

## AN EMPIRICAL STUDY ON CSFs FOR PRE-DEVELOPMENT PROCESSES IMPLEMENTATION AT SMEs IN MALAYSIA

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### Graphical abstract



### Abstract

New product development processes and product innovation in manufacturing organization is promoting an environment of competitive advantage for organization that can make adequate use of the processes. However, Malaysian SMEs is facing with huge obstacles in implementing various product innovation activities particularly the pre-development processes due to scarce financial resources, manpower, knowledge, and expertise. In fact, the previous research result shows that more focus were given to the discussing about critical success factor for pre-development process implementation in large organizations compared with SMEs. In reality, SMEs having different characteristics compared with large organizations. Primarily, this study is performed, to identify the critical factors which are able to increase the successful implementation of pre-development in SMEs. In achieving the research objective, Delphi techniques have been used for confirmation to identify critical factors based on previous literatures, whether those factors are suitable with the characteristics and surrounding nature of SMEs. The survey form were sent to 35 respondents whose expertise are in the field of pre-development process. However, the researcher managed to interview 20 expert panels. The result of the research showed that top management factor, team leaders and members of the team were the main contributors leading the successfulness of the pre-development process in the SMEs organization worthwhile training program factor's effect is low.

Keywords: Pre-Development, critical successful factors, Malaysian SMEs, Delphi techniques

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### 1.0 INTRODUCTION

Manufacturing organization should consistently produce new products continuously to be a market player in an aggressive and competitive market [1].

All development activities and production by manufacturing organization at the radical level as well as product re-designation are known as new product development (NPD) [2]. Some researchers such as [3] agreed that the successfulness of the

manufacturing organization in the new product development activities were influenced by the effectiveness of the early phase implementation in the NPD process which was known as pre-development process.

With the rapid changes in the business market situation, the implementation of effective pre-development process is very challenging to the manufacturing organizations in SMEs category. Those challenges emerged from the increasing global competition among the domestic organization and international based, technology enhancement, decreasing product life cycle, and uncertainty in customer demand [4]. A production organization and manufacturing are classified as SMEs when employed fulltime employees between 5-150 peoples or achieving annual sales less than RM25 millions [5]. SMEs performed at the minimum low level in producing innovative new product processes [6]. Such statement supported from the result of empirical research which showed the existence of positive relationship between the size of the organization with product innovation level where SMEs frequently showed low level performance in producing innovative new product compared to the large organization. Besides, [7] have estimated between 70 and 90% of new food product and drinks launched by SMEs was failed within a year period in the market. Those failures originated from the poor execution and less effective implementation of pre-development process causing the new product unable to meet the marketing taste, wrong pricing, poor promotion, and market segmentation [7]. Particularly, research in Malaysia found that most of SMEs manufacturing organization facing with failure to develop and market the successful new product in the market. The root causes of such failures were from low understanding and ignorance in implementing the effective pre-development process, changes and customer neglected [8].

There are several research focusses on the critical success factors for pre-development process implementation such as: Wei et al., Russell and Tippett, Sun and Wing, Kandemir et al., Gonzalez and Palacios, Kim and Wilemon, Barclay, and Murphy & Kumar. Unfortunately, majority of them were mainly on the large organization. This implies, very few depth research concerning SMEs have been done. Furthermore the practice and approach of pre-development product process in large organization are ruled out to be used directly in the context of SMEs due to both organizations having different characteristics.

Based on the researcher's knowledge, until presently no particular research done focussing specifically on the factors influencing the successfulness in implementation pre-development product process in SMEs. Therefore, the prime objective of this research is to identify and validate the critical factors affordable to influence the successful implementation of pre-development

process according to characteristic and SMEs environment.

## 2.0 PRE-DEVELOPMENT PROCESS

Pre-development process refer to the earliest NPD process as being shown in Figure 1. [11] described that the NPD process consist of 2 primary sections which is pre-development and NPD implementation section.

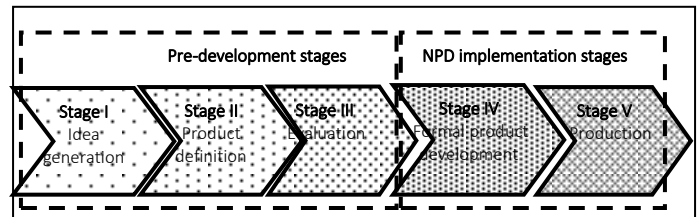


Figure 1 NPD process (Source: [11])

Pre-development process consists of 3 major activities such as brainstorming idea, product concept development, and project evaluation activities. The success and failure of the overall NPD fully depends towards the activities implementation existence in the pre-development process.

