

New Product Development in Malaysia: Does Organizational Background Really Matter?

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Graphical abstract

Group Statistics					
Demographic	Local Overseas	N	Mean	Std. Deviation	Std. Error Mean
NPD Performance	Local Company	69	3.0543	.25945	.03123
	Multinational Company	117	3.5865	.26591	.02458

Abstract

New Product Development (NPD) is vital in assisting Research and Development (R&D) based organizations to adapt to the changes in markets and technology for competitive advantage. Ensuring the success of new products and optimization of new product performance is critical and essential for Research and Development based organizations. Hence, this study is carried out to explore does organizational background in term of company's ownership (i.e. local or multinational companies) and operational scales (i.e. number of Research and Development staffs) affect NPD performance of Research and Development companies in Malaysia. In line with this, 8 New Product Development performance attributes were identified from literature review. These attributes were subsequently formulated into a survey questionnaire and responded by 186 respondents. Thereafter, the effect of organizational ownership and operational scale toward NPD performance are examined separately via Independent Sample t-test and Analysis of Variance (ANOVA). Finding from the study revealed that the level of NPD performance in multinational R&D companies is higher than local R&D companies. Findings from this research also implied that NPD performance can be further improved by increasing number of R&D staffs.

Keywords: New product development; research and development; organizational background; performance

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1.0 INTRODUCTION

Intense competition in the global business market forced organizations to regularly review and re-examine their strategies (such as innovation, operation and marketing strategy) to attain competitive advantage [1]. In the case of research and development (R&D) based companies, competitive advantage can be obtained by creating and developing new technology-based and innovative products. All R&D based companies are currently facing the challenges of innovation. Whereby, their survival and growth mainly depends upon the capacity they possess to renew the product innovation system; the effectiveness of the innovation process; and the ways in which they create and deliver the offering [2].

In many industries, patenting is a tool commonly used to protect one's own technological position and attack the technological positions of competitors or other companies [3]. Patents filed by a company is a major constituent of the company's valuable assets, creates barriers for competitors to enter the segment and improves competitive insulation, making "winning over" the firms customers difficult for competitors [4]. Patenting is also used as an innovation measurement tool to identify a corporation's innovation levels [5]. However, when this is applied

in the context of Malaysian companies, there is growing concern that innovation level, or the R&D and New Product Development (NPD) activities in Malaysian companies are less efficient as compared to foreign companies.

Statistics from the Trademark and Patent Office of Malaysia revealed that there was an increase in the number of patent applications in Malaysia from 1,887 in 1989 to 5,402 in 2008; however, foreign companies still own more patentable and patented technologies than Malaysian companies [6]. From 1986 to October 2009, patent applications by the Malaysian companies have been restricted to an average of 7% (Intellectual Property Corporation of Malaysia Patent Statistic 1986-2009) of the total patent applications received by the Intellectual Property Corporation of Malaysia (MyIPO). Moreover, patents awarded to Malaysian companies during the same time period made up only 4% (Intellectual Property Corporation of Malaysia Patent Statistic 1986-2009) of total patents released by MyIPO [6].

In addition, based on the 2009 Malaysia Productivity and Investment Climate Survey, the innovation and technological capabilities in Malaysia were reported to be lower compared with the survey done in 2002 [7]. According to the survey, R&D staffs employed by manufacturing companies had reduced from 18 percent in 2002 to 12 percent in 2009. Meantime, number of hired

R&D staff in services sector also dropped from 9 percent in 2002 to 5 percent in 2009.

Hence, this study is carried out to explore does organizational background in term of company's ownership (i.e. local or multinational company) and operational scales (i.e. number of R&D staff) affect NPD performance of R&D companies in Malaysia? As such, two research questions are developed for this study:

RQ1: What is the perceived level of NPD performance within R&D companies in Malaysia?

RQ2: Are there any differences in NPD performance within R&D companies in Malaysia base on organizational background in term of company ownership and operational scale?

2.0 LITERATURE REVIEW

2.1 Overview of NPD Performance

As product innovation is significant in assisting R&D based organizations to adapt to the changes in markets and technology for competitive advantage, ensuring the success of new products and optimization of new product performance is critical and essential for R&D based organizations [8-9]. However, one of the key issues faced by R&D organizations is the assessment of innovation achievement, and evaluation of R&D effectiveness or NPD performance as a whole. Part of the challenge is to determine and award NPD performance fairly and equitably. R&D Researchers and Managers often argue that one of main challenge in NPD management is the measurement and management of NPD performance [9].

2.2 Definition of NPD Performance

NPD performance or product innovation performance is the market reward for new products in terms of the products' contributions to sales and profits [10]. Based on a definition from Product Management and Development Association (PMDA), NPD performance indicators are the evaluation criteria for new product performance in the market. Prior research has shown that NPD performance measurement or indicator can effectively distinguish best practice R&D firms from average R&D industry [11-12].

