMIDEC company lists. All of these firms were categorized as SMEs with the companies' turnover do not exceed RM25 million annually and the number of employees are less than 150 full time employees (SMIDEC, 2004). Even though DXN has more than 150 full time employees, yet the researchers categorized it as medium enterprise due to its company's

annual turnover which is below RM25 million. These three firms were chosen for their number of full time employees and the company's age.

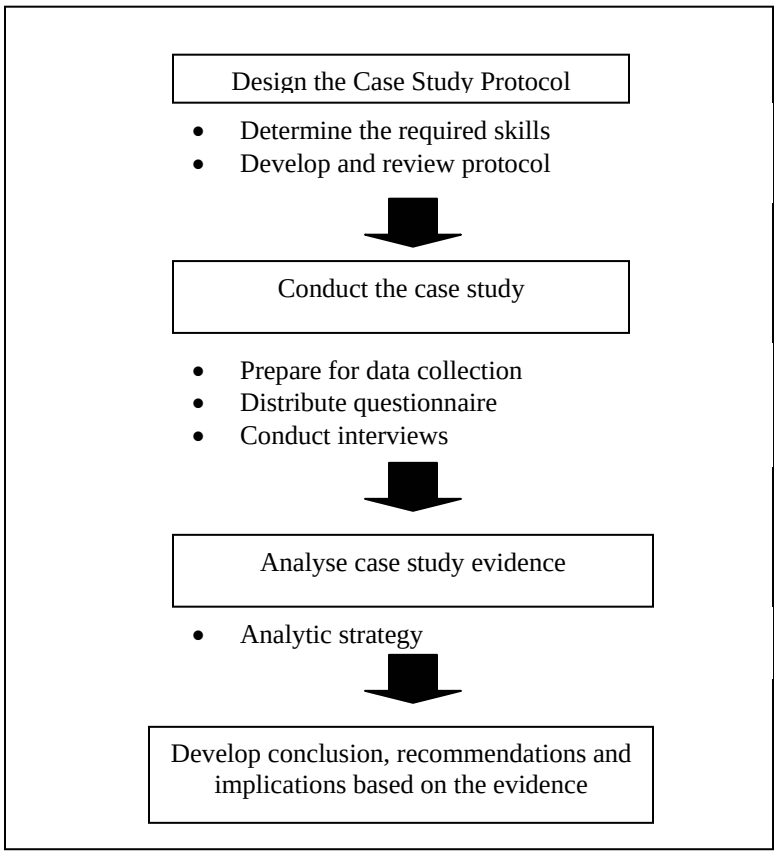

Figure 1: Case Study Methodology by Robert Yin (1994).

2.2. Data collection

The data came from two sources: semi-structured interviews and observation. For semi-structured interviews, we used an interview protocol at all the plants (see Appendix A). This interview protocol is a replication of questionnaires adapted and modified from Sabourin and Beckstead (1999), which have done a research on the advanced manufacturing technology (AMT) adoption in Canadian manufacturing covering a wide range of manufacturing industries. The interview protocol was concerning the firms' use of technology and the obstacles faced by these companies in applying advanced manufacturing technology. The same questions were asked to different interviewees for triangulation purposes (Tellis, 1997). The interviews were conducted with the top management of the selected companies. The average interview time in each plant was one hour. As was recommended by Yin (1994), the open-ended interviews were used to expand the depth of data gathering and to increase the number of sources of information. The need for triangulation arises from the ethical need to confirm the validity of the process. The interview subjects are questioned with regard to their actual experiences. And for consistency in the data and its interpretation, the interview structure was provided.

A plant tour was requested and offered at all companies visited except NXD. During the tour, the process flow of the main products and its machineries used in the production floor were showed and explained in detail. Whenever possible, the observation was made on what type of technology been used in the company and the obstacles faced by the company in implementing the technology that was currently used

and also in the near future. The information gathered was written down in a log book with the summary from the interviews. The purpose of these observations was primarily to verify the information collected from interviews.

