

Evaluation Criteria of New Product Development Process

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ABSTRACT

New product development (NPD) is one of the most importance processes for firms to increase their profit and competitiveness. This study presents the results of a comparison study between Taiwan and Indonesia in the employment of evaluation criteria for NPD process. This study is guided by a stage-gate process to derive a structured NPD performance evaluation framework. In this study we use 20 evaluation criteria that are grouped into five dimensions, market-, financial-, product-, process-, and intuition-based measures. Based on a sample of 148 industrial firms, the findings of the study reveal that evaluation criteria under market-based dimensions are more stressed during the later phases of NPD gates. Financial-based criteria are appearing importantly during the business-analysis gate and product-based criteria are strongly higher than other evaluation dimensions in the product-testing gate. The results of the experiments present useful guidelines for R&D managers as measuring product development and employ appropriate evaluation dimensions for effectiveness and efficiency in NPD related decision making.

Keywords: New product development, Evaluation criteria

1. Introduction

New product is a product bearing a new brand name, or a newly introduced item or line extension; occasionally used loosely to refer to an improved product an exiting brand, or new size. In business and engineering, new product development (NPD) is the term to describe the complete process of bringing the new product or service to the market. This description begins with the identification of an opportunity in the market and come to an end with the successful launch of the product. An NPD project connects many activities, such as classifying the requirements, developing and testing a product concept, fully defining and developing the product, sourcing for suppliers involved, planning manufacturing processes and supply chain, and designing the marketing programs.

One of the most comprehensive study of NPD attributed to Cooper (1993) in which the NPD has represented as a stage-gate system. An NPD system is regarded as a process of development stages interpolated by evaluation stages. And in stages there is a connection to a gate; where in each gate there are criterions to measure whether different tasks have been performed efficiently and effectively. After that, the evaluation of the performance of the NPD effort can be made and managers can make some changes if needed.

In order to insure competitiveness, the industries in many countries engage the NPD management. They are now upgrading their industrial structure from labor-intensive to technology-intensive, service-oriented patterns with emphasizing on industrial innovation and NPD capability. The success of Taiwan in industrialization has been creating an “economic miracle” that has held the attention of the world (Joseph, 2004). The insights

learnt from the industries in Taiwan can be retrieved and reused by the other developing Asia countries.

There is a continuing need to address long-term issues of economic development and industrialization in Indonesia even as the country faces difficult problems of economic stagnation, inflation, and structural adjustment (Thee, 2006) caused by Asian financial crisis. In addition, the study by Hart et al. (2003) point out variation in the usage of criteria during the NPD process without reporting their statistical significance.

This research investigates the NPD processes from firms of manufacturing industrial goods in Taiwan and Indonesia, where it addressed various industrial sectors and it compare internationally. We compare the data from Taiwan and Indonesia to understand the differences in their employment of evaluation criteria during the NPD process. Furthermore, the results obtained from this comparison could be usefully help R&D management team in developing their new product and arranging their resources to areas that need more attention.

Specifically, this study aims at the main objective to help industries in developing countries reduce the uncertainty in their NPD process, and facilitate them to make an effective and efficient decision-making during the NPD process.

- What are the differences in using of evaluation dimensions between Indonesia and Taiwan industries?

2. Literature Review

2.1 Stages – Gates Systems for NPD Process

The first-generation schemes of NPD process have a functional structure where the technical area acts as the NPD guide, marketing being limited to the final phase (that of launch). These models follow a control and measure methodology, ensuring that the project is adequately developed and that all tasks are fulfilled (Booz et al., 1982). The stage-gates systems for NPD process are also known as the second-generations; the schemes were developed and nowadays are applied. The schemes adjust to a systematic process by Cooper (1990) that serves as a guide starting from the generation of a new products idea to its launching. However, this scheme also presents some limitations; the scheme is mainly derived from its structural rigidity, a feature already present in first-generation schemes.

The ideal process of NPD includes a series of checkpoints that allow R&D team to evaluate whether the project is, in fact, viable, and whether the team is on the path leading to its success. The stage-gate systems are integrated in three parallels, but interdependent streams of activities – technical, market, and financial – needed to develop a product from its initial concept through the R&D and to market and launch. The new product stages “define the works” while the gates “facilitate decision making”, as shown in figure 1.

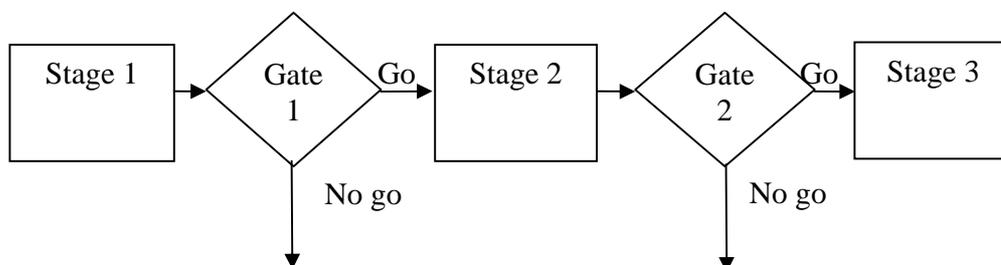


Figure 1 a Stage-Gate for New Product Development Process

Therefore, the NPD process is like a series of stages punctuated by decision point or gates. Where each stages is a set of parallel activities performed by project contributor. And each gate is a checkpoint at which the contributors and commission decision makers or managers (“gatekeepers”) decide to move forward or go back to resolve the key issues or stop the project (i.e., go/no-go decision).

Such a stage-gate system is designed to work as a “funnel” that begins with screening the ideas or projects in the early stages of the project, when fewer resources are utilized, and continues throughout the life of the project. A project leader is in charge in each stage to ensure that the project meets all the required criteria to pass the gate and moves forward to next stage. In the implementation of stage-gate system the team and leader of the project work together from the start of the stage until the end. Beside, many research reviews that such a NPD process is commonly used (e.g., Cooper, 1993; Griffin, 1993; Schmidt and Calantone, 1998). And the stage-gate system also can improve the effectiveness, efficiency and productivity in the execution of key project tasks.

3. Research Hypothesis and Research Instrument

3.1 Research Hypothesis

The study by Hart et al. (2003) compared between the Netherlands and the UK industries reveals that the UK and the Netherlands have similar patterns of evaluation dimensions to be identical for both countries. The preceding discussion suggests the following hypothesis, H1.

H₁: There are significant differences between Taiwan and Indonesia industries for their evaluation dimensions at NPD gates.

3.2 Research Instrument

Total sample in our research is 148 respondents. The sample are based on a survey from Indonesia and Taiwan firms that are developing and manufacturing industrial goods. The unit of analysis considered to answer the questionnaire was the project level. This research instrument was divided into two parts where, the first part was basic information about the respondent, the firms and characteristics of their new product development. Second part is about degree of the importance and the implement of the evaluation gates and how they use the evaluation criteria through the various evaluation gates based on their successful NPD project that had fully launched.

The questionnaire originally was developed in Taiwan for data collection in Taiwan and subsequently was translated in English for data collection in Indonesia. This research used same procedure for collecting the data in both countries. The survey was pre-tested in interviews with eight managers in each county due to the existence of difference languages that used in the questionnaire. All the managers can complete the questionnaire without