Amass finding from previous researchers, this study extracted eight modes of assessment measures as NPD performance attributes [10-14]. The NPD performance measures employed in this research comprise of the broader aspect of measurement, which includes assessment of product achievement via performance target and quality specification; measurement of organization performance in terms of financial aspects (cost reduction, organization financial gain) and effectiveness of project management (Time-to-market, Number of new product introduced per year), R&D innovation capability (patent discloser) as well as measurement of customer satisfaction. The eight NPD performance measures are summarized in Table 1.

3.0 RESEARCH METHODOLOGY

This study used quantitative research approach. The questionnaire is developed to grade NPD performance based on the eight NPD performance indicators derived from literature review (refer to Table 1). To save time for the respondent, the questionnaire is design in a table format, and the selection of answers involves circling the standard rating that is provided. Respondents were asked to rate the perceived level of NPD performance based on the

five point scale ranging from (1) very low to (5) very high via questionnaire. Scale reliability using Cronbach's Alpha was generated to assess the consistency of homogeneity among items. Subsequently, Descriptive statistic was used in respond to RQ1, while the effect of organizational ownership and operational scale are examined separately via Independent Sample t-test and Analysis of Variance (ANOVA).

Table 1 NPD performance measurements

No	NPD Performance Measures	
	NPD Performance Attributes	Sources
1	Met Performance Specification	Ledwith and O'Dwyer [8]; Aaron [14]
2	Time to market (T2M)	Aaron [14]; Han [9]; Cooper and Edgett [13]; Ledwith and O'Dwyer [8]
3	Met Quality Specification	Ledwith and O'Dwyer [8]
4	Cost and Performance improvement compare with previous product	Han[9]; Cooper and Edgett [13]
5	Customer satisfaction, (Satisfaction by survey or by number of repeated orders)	Ledwith and O'Dwyer [8]; Aaron [14]
6	Organization gains such as Sales Volume, Market Share, Profitability and Return of Investment.	Aaron [14]; Cooper and Edgett [13]; Ledwith and O'Dwyer [8]
7	Number of new products introduced to market per year.	Han [9]
8	Patent disclosure. Number of patent application.	Han [9]

4.0 DATA ANALYSIS

The sample frame consists of 384 randomly selected individual from 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%.

4.1 Reliability Test

Reliability coefficients were calculated. For purpose of this study, a reliability coefficient above .60 will be used to gauge statistical reliability [15]. Cronbach Alpha reliability values for NPD Performance attributes are found to be above 0.7147. This implies that the data are statistically significant (i.e > 0.6) to proceed for further analysis.

4.2 NPD Performance Level

Table 2 summarizes the mean scores of the eight NPD performance attributes in descending order. NPD performance attribute "Met Performance Specification" scored the highest mean of 4.28, and "Patent disclosure" is rated as the lowest performance attribute at performance level of 1.94. The rest of NPD performance attributes are suggested by respondents attained performance range of 2.95 to 3.79.

Table 2 Perceived NPD performance level

No	Perceived NPD Performance	
	NPD Performance Attributes	Mean
1	Met Performance Specification	4.28
2	Time to market (T2M)	3.79
3	Customer satisfaction, (Satisfaction by survey or by number of repeated orders).	3.57
4	Cost and Performance improvement compare with previous product	3.56
5	Met Quality Specification	3.53
6	Organization gains such as Sales Volume, Market Share, Profitability and Return of Investment.	3.49
7	Number of new products introduced to market per year.	2.95
8	Patent disclosure. Number of patent application.	1.94
Overall Mean		3.39

The mean NPD performances among the eight NPD performance attributes are compared using paired t-test (refer to Figure 1). Paired t-Test result of Figure 1 revealed that the mean performance for the top two attributes, Met Performance Specification (MeetPerformance) and Time to Market (T2M) are significantly higher than the other attributes. This result suggests that R&D companies in Malaysia rated their performance in meeting performance specification and time to market above all other performance measures.

Result from paired t-test also suggested that that NPD performance measures “Number of new products introduced to market per year” (Patent) and “Number of patent application” (NoOfProduct) are significant lower than the rest of NPD performance attributes. The finding demonstrates that R&D companies in Malaysia perceived their performance in term of number of new products introduction and patent application are poorer than the rest of NPD performance measures.

