A Triangulated Approach To The Assessment of Important Constructs In New Product Development Process

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Abstract: New Product Development (NPD) is vital for organizational competitiveness and success. However, in the current NPD literature, the important constructs for NPD success are frequently derived from quantitative research. Whereby, qualitative based research on the similar subject is limited. Hence, this study aims to assess the important NPD process constructs in Research and Development (R&D) companies within Malaysia via triangulated approach. As such, the study applied both structured questionnaire and semi structured interview. 384 questionnaires were distributed to staffs in R&D companies within Malaysia, with 186 responded. In addition, 10 NPD experts were participated in the semi structured interview. The triangulation method used in this research showed consistency and support one another. Quantitative finding that derived from descriptive analysis is in line with qualitative outcome that analyzed via Kendall Coefficient of Concordance. Respondents and interviewees perceived that the most important constructs for NPD process in R&D companies within Malaysia are Design and Development, followed by Product Commercialization, Opportunity Identification, Product Testing and Concept Development. The rigor in analysis of this study makes the 5 NPD constructs the valid variables that could be used in future research to assess the conditions and subsequently enhance the NPD performance in R&D organizations.
[Tan O.K., Choi S.L., Amran R. **A Triangulated Approach To The Assessment of Important Constructs In New Product Development Process**. *Life Sci J* 2014;11(6):330-338] (ISSN:1097-8135). http://www.lifesciencesite.com. 45

Keywords: New Product Development; Research and Development; Design; Product Commercialization; Opportunity Identification; Product Testing; Concept Development.

1. Introduction

Continuous development of new product that desired and appreciated by the customers is the most important aspect for Research and Development (R&D) organizations in maintaining and improving competitive advantage (Ian and Philip, 2000; Wolff and Pett, 2006; Mohammad, Mehrnoosh and Parivash Jaffari, 2013). However, developing and launching a new product is not an easy task (Cooper, 2008). Scholars and R&D managers are extremely keen to learn about the constructs that implied high impact on the success of new product development and launching process (Chen and Chen, 2009). In the current academic literature, there is a rich stream of literature which discusses the important constructs for New Product Development (NPD) success. However, the important NPD constructs in the current literature are frequently derived from quantitative based studies. There is limited literature available to the extent of NPD constructs that originated from qualitative based research.

According to David and Sutton (2004), there is no absolute separation between quantitative and qualitative research, and that the boundary between quantitative and qualitative research is not set by any single or agreed set of principles. Therefore, this study aims to adopt a combination of qualitative and quantitative research approaches, or namely a triangulated approach to identify the main constructs associated with new product development process, with the focus on R&D based companies in Malaysia.

2. Literature Review

Innovation growth in Malaysia is driven by two main innovation models, which are known as the Technology Based Innovation Model that mainly driven by public sectors, and the Market Based Innovation Model that primarily steered by private sectors. In line with the recommendation made by the National Innovation Council of Malaysia which stated that the country needs to aggressively pursue market-driven innovation to capture short-to-medium term opportunities and to create jobs and wealth; this paper therefore focuses on Technology Based Innovation model which is founded bases on linear NPD process framework.

2.1 Linear NPD Process Framework

Linear NPD process framework (or Sequential NPD process framework) characterized as a fixed and isolated process with sequential flow (refers to Figure 1). The output from each NPD process, as well as the links and flows between processes are relatively deterministic (McCarthy *et. al*.,2006). This makes Linear NPD process the best fit for NPD that aims to meet client's specified requirements on time and within targeted cost. Linear NPD is a systematic approach process through a series of distinct phases comprises of design and development, testing, product launch and product commercialization (Bunduchi, 2008). Linear NPD process framework focuses on how individual process and inter-process links are structured. The framework emphasizes on the impacts of process's behaviour (i.e. individual process structure and inter-process links) toward products performance such as quality, reliability and variety, as well as product development cost and managerial complexity (Muffatto and Roveda, 2000).