2.3. Interview protocol

An essential process in qualitative research is recording data. An interview protocol is a form designed by the researcher that contains instructions for the process of the interview, the questions to be asked and space to take notes on responses from the interviewee (Creswell, 2002). Yin (1994) asserted that the development of rules and procedures contained in the protocol enhance the reliability of the case study research. Recommended by Yin (1994), interview protocol should include the following sections:

- An overview of the case study project – include project objectives, case study issues and presentations about the topic under study.
- Field procedures – reminders about procedures, credentials for access of data sources, location of those sources.
- Case study questions – the questions to be asked.
- A guide for the case study report – the outline and format for the report.

As for the interview protocol, the sections which are relevant to the scope of the study were chosen. The items included in the protocol were company background; technologies used (currently and plan to use-within three years); development and implementation of technologies; results of technology implementation and obstacles of implementation.

2.4. Data analysis

As suggested by Yin (1994), data analysis consists of examining, categorizing and tabulating in order to address the initial proposition of a study. First, the primary researcher transcribed the field notes, and then edited and checked by second researcher as soon as possible after the visit. In a case study research, reliability deals with the ability of a different researcher to reach the same conclusions if they did the same case studies. To help ensure the reliability, it is suggested that the research follows an established protocol and the data was categorized and tabulated for formal case study database. The primary reason was to ensure the analysis relied on all the relevant evidence, it address the most significant aspect of the case study and ease of understanding for further analysis (Yin, 1994).

3. RESULTS AND DISCUSSION

3.1 Company profiles

In order to give some background to the 3 herbal manufacturing companies, Table 1 are provided to show the significant of the companies' selection.

	NXD	**APH**	**TAMF**
Age of the company	10	6	69
Ownership	Local	Local	Local
Location	Kedah	Perlis	Penang
No. of employment	500	110	6 3
Markets	Malaysia, India,	Malaysia,	Malaysia, Hong

	Philippines, Indonesia, China	Indonesia, Thailand	Kong, South-East Asia countries
Future markets	Europe USA	Singapura Brunei	China
No. of products	49	51	25
Main products	5	10	3

Table 1: Herbal Manufacturing Companies Profiles.

As can be seen in Table 1, all the selected companies are locally owned. TAMF is known as the oldest and largest herbal manufacturing company in Malaysia while APH can be said as a new entrant in Malaysian herbal industry. In number of employment, NXD seems to have the highest number of workers, 500 compares to APH, 110 workers and TAMF, only 63 workers. All the companies market their products locally and also overseas. These companies have a series of herbal products which are made of 100 percent natural and organic cultivated raw materials except for TAMF also produced over-the-counter (OTC) products. These herbal products include health food supplement, food and beverages, personal care, household products, and skin care and cosmetics.

3.2 Technology application

In relation of technology usage, Table 2 shows the result of types of technology use in the company, which show the current technologies available in the company and also the future technologies that are in the company's strategies and planning for the next three years. There are 14 technologies listed, which belong to three functional technology groups:

a) Process technology - focus on the process related aspects in manufacturing; use on the shop floor.
b) Integration and control - control and monitor the material flow from raw material to the delivery of finished products.
c) Network communication

The current technologies used in most of the herbal manufacturing companies are Programmable Logic Control (PLC) machines, automated sensor-based systems used for inspection and automated packaging (bottling and encapsulation). And for the next three years, most companies are planning to uptake the following technologies; part identification for manufacturing automation (i.e. bar coding), automated vision-based systems used for inspection, use of inspection data in manufacturing control and local area network (LAN) for production

From the interviews and observations done, the level of technology in all three herbal manufacturing companies is mostly semi-automated. None of the respondents has achieved advanced manufacturing technology (AMT). Even though, these companies use more medium-level technology due to lack of necessary infrastructure and skilled personnel, however they are able to meet local and overseas markets.

By utilizing the appropriate level of technology will results in better use of labour resources and better production efficiency especially for manufacturing firms from developing countries (Khalil, 2000). Consistent with Nouri (1997), the technology level in Malaysian manufacturing firms are at their maturity stage. This also is applicable to local herbal manufacturing. One of the main reasons of less sophisticated technology applied by companies is the low labour cost (Nouri, 1997; Zhao and Co, 1997). Due to these low cost but high motivated workforce, often it makes the economic justification of automation in newly industrialized countries difficult.