Paired Samples Test

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	MeetPerformance - T2M	.48925	.75866	.05563	.37950	.59899	8.795	185	.000
Pair 2	T2M - CustomerSatisfaction	.22043	.71267	.05226	.11734	.32352	4.218	185	.000
Pair 3	CostPerformanceImprove - CustomerSatisfaction	-.01075	.49853	.03655	-.08287	.06136	-.294	185	.769
Pair 4	MeetQuality - CostPerformanceImprove	-.03226	.60541	.04439	-.11984	.05532	-.727	185	.468
Pair 5	MeetQuality - OrgGains	.03226	.65680	.04816	-.06275	.12727	.670	185	.504
Pair 6	OrgGains - NoOfProduct	.54301	.90690	.06650	.41182	.67420	8.166	185	.000
Pair 7	NoOfProduct - Patent	1.01075	.74970	.05497	.90230	1.11920	18.387	185	.000

Figure 1 Paired samples t-test

4.3 Independent Sample t-test

Independent samples t-Test is applied to assess the differences in NPD Performances based on companies’ background in term of companies’ ownerships, i.e. local or multinational R&D based companies within Malaysia. Null hypothesis in this regard formulated was “there is no difference in NPD performance level between local companies and multinational companies based in Malaysia”. The null hypothesis would be rejected if the p-values was found to be lower than 0.05. For this study, p-value that is less than 0.05 will be highlighted

From Figure 2, significant level for Levene Test (F-value) is 0.878, which is higher than 0.05, hence, null hypothesis that the variances of the two populations are equal, is fail to reject. Therefore independent samples t-test result will be based on assumption that variances are equal between NPD performance of local and oversea companies, or equal variance method is used.

Independent Samples Test

		NPD Performance	
		Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F	.024	
	Sig.	.878	
t-test for Equality of Means	t	-13.304	-13.388
	df	184	145.589
	Sig. (2-tailed)	.000	.000
	Mean Difference	-.53219	-.53219
	Std. Error Difference	.04000	.03975
95% Confidence Interval of the Difference	Lower	-.61111	-.61075
	Upper	-.45327	-.45363

Figure 2 Independent samples t-test

From column “Equal variances assumed” of Figure 2, the significance level for a two-tailed test is 0.000, which is less than 0.05 suggested that the hypothesis is rejected. Therefore, field data reveals that there is significance different in level of NPD performance between Malaysian owned corporations versus multinational companies based in Malaysia. From Figure 3, the average NPD performance in multinational R&D companies within Malaysia is rated at 3.58, while the average NPD performance of local owned R&D based companies is 0.53 lower at the average of 3.05.

Demographic	Local	Oversea	N	Mean	Std. Deviation	Std. Error Mean
NPD Performance	Local Company		69	3.0543	.25945	.03123
	Multinational Company		117	3.5865	.26591	.02458

Figure 3 Independent samples t-test group statistics

4.4 Analysis of Variance (ANOVA)

ANOVA is applied to assess the differences in NPD Performance based on companies operation scale in term of number of R&D staffs. Subgroup of companies operation scale is 4 which are:

- Subgroup 1 = Less than 10 R&D staffs
- Subgroup 2 = 10 to 30 R&D staffs
- Subgroup 3 = 31 to 80 R&D staff and
- Subgroup 4 = More than 80 R&D staff

The null hypothesis states that the NPD performance’s mean of the four sub-groups are equal. The alternative hypothesis HA assumes that the mean are not equal.

Ho: There is no difference in NPD performance level among companies with number of R&D staff.

HA: There is difference in NPD performance level among companies with number of R&D staff of less than 10, from 10 to 30, from 31 to 80 and more than 80.

Table 3 Analysis of variance (ANOVA)

Groups	Analysis of Variance (ANOVA)				
	Sum of Squares	Degree of Freedom	Mean Square	F	Sig.
Between Groups	2.604	3	0.868		
Within Groups	22.469	182	0.123	7.030	0.000
Total	25.072	185	-		

The ANOVA results via SPSS are presented in Table 3. Based on Table 3, as the significance level corresponding to the compared mean in the analysis is observed to be 0.000, which is less than 0.05, therefore, the hypothesis is rejected. The analysis result, hence, suggested that there is significance difference in NPD Performance based on company’s R&D scale in term of number of R&D staff.

The mean NPD Performance rating for each sub-group is shown in Figure 4. It is remarkable to observe that NPD Performance for companies with 80 R&D Staffs or more is the highest with the mean of 3.5846. While companies supported by less than 10 R&D staff scored the lowest NPD Performance level with the mean of 3.2923.

NPD Performance		Less than 10	10 to 30	31 to 80	More than 80	Total
N		71	47	34	34	186
Mean		3.2923	3.3165	3.4963	3.5846	3.3891
Std. Deviation		.33404	.36196	.38495	.33671	.36814
Std. Error		.03964	.05280	.06602	.05774	.02699
95% Confidence Interval for Mean	Lower Bound	3.2132	3.2102	3.3620	3.4671	3.3359
	Upper Bound	3.3713	3.4228	3.6306	3.7020	3.4424
Minimum		2.50	2.38	2.63	2.63	2.38
Maximum		4.00	4.13	4.38	4.38	4.38

Figure 4 NPD performance bases on operational scale

5.0 DISCUSSION

5.1 NPD Performance

The perceived NPD performance in this study was assessed using eight NPD performance’s attributes. The ranking orders of NPD performance level for the eight attributes are as follow, Met Performance Specification, Time to market, Customer satisfaction, Cost and Performance improvement, Met Quality Specification, Organization gains, Number of new products introduced to market per year and Patent disclosure.