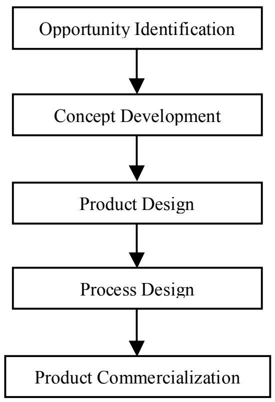

Figure 1. Linear Framework

There are two common models of Linear NPD frameworks, Traditional NPD Model (Booz, Allen and Hamilton, 1982; Brand, 1998) and Stage-gate Model (Cooper, 1993; Cooper and Edgett, 2008). The traditional NPD approach (Figure 2) breaks down the product development process into six discrete phases which are Opportunity Identification, Analysis and Evaluation, Design and Development, Market Testing, Commercialization and Life Cycle Management (Booz, Allen and Hamilton, 1982; Brand, 1998).

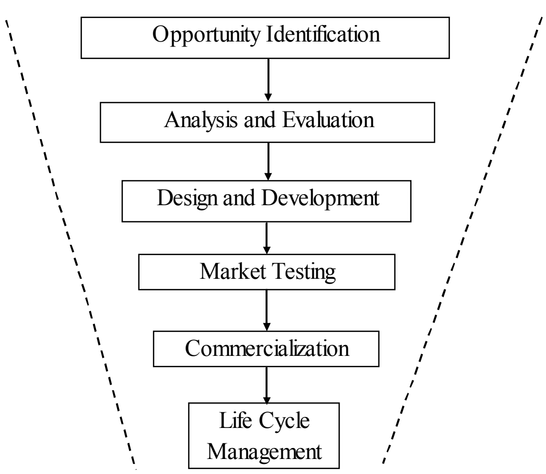

Figure 2. Traditional NPD Framework

As illustrated in Figure 2, the six discrete phases are structured as a funnel with a wide range of entering points at potential product opportunity stages, and tapering as project reaches subsequent phases of development, where project focus point is narrowing to selected product idea and design concept (Brand, 1998).

Cooper (1993) developed the stage-gate model through a research of evaluating the success factors for developing a "winning new products". A stage-gate model represents NPD as a sequential and orderly series of processes with checkpoints or gates between stages. At each gate, outputs of each stage are evaluated prior to proceeding to the next stage. In other words, the stage gates are strict and formal check points where "go" or "no-go" decisions are made.

According to Cooper and Mills (2005), thorough and structured reviews at each NPD process check points or gates could ensure project execution plan and expenses are strictly monitoring and controlling. The logical and systematic structure of Stage gate NPD process reduces NPD management risk by reducing the complexity of NPD process.

Stage-gate model is a system driven by new product ideas or new market demands as input to the NPD system (Clark and Wheelwright, 1996). The input is subsequently processed through the center of system that consists of Engineers and Marketing staffs, and finally generates output of "New Product". Cooper (1993) described the stage-gate model in thirteen phases: a) Initial screening; b) Preliminary market assessment; c) Preliminary technical assessment; d) Detailed market study; e) Preliminary business analysis; f) Product development; g) Alpha test. h) Beta test; i) Market test; j) Trial production; k) Final business plan; l) Production ramp up and m) Market launch. In a study of how to model the NPD into a strategy-oriented approach, Perotti and Pray (2002) simplified Stage-gate model into five common phases, namely "Beginning", "Information", "Make Decisions", "Development and Testing" and "Go to market" as shown in Table 1.

The simple and effective structure of Linear NPD framework made it best suited to organization that aims for minor incremental innovation through external market pull and internal market push (McCarthy *et. al.*, 2006). However, the framework does not consider the correlation of the dynamic behaviours' associated with radical innovations (McCarthy *et. al.*, 2006).

2.2 NPD Process Constructs

From NPD process perspective, there are five universal NPD process phases that commonly recognized by prior researchers as important constructs for Linear NPD process framework. The five phases are Opportunity Identification, as starting phase, followed by Concept Generation, Product Design, Product and Market Testing ending with Product Commercialization.