	NXD		APH		TAMF	
	C*	F**	C	F	C	F
Process technology Programmable Logic Control (PLC) machines		✓	✓		✓	
Part identification for manufacturing automation (e.g. bar coding)	✓	✓		✓	✓	
Automated vision-based systems used for inspection/testing of inputs and/or final products		✓		✓		
Other automated sensor-based systems used for inspection/testing of inputs and/or final products	✓	✓		✓	✓	
Packaging: • Encapsulation • Bottling	✓ ✓	✓ ✓	✓		✓ ✓	
Integration and control						
Material Requirement Planning (MRP)	✓	✓				
Manufacturing resource Planning (MRP II)/ Enterprise Resource Planning (ERP)	✓	✓				
Computers used for control on the factory floor		✓				
Use of inspection data in manufacturing control	✓	✓		✓		
JIT			✓			
Network communication						
Local area network (LAN) for engineering and/or production	✓	✓		✓		
Company-wide computer networks (including Intranet)		✓			✓	
Inter-computer networks (including Extranet and EDI)		✓				
Internet (website, etc)	✓		✓			

Table 2: Current and future technology use.

* C = Currently use

** F = Future planning within 3 years

The finding of low technology uptakes by the interviewed companies also consistent with Swamidass and Kotha (1998) findings which found positive relationship between size of firms and the level of applied technology especially advanced manufacturing technology (AMT). The investigation shows that small plants are lagged behind than larger plants in technology usage.

3.3 Barriers in technology implementation

Despite the fact that the benefits of technology implementation are high, yet there may be significant enough to a firm to feel reluctant or unable to invest in improvement programs and activities, and also new technology especially SMEs (Kennedy and Hyland, 2003). As for NXD, APH and TAMF, even though, these companies are very ambitious in their future plans and strategies, somehow they have to admit the barriers that hindered them from applying the technology they wish to apply. The main obstacles mentioned by the interviewees were financial constraints due to costly and expensive equipments and outside technical support, and also insufficient skilled labour to improve the companies' processes and systems.

Financial supports seem to be the critical barriers in implementing new technology in these herbal manufacturing companies. As all the companies correspond are categorized as small and medium enterprises (SMEs), financial is a major issue. As mentioned by Kennedy and Hyland (2003), smaller firms usually lack of financial and human resources which resulting in lower levels of adoption of more costly technologies.

Expensive technical supports also hindered these companies in acquiring high and advanced technology. As these companies lack of employees with the experiences and necessary skills to implement some new technologies, technical support is very important. However, due to costly consultations and maintenance services, some how these companies had to postpone or reject the ideas of new technology for the companies' processes and systems. As a result, these companies are very dependent on the staff knowledge and experiences which will limits the technology implementation. Quoted by APH's R&D Manager:
"At the moment, we get the advice and ideas from our experienced Production Manager and technicians. The outside consultations are too expensive and we can't afford it."

Other than technical support, management supports are also crucial in technology implementation (Estrin et al, 2003). SME managers know their products, markets and customers, and often the ones who make the choice in technology implementation. As revealed by TAMF's Quality Assurance Manager, at the moment, the company has no immediate technology implementation plan due to the management problems. All the planning and new ideas are being kept aside until the problem solved. This statement shows that problems in management level will very much effected technology implementation choices.

From the interviews, GMP guidelines are also another obstacle faced by the respondents. In order to abide the GMP guidelines, each production process must have its own area that is separated from each other to prevent product contamination or cross contamination. However, the current practice in all the responding firms was manual handling, for example boxes and bins of finish and semi-finished products were transferred by trolleys.

4. CONCLUSION

Generally, all the herbal manufacturing companies interviewed believe of the positive impact of technologies in their business especially in productivity and product quality, and continue to improve the firms' processes and systems. However, with all the constraints and obstacles in implementing a fully integrated advanced technology, the aim of achieving the technology level is still a long way to go. Among the major constraints are lack of financial and human resources, and management supports that limit the success in advanced technology implementation.

Almost all the responding companies were strongly agreed to the benefits in applying advanced technology. Before making any technology investment, NXD, TAMF and APH considered several constraints. The main restrictions were (a) financial and human resources; (b) management internal problems as most of the business are family businesses; (c) low wage rate that make hiring more workers seems more favorable than investing on high technology machines or equipments; and (d) GMP guidelines.

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