The mean performance of 3.39 (refer Table 2) across all the eight NPD performance attributes reveals that the NPD performance within R&D based companies in Malaysia is above average. NPD Performance attribute "Met Performance specification" scores the highest mean of 4.28 which suggest that the achievement of product performance specification has been well managed by R&D based companies in Malaysia. However, finding from the research also reveals that NPD performance related to patent disclosure and number of new product launched per year are relatively low at the level of 1.94. This finding is in line with the statistics extracted from 2008 Malaysian Science and Technology Indicates (MSTI) Report released by Ministry of Science, Technology and Innovation (MOSTIC) [6]. Base on MSTI report, for the period of 2005 to October 2007, a total of 13,266 patents issued by MyIPO, of the total, applications from Malaysia only accounted for 3.3% of total patents granted. Global Comparisons on patterns applied and granted by United States Patent and Trade Mark Office (USPTO) 2008 also reveals that the innovative activities and R&D works by Malaysian is still insufficient.

5.2 NPD Performance versus Company Background

Independent sample t-Test conducted in this study with 5% significance level as criterion revealed that there is significant difference in NPD performance between multinational and local organizations. Multinational organizations tend to perceive a higher performance. The findings from this research are consistent with the survey result of 2009 Malaysia Productivity and Investment Climate Survey Report (PICS-II) [7]. The PICS-II survey reported firm characteristics are often a good predictor of firm performance. The survey suggested large, foreign-owned, exporting firms that engaging in R&D activities tend to have higher labor productivity and total factor productivity than others.

Within the content of the PICS-II survey, the presences of foreign firms have beneficial effects on the performance of domestic firms. The pattern is consistent with the experience of other countries.

5.3 NPD Performance versus R&D Scale

To address the second part of RQ 2, one-way Analysis of variance (ANOVA) was conducted to test differences of NPD performance mean base on R&D scale in term of number of R&D staff as sub group. The mean NPD Performance rating for each sub-group is shown in Figure 4. It is interesting to observe that NPD Performance for companies with 80 R&D Staffs or more is the highest at a mean value of 3.5846. While companies supported by less than 10 R&D staff scored the lowest NPD Performance level with a mean of 3.2923. A notable trend spotted in Figure 4 where companies with bigger scale of R&D staff tend to achieve a higher NPD Performance.

The finding is in agreement with study done by Zhang, Anthony, and Scott who found that increased resource allocation shows a positive relationship to product innovation performance,

in particular for moderately innovative products [8]. A common problem faced by R&D companies is allocation of resources between innovation initiatives in a portfolio [16]. According to Zhang, Anthony, and Scott, the more resources a R&D organization committed towards highly innovative and moderately innovative product development, the more likely it is to use all the knowledge available to it intensively [10]. In turn, this improves the perceived market success of its new products.

6.0 CONCLUSION AND RECOMMENDATION

The research revealed that the level of NPD performance in multinational R&D intensive companies is higher than local R&D intensive companies. The Malaysia's National Innovation Model emphasize on a shift of Malaysian economy from a resource-led economy to an innovation-led economy [17]. However, Foreign direct investment (FDI) by multinational corporations (MNCs) international joint ventures (IJVs) has played a significant role in enabling the country to not only acquire capital, but also the technologies in order to enhance its competitive performance [17]. Hence, the finding from this research implies that national innovation policy should place a pronounced effort upon improving NPD performance among local R&D based companies. For instance, as highlighted in Economy Transformation Program, efforts should be made to provide local companies a better access to research and technologies, improve research infrastructure and provide financial support. All these are the crucial factors which can help raise the level of NPD awareness and NPD performance for local R&D intensive companies.

Findings from this research also imply that NPD performance can be improved by increasing number of R&D staffs. The implication from management perspective is that the management can influence the performance of NPD by optimizing resource allocation across NPD project teams. Eric, Orville and Robert suggested a flexible; project-by-project contingency resource allocation approach which is likely to produce better outcomes on a variety of performance dimensions than adopting a one-size-fits-all approach to organize and manage product development efforts [18].

Although the study covered a wide range of private sector organizations from a variety of sectors, however, the study is limited to a single nationwide sample, which is Malaysia. Generalizing the research results to international contexts and alternate setting may not be applicable. Therefore, future research could be done at other countries with the steps and processes modeled from this study; this would contribute to the knowledge of NPD via determination of how the research output differs between countries.

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