Table 1. Stage gate NPD Framework

Stage gate NPD framework*	Simplified framework**
1. Initial screening	Beginning
2. Preliminary market assessment	
3. Preliminary technical assessment	
4. Detailed market study	Information
5. Preliminary business analysis	
6. Product development	Make Decisions
7. Alpha/in-house testing	Development and Testing
8. Beta/customer testing	
9. Market testing	
10. Trial production	
11. Final business plan	Go to market
12. Production ramp-up	
13. Market launch.	

Note: Adapted from:* Brand (1998) and **Cooper (1993)

2.2.1 Opportunity Identification

Opportunity for an organization is a gap between the current status of the organization and the potential future threat; in both business and technology aspects that need to be resolved in order to capture competitive advantage (Cooper, 2008). The process of creatively recognizing such opportunity is known as Opportunity Identification process. Opportunity Identification phase is the first phase of the product development process for an innovative product. At Opportunity Identification phase, new product opportunity generates spinouts of the ongoing business operation (Merle and Anthony, 2006). This process requires the capability to forecast market demand on products and technology. Engineers should play the roles of "driving innovation" instead of "supporting innovation". In other word, an engineer should be capable of identifying potential new product opportunity on top of designing new product (Kim, 2007).

The process of opportunity identification involves market and technology research, opportunity evaluation and ranking, followed by opportunity selection and definition of the identified opportunity (Merle and Anthony, 2006).

2.5.2 Concept Development Phase

Lin *et.al.,*(2008) defined the elements of concept development as the "birth", "grown" and "maturation" of a tangible product idea. According to Arthur (2005), an effective, systematic and deliberate approach on new product and new idea creation has direct impact on organization revenue growth. Concept development process starts with identification of potential sources for new product ideas. There are few approaches suggested by Cooper and Edgett (2008), which include gather feedback from customer or users and collaboration with institutions that offer more radical idea.

Cooper and Edgett (2008) conducted a study which looked into 18 new product ideas generation approaches. The study aims to assess the application level of each method, as well as to evaluate the management's perception on the effectiveness of application. The 18 idea generators were grouped into three categories and called as Cooper-Edgett Ideation Study as shown in Table 2.

Table 2. Cooper-Edgett Ideation Study

Voice of customer (VOC)
a) Ethnographic research b) Customer visit teams c) Customer focus groups for problem detection d) Lead user analysis e) Customer or user designs f) Customer brainstorming g) Customer advisory board or panel h) Community of enthusiasts
Open innovation
a) Partners and vendors b) Soliciting the external scientific/technical community c) Scanning small business and business startups d) Invite external finished product designs e) External submission of ideas f) External idea contest
Others
a) Peripheral vision b) Disruptive technologies c) Patent mapping d) Idea capture internally.

Note: Adapted from Cooper and Edgett (2008).

The study was participated by 160 companies. Five methods were identified from the study as the most effective and commonly used approach by industrialists, which are Customer visit team, Customer focus groups for problem detection, Lead user analysis, Peripheral vision and Disruptive technology.

2.5.3 Design and Development Phase

In the traditional sequential design process, designers and engineers work in an isolated world from other functional units within the organization. As a consequence, there is lack of involvement and appreciation of design activities by the rest of functional unit within the same organization (Merle and Anthony, 2006).

Design does not just refer to the application of Computer Aided Drafting (CAD) to transform product ideas into two dimensional (2D) or three dimensional (3D) drawings. Designing activities are those that enhance, define, describe and develop the specifications and expectations of the desired product into the form and function outlined in the product planning activity (Jack, 2000). The critical path in the designing process involves generation of few design options by designer and engineers, followed by selection of the best design option that meet product's target specifications, desired performance as well as customer needs. This process is called as design optimization process (Kelly, 2010).

2.5.4 Product Testing Phase

General guidelines exist for new product success from previous researchers (Dariush,2007; Lehman and Rusell, 2005) suggested that it is prudent for the firms to commit to rigorous product testing in order to achieve product superiority over their competitors. NPD Product testing is also labeled as Beta Testing, which refers to the validation of the product at the Beta phase or product development phase. According to Darish (2007), Lehmann and Rusell (2005), the purpose of product testing is to qualify product performance, enhance ability of design integration, compatibility, robustness, manufacturability and serviceability at customers' use environments, which includes installation, user-friendliness and troubleshooting. It is important to make a distinction between the different categories of testing applied at different stages of the product development process as different testing methods will have different objectives and approaches. Three common categories of testing are Exploratory Test, Assessment tests and Validation.