As the earliest phase in NPD process, pre-development process plays an important valuable role in determining the direction of an organization in the development of new product. Thorough out this process the project team is responsible to gather information to develop the product concept which have a big potential to accommodate the organization capability, provide a complete information of the product characteristics, cost, time duration, market targeting, and profit forecasting [13]. Therefore such a successful organization which has achieved effectiveness in the implementation of the pre-development process managed to reduce manufacturing cost, simplified and fastened the redesigning product concept based on customer preferences, increase product quality [14]. In addition, all improvement along the pre-development process will produce more positive effect to the organization namely; waste reduction and encouraging cost reduction, time duration, and labor reduction compared to improvement done at the formal final phase of the product in production process [15].

Equally important, [16] explained that pre-development process is among the high risk process compared to the other processes. The important challenges facing the project team throughout the implementation of the pre-development process such that all decision must be based on the information source and the cloudy environment and uncertainty. The uncertainty environment referred to the changes in the market situation, technology, raw materials, and the organization's capability which

subject to changes. Besides, the knowledge and competency of SME's human resource which is limited contribute to the difficulties factor for the team members to identify the important information more accurately. In brief, to produce a successful new product concept, the team project must overcome the unclear information sources by identifying or forecasting accurately the present market position, technology, raw materials, and the organization's capability.

## 2.1 Comparison Between Smes And Large Organization

SMEs has a different characteristics compared to the large size organization as being shown in the Table 1. The difference between SMEs and the large organization exists in the organization structure, top management leader, procedures, cultures, human resource, training, external organization relationship and customers. Additionally [12] stressed that the practise and implementation of the pre-development process product in the big size organization is unable to be used directly in the context of SMEs due to both organization having different characteristics. Therefore, it is important to value and identify the successful critical factors for the implementation of the pre-development process product based on the contexts and SMEs own environment [16,17].

**Table 1** Comparison of SMEs characteristics with large organization

Character	Large Organization	SMEs Organization
<b>Organization Structure</b>	Many management layers, work assignment, decision making chain. Job allocation and proper specialization	Centralized management, less work assignment. Short decision making. Limited job allocation and unclear.
<b>Top leader</b>	Involve in the planning process only.	Involve in the overall planning process
<b>Procedures</b>	Formal procedures control the activities and operations. Decision made based on facts. Complex planning and controlling system.	Informal procedures control the activities and operations. Standard and formulation is low. Decision making incidentally follows gut feels and always happen.
<b>Cultures</b>	Corporate thinking style. Encourage team creativity. Commitment based on rewards. Human is blame based on error	Corporate thinking is seldom. Encourage individual creativity. Commitment is high and appreciate contribution on rewards. Never blame the human.

<b>Human resource</b>	Financial source and human capital, knowledgeable and experience. Staffs assign to specific department. Strong department functioning.	Financial source and human capital, knowledgeable and experience are limited. Staffs assign to more than one specific department. Weak department functioning.
<b>Training</b>	Training and staff development are properly plan and involving big scale. Specific budget for training.	Training and staff development are ad-hoc. No specific budget for training.
<b>External organization relationship</b>	Competition based on quality performance and pricing. Both products and services are for local and international market.	Close relationship, easily access and known to others personally. Most of the product and services are for local.
<b>Customers</b>	Rely on the big customer's volume. Customers are strangers to company activity.	Rely on the small customer's volume. Customers are close and directly involve to company activity.

Sources: [18,19,20]

## 2.2 Factors Influencing The Successfulness Implementation Of Pre-Development Process

Based on the previous research, researchers have identified eight factors which are able to increase the success and smoothness of the implementation of pre-development process. The factors are product strategy, top management commitment, team leader's capability, team project continuous involvement, customer participation, involvement of external organization, motivation and training development. Table 2 summarized the previous researches which have been executed by researchers. However, majority of the researchers [21,11,22,23] focussed their research on the big size organization. Four researchers have conducted their research involving respondent from the various size of organization which were SMEs and large organization [24,10]. Only research performed by [25] specifically focussed on the factors which are able to increase the influence of success and the implementation of pre-development process based on SMEs.

Not all factors proposed by the eleven researchers are suitable with the characteristics and SMEs environment. To achieve the research objectives, confirmation evaluation need to be performed by using Delphi technique to determine how far those factors are able to fulfil the SMEs needs in implementing the pre-development process. Importantly, the confirmation evaluation need to be performed to identify suitable factors with the characteristics and SMEs environment in Malaysia in implementing the pre-development process. Additionally, through Delphi technique, the

importance of critical factors for SMEs are able to be identified.

**Table 2** Factors influencing the success implementation of pre-development process.

Factors	Description							
		(10)	(11)	(24)	(22)	(26)	(21)	(27)
Clear product strategy	Transparent guidelines, prioritization and fix performance.	√	√	√	√	√	√	√
Top leader commitment	Encouragement support and motivation, provide resources (financial, manpower and time)	√	√		√	√	√	
Capability of team leader	Lead the implementation process, committed, possess various skill (technical and management)		√	√		√	√	
Team project involvement	Total employee involvement throughout the implementation	√	√	√	√	√	√	
Customer involvement.	Provides needed information and requirement, opinion and suggestion.		√			√		
External organization involvement.	Financial institution, government agency and private, competitors and successful organization.		√		√	√		
Motivation	Continuous encouragement to the project team to increase creativity and continuous innovation.		√		√	√		
Training	Knowledge management and project team expertise		√		√	√		

### 3.0 RESEARCH METODOLOGY

Delphi Technique was developed by [28] at Rand Corporation in 1950. Main foundation of Delphi Technique is communication structured for decision making process. The Technique has been accepted

and widely used to gather opinion and final decision made centrally by the experts on specific topics. As being acknowledged by [28] this technique can be considered as a method to restructuring the communication process among the group of experts to be more effective and able to solve complex problems. In support, [28] believed Delphi Technique is able to assist in identifying the organization collaborativeness, identify the problematic area, capable of prioritizing the tasks by providing the detail feedback and systematic follow-up action. As a result, the confirmation evaluation by using Delphi Technique approach is useful for such framework for the long term usage due to the information obtained in this technique solely from the experts.

This research used the semi structured interview whereby the survey form acted as intermediaries between the researcher and expert panels. 35 expert panels from SMEs industry and academic field were identified. Each panels has been contacted through telephone and was invited to participate in the research. Upon receiving an agreement from the respondent, the researcher proceeded by sending mail to clarify the objective of the confirmation research being done together with the survey form as a reference. Next step is to gather the needed information, each expert panel will be contacted through phone call and e-mail. However, based on the interaction and communication received from 35 respondent, only 22 respondent were ready to participate in the incoming discussion. Finally, only 20 respondent consists of expert panel successfully interviewed through the telephone and e-mail. The discussion done based on the survey form send by mail. The conversation was recorded, the result obtained has been analysed manually.

#### 3.1 Selection and Number of Expert Panel

The selected expert panel to ensure the successful confirmation process were from SMEs industrial practitioner and knowledgeable and expert academicians in NPD field process particularly in the pre-determined process. From the 20 respondent involved in this research, 4 respondent were the owner from SMEs company or the top management (18%), 11 people were a manager and senior SMEs executive (59%), and 5 people were academicians (23%). Through the composition of the dynamic panel member and vast experiences as well as individual expertise, the panels provide the concrete opinions and realistic suggestions towards the implementation framework in the pre-determined process suggested by the researcher.

The 20 expert panels involved in the confirmation research were subsequent to conclude the collaborativeness among the panel members in obtaining the accurate measurement. Minimum required respondent in Delphi technique was 5 people in ensuring the opinions from panel members represent various suggestions and perspectives from the bigger group. In due respect, the researcher

believed with the 20 respondent available were realistic and managed to avoid any miss information problem.

### 3.2 Delphi Technique Implementation Procedures

Delphi Technique Implementation Procedures normally involved three or more rounds. Each round with a purpose to gather feedback from the expert panel for improvement topic which needs verification, and the round will prolong until the expert panel unanimously agreed that the best solution obtained. In the final round, each expert panel must arrive to the conclusion that the best solution which have been proposed were validated and verified to be used in the actual business environment.

**Round 1:** In round 1, expert panel are required to make comments regarding the suitable factors which have been identified through the literature research in assisting SMEs towards the successfulness in the implementing the pre-development process. Expert panel also are required to list down the practices in each factor. Besides, they are also been requested to provide ideas and opinions for improvement on the identified factors. The survey structured form have been used as a guideline for the expert panel in ensuring the interview session conducted focussing solely on the discussion topics.