2.5.5 Product Commercialization Phase

The successful launch of product requires appropriate product launch strategies (Chiu *et.al.* 2006). Product commercialization is the meeting point of product innovation and entrepreneurship or is in between the activities of "economy creation "to" economy realization" (Dean, Gerrit and Cristiaan, 2008). Therefore, the meeting point call for a well-defined processes and activities to serve as bridge instead of creating a gap between both (Chiu *et.al.* 2006).

Dean, Gerrit and Cristiaan (2008) suggested activities that drive towards the success of product commercialization make up of two main elements, a) Innovation or product fulfill market needs, and b) Commercialization strategy. While Chiu *et.al.* (2006) argued that the best model for new product launch strategy should consist of three aspects:

- Strategic aspect which incorporates Product Strategy, Market Strategy, Rivalry and Business Strategy.
- Marketing aspect which involves product branding, distribution channel and expenditures, product price setting, sales force intensity and promotion expenditures.
- Organization aspect which refers to the organizational structure of both NPD and marketing team.

3. Research Methodology

3.1 Population

The Malaysia Research and Development Classification System (MRDSS) developed by The Malaysian Science and Technology Information Centre (MASTIC) is a set of classifications on Research and Development (R&D) activity undertaken in Malaysia both in the public and private sectors. The classification system is a useful guideline for government policy makers, industrialists and researchers

Population of this research will be R&D staffs who have NPD experiences from the 9 main (out of 22) R&D groups defined by MRDCS. The nine R&D groups are, (a) Consumer Product R&D (S2062200), (b) Fabricated Metal Product R&D (S2061000), (c) Computer Hardware and Electronic Equipment R&D (S2061200), (d) Communication Equipment R&D (S2061300), (e) Instrumentation R&D (S2061400), (f) Machinery and Equipment R&D (S2061500), (g) Industrial Chemical Related Product R&D (S2060700), (h) Wood, Wood Product and Paper R&D (S2060300) and i) Latex Product R&D (S20601600).

3.2 Sampling Size

3.2.1 Quantitative Sample Size

A listing of R&D based companies in Malaysia is derived from 2 sources.

- A list of Multimedia Super Corridor (MSC) status companies provided by the authority of MSC.
- A list of R&D based company in Malaysia proposed by a panel of the R&D experts. The panel of R&D experts consists of 10 members; the list of experts detailing their background is shown in Table 3.

Table 3. Panel of R&D Experts

No	Current Position	Background
1	Design Director	Owner and director of a local Contract Design Company. 25 years experiences in NPD.
2	Engineering Manager	A Japanese with 31 years of experiences on home appliances design.
3	Industrial Design Director	Director of a local Contract Design Company. 23 years of NPD experiences.
4	Senior Design Manager	Senior Design Manager in a UK based design company in Malaysia. 10 years experiences on design of Medical equipments, industrial lock; followed by 8 years experiences on design of home appliances
5	Head of R&D	8 years experiences on Plug and cable design, and 10 years experiences on design of home appliances
6	R&D Manager	R&D Manager of a local owned company. Involved in approximately 20 design projects.
7	Design Consultant	Full time design consultant, specialize in electrical and electronic design. Involved in design and development of approximately 100 products.
8	Head, School of Art	Industrial Design background. 10 years experiences on furniture design.
9	Dean, School of Design	Worked in a USA company for 25 years. Involved in development of 25 products
10	Senior Design Manager	An European worked in a Europe company and involved in design and development of 6 products.

3.2.2 Qualitative Sample Size

There is no general rule for the selection of qualitative sampling size (Patton, 1990), Romano (1989) suggested sampling size for qualitative survey should be determined by the researcher. Sample size is not the main success factor for qualitative survey or semi-structured interview; instead the potential of each respondent to contribute to the development of insights and understanding of the phenomena is the most crucial factor for semi-structure interview. As such, a jury of the R&D experts consists of 10 members are selected and are participated in the interview. The list of experts detailing their background is shown in Table 3. They are R&D Directors, Design Directors, Industrial Design Directors, Senior Design Manager, Head of School of Design and Senior R&D Manager who have been engaged in new product design and development activities for more than 12 years.

3.3 Research Tools

3.3.1 Quantitative Research Tool

The 5 important NPD constructs and 101 NPD attributes identified from literature review were transformed into a survey questionnaire. The questionnaire attempts to assess the level of importance that perceived by the respondents from R&D companies in Malaysia. Respondents are asked to rate the level of importance they placed on each attributes based on the five point scale of (1) `Not important ‘to (5) `Extreme important’.

3.3.2 Qualitative Research Tool

The qualitative tools refer to forms of structured interactions, such as structured and unstructured interview or observation. Berg (2007) reveals that the more informal, unstructured and un-standardized the interview is, the more the interviewer needs to work during the conduct of interview. There is no such thing like totally unstructured interview or observation, even if some forms of research adopt far less pre-emptive structuring than others (Floyd and Fowler, 2009). Therefore, qualitative survey tools, in terms of semi structured interview, are used in the research to collect the feelings and thoughts of the 10 NPD experts on what are the important NPD constructs in R&D based companies within Malaysia.

3.4 Analysis Tools

3.4.1 Quantitative Analysis Tools

Scale reliability using Cronbach's Alpha was applied to assess the consistency of homogeneity among items (Rasli, 2006). Reliability coefficients were calculated. For purpose of this study, a reliability coefficient above.60 will be used to gauge statistical reliability (Shum and Lin, 2007). Subsequently, descriptive statistical analysis tool is used to derive the perceived importance level of NPD constructs.

3.4.2 Qualitative Analysis Tools

3.4.2.1 Expert Opinion Assessment

Expert Opinion Assessment (EOA) is used to gather expert’s opinion on the important ranking of NPD Process constructs. EOA, which is similar to Delphi Method, serves as an instrument to obtain the most reliable opinions, judgment and consents from a group of experts (Okoli and Pawlowski, 2004). Criteria of EOA panel selection and method of EOA assessment are the key factors to achieve an acceptable degree of EOA reliability (Rasli, 2006). The panel of EOA in this study consists of 10 experts in the field of NPD or R&D, they are also the jury of interviewers for semi-structure interview as summarized in Table 3. In addition, the EOA assessment is integrated as part of semi structure interviews and is conducted via face-to-face and 1 to 1 interaction to ensure that who was involved remain anonymous to one another.

3.4.2.2 Kendall Coefficient of Concordance

The feedback from EOA is analysed using Kendall (Rasli, 2006) coefficient of concordance to assess the agreement among the experts. The Kendall (Rasli, 2006) coefficient of concordance is a non-parametric statistic use to evaluate the degree of similarity among sets of ranks given to a same set of object. Kendall's coefficient of concordance is ranged from "0" which represent 'No agreement" to "1" which represent "complete agreement". Semi-structure interview might be repeated with the same population of study until consistency in response is achieved.

4. Quantitative Result

4.1 Response Rate

The sample frame consists of 384 randomly selected individual from Research and Development (R&D) staff in R&D companies within Malaysia. Return survey questionnaires were verify via data screening process to ensure data in the questionnaires are all in place, and accounted for. As the result, the total useable respondents is 186, this made up a useable response rate of 48.4%.

4.2 Reliability Test

Cronbach Alpha reliability coefficient is used as reliability test. Cronbach Alpha reliability values for NPD Process constructs are ranged from 0.6951 to 0.8205. This implies that the data is statistically significant (i.e > 0.6) to proceed for further analysis.

4.3 Important NPD Construct.

The respondents' perception of importance level for NPD attributes' are retrieved from survey questionnaire. The individual mean score across the 101 NPD attributes were summed up according to the categories of NPD Process constructs as shown in Table 4.