**Round 2:** In round 2, each expert panel will receive a second survey contains the summarized items based on the information obtained in the round 1. In this stage, expert panel need to provide percentage to each item based on the importance of factors towards successfulness in the implementing the pre-development process in SMEs. In the final round 2, the collaborativeness shaped among the expert panel whereby each respondent successfully contribute to some percentage to all factors based on the importance level.

## 4.0 RESULT AND DISCUSSION

This part presented the result from the Delphi Technique. Table 3 exhibit the suggestions and

collaborativeness achieved by the 20 expert panel. The result in round 1 showed that the panels successfully identified the practices which will be implemented by SMEs for each critical factor. For example, the 'company director commitment' panel members have suggested 6 best practices to be implemented by SMEs to achieve the success implementation of pre-development process. This practises are company's director responsible to develop a strategic product, establish team project, provides comfortable working environment, supervising pre-development activity, maintain good relationship with the team project and providing resources needed.

Next in round 2 Delphi Technique, expert panel successfully achieved the collaborativeness on the importance of critical factor which will assist in the effective and success for PKS in implementation of pre-development process. Factor as 'an appointment of knowledgeable and experience team leader' was agreed by expert panel making it the most critical factor with the value of 81%. Second important factor is 'commitment from the company director or top management' with value of 76%. Third important factor is continuous improvement by team members' with value of 66%. In addition, panel members agreed that 'team member development training' is less important in assisting implementation of pre-development process for SMEs.

The results obtained from round 2 evidently claimed that even though SMEs facing with the barriers of financial resource, knowledge and limited man power skill [29] however through continuous involvement and commitment from top management, leader and team member the SMEs is able to succeed in the implementation of product innovation process.

The result also exposed the 'team member development training' factor was lowest with value of 4%. The result coincided with research of [30] which found that the organization needs high financial budget to conduct formal training programme for development. In fact SMEs is upfront having a limited financial resource which effected the training programme for development.

**Table 3** Percentage of critical factor for successful pre-development process implementation at SMEs.

Factor	Result Round 1	Result Round 2
	(N=20)	(N=20)
Best Practise Suggested by Panels		
Company director commitment.	Develop product strategy. Shaping team project and team leader appointment. Provide comfortable working environment. Monitoring pre-development activity	76%
Product strategic development.	Product specification explanation. Manpower responsible explanation. Market target and demand explanation	29%
Project team leader's knowledge able and skillful.	Knowledgeable, continous knowledge. improvement & sharing knowledge. Explanation and leading the team members achieving product strategic and company objective	81%
Project team member total involvement.	Sharing information. Understanding the organization objectives, product strategy, needs and consumer requirement. Identify new opportunitie	66%
External organization involvement.	Supply raw material. Market information channel, technology, R&D, innovation. Financial support. Assisting in new product development.	12%
Consumer involvement.	Give feedback on the product. Describe the present taste and future.	25%
Team members development training.	Formal training and schedule. <i>On-the-job-training</i> . Assisting in increasing creativity & innovation.	4%
Motivation	Financial rewards & etc. Comfortable working environment Top management fulfil the needs Leader lead the team	10%

## 5.0 CONCLUSION

Primarily, this research was performed to identify the critical factors which are able to increase the successfulness implementation of pre-development suitable with the characteristics and environment in SMEs. Research result successfully identified eight

critical factors which will assist organization to achieve the implementation of pre-development. However, those factors have been identified by the previous researchers when conducting research on the big size organization. The suitability of those factors in fulfilling the environment and characteristics of SMEs are questionable. Next Delphi technique has been implemented to get the opinion and collaboration from 20 expert panels in identifying the critical factors which are suitable to the characteristics and SMEs environment. Delphi technique successfully listed the practices which are able to implement in each critical factors. Besides, factor as 'skillful team leader' and 'top management commitment' and 'total employee involvement' have been identified as the most critical and important for SMEs. SMEs is facing a financial crisis indirectly causing 'training development' factor less critical to be implemented in SMEs. From the theoretical perspective, the researcher has successfully introduced the successful factors critical process of pre-development by involving the characteristics and environmental of SMEs. From the practical perspective, this research has provided a guideline to SMEs regarding the practices and critical factors suitable with SMEs. Each critical factors have been arranged based on the importance to fulfil the advantages for SMEs.

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