Table 4. Importance Level Ranking of NPD Process Constructs

Importance Ranking	NPD Process Main Constructs	Average
1	Design and Development Phase	4.62
2	Product Commercialization	4.42
3	Opportunity Identification Phase	4.30
4	Product Testing	4.23
5	Concept Development Phase	4.10

Based on Table 4, the upper and lower importance ranges of NPD Process constructs are formed by Design and Development Phase and Concept Development Phase. Design and Development Phase ranked as the most critical NPD Process construct with the mean score of 4.62. While Concept Development Phase ranked in the last position however with a relatively high importance score mean of 4.10.

5. Qualitative Result

5.1 Respondents' Profile

Field work on qualitative survey was conducted on ten interviewees as shown in Table 5. All of interviewees managed to complete the full interview process. This has resulted into an overall response rate of 100% for qualitative survey.

Table 5. Profile of interviewees

No	Designation	Current Position	Company Background
1	LA	Design Director	Local
2	MA	Engineering Manager	Multinational
3	LB	Industrial Design Director	Local
4	MB	Senior Design Manager	Multinational
5	LC	R&D Manager	Local
6	MC	Design Consultant	Multinational
7	AA	Dean, School of Design	Academician
8	AB	Senior Design Manager	Academician
9	X	Senior Design Manager	Multinational
10	Y	Engineering Manager	Local

5.2 Important NPD Process Constructs

Qualitative data from the semi structured interview is coded to identify pattern of important NPD constructs ranking revealed by interviewees. NDP activities that perceived as important by each interviewee were coded, grouped and categorized according to the five common NPD phases, which are Opportunity Identification (OI), Concept Development (CD), Design and Development (DD), Product Testing (PT) and Product Commercialization (PC). The perception of importance level ranking suggested by the interviewees is summarized in Table 6. The data is subsequently analysed with Kendall (1995) coefficient of concordance to assess the agreement among the interviewees.

Table 6. Perception of Importance Ranking

Interviewee	OI	CD	DD	PT	PC
LA	4	3	1	2	5
MA	3	4	1	2	5
LB	4	5	2	3	1
MB	4	5	2	3	1
LC	3	5	1	4	2
MC	3	4	1	2	5
AA	1	5	2	4	3
AB	4	5	2	3	1
X	4	5	1	3	2
Y	1	5	3	4	2
Average	**3.10**	**4.60**	**1.60**	**3.00**	**2.70**

Analysis result of Kendall's coefficient of concordances (W) via SPSS is shown in Figure 3. From Figure 3, the Kendall's coefficient of concordances and p-value for the importance level ranking are 0.462 and 0.001 respectively. Since the p-value is less than 0.05, the findings were deemed to be significant; thus implying that the ranking of the 10 interviewees are consistent.

Test Statistics

N	10
Kendall's W[a]	.462
Chi-Square	18.480
df	4
Asymp. Sig.	.001

a. Kendall's Coefficient of Concordance

Figure 3. Kendall's Coefficient of Concordance

In addition, the higher value of Kendall's W also implied a high level of consistency on importance ranking perceived by the 10 interviewees as summarized in Table 7.

Table 7. Importance Ranking Perceived by Interviewees

Rank	NPD Phase
1	Design and Development
2	Product Commercialization
3	Product Testing
4	Opportunity Identification
5	Concept Development

6. Discussion

The high perceived level of importance placed by quantitative survey's respondents across all NPD Process constructs (refer Table 4) suggest that all the five NPD Process constructs are important. Design and Development phase is perceived as the most important construct, followed by Product Commercialization, Opportunity Identification, Product Testing and Concept Development. The findings echo the study by Loch and Kavadias (Loch and Kavadias, 2008). According to Loch and Kavadias, (2008), NPD encompasses a large number of topics, each of these different topics represents a field of inquiry therefore no consensus has been developed regarding the none-existence or none importance of these constructs.

The notable finding from this research is, the importance level ranking of NPD Process constructs drawn from quantitative survey is in line with the importance level ranking order derived from semi-structured interview tested via Kendall's coefficient of concordances.

Design and Development is ranked as the most important NPD process construct in both quantitative and qualitative research. This is in agreement with findings on important NPD process constructs in other research studies conducted by Julie, Marjorie & Robert (2005) and Crawford & Di Benedetto (2008). Study done by Julie, Marjorie and Robert (2005) found that Design and Development phase as the most important phase because firms that are observed to be the higher in design effectiveness outperform other firms in terms of sales and assets, net incomes and cash flow, as well as higher stock market returns. In addition, study conducted by Crawford and Di Benedetto (2008) also revealed that top management always sees Design and Development process as important as it can be used as a tool in boosting organization's competitiveness.

Product Commercialization is rated as the second important NPD process construct. This finding is consistent with the study done by Crawford and Di Benedetto (2008) which showed that Product Commercialization often turns out to be the most expensive and risky part of NPD due to the financial commitments made to both production and marketing, especially, when the go-ahead on product commercialization is given. Study by Ofek (2008) also proved that commercialization of new product is perhaps the most prevalent way for start-up firms to establish themselves in a market and is a common strategy for incumbent firms to retain their industry position and grow top line profits.

Opportunity Identification is perceived as intermediate important NPD process construct which is in accordance with study done by Kahn, Barczak and Moss (2006). In the study of establishment the best practice NPD framework, Kahn, Barczak and Moss (2006) stress that Opportunity Identification is not the most important rather it is an ongoing activity and can actually redirect the companies' strategic plan in order to respond to market forces and new technologies. On top of this, according to Ulrich and

Eppinger (2004), NPD is the set of activities beginning with the perception of a market opportunity and ending in the production, sales and delivery of a product. Even though Opportunity Identification is not the most important element within the NPD process; however it is important as it drives the companies' NPD and innovation strategy.

Findings from this research placed Product Testing at the second last position in terms of importance level ranking. Study from prior researchers (Loch and Tapper, 2002) revealed that the importance level placed on Product Testing at the beginning stage of NPD is generally higher than the level of importance at the later stage of development cycle. According to Loch and Tapper (2002) and Thomke (2008), design issue found at the late stage of product development process can cost hundred times more expensive than the detection of problem at early stage of development. Therefore, early testing and prototyping not only iron-out potential design problems at initial development stage, but also would reduce expenses that caused by design changes in the late stage of development (Thomke, 2008). Product testing at the beginning stage of NPD serves as means to detect potential design issue, while testing at late stage of development aims to confirm the design issue is resolved or brought down to the level that accepted by the business (Donald and Rusell, 2005). Perhaps, the inconsistency of importance level at the beginning and later stage of development cycle explained why Product Testing is rated at the fourth important NPD construct.

Concept Development as suggested by respondents during the quantitative survey and semi-structured interview is relatively less important. The finding opposes to the study done by previous researchers (Holger, Wayne and Carsten, 2010; Cooper, 2001). Study done by Holger, Wayne & Carsten (2010) revealed that Concept Development is important because an effective Concept Development creates higher commercial value to the company. According to Cooper (2001), an adequate product concept is important and should be defined in the early stage of NPD and aligned with customer, market and companies' strategic requirements in order to increase the likelihood that the new product will succeed commercially. Concept Development is rated as the least important NPD Process construct. Perhaps the reason behind this phenomenon is Concept Development of multinational R&D companies in Malaysia take place at the beginning of product development stage prior to transfer of NPD project from the companies' headquarters to the R&D entities in Malaysia.

7. Conclusion and Recommendation

Rossi and Freeman (1993) suggested that qualitative data is practicable to determining the nature of the need, whilst quantitative data is necessary to determine the extent of the need. Finding from this study suggested that within the content of NPD process for R&D companies in Malaysia, the nature of need and the extent of need are in line. The triangulation method used in this research showed consistency and support one another. The important NPD process constructs revealed from semi structured interview are in agreement with constructs identified in quantitative research. The rigor in analysis of this study makes the 5 NPD constructs the valid variables that could be used in future research to assess the conditions and subsequently enhance the NPD performance in R&D organizations.

Acknowledgements:
Authors wish to acknowledge the Malaysian Ministry of Higher Education and Universiti Teknologi Malaysia under the Research Grant (Vote No. 00K48) for sponsoring this publication..

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3/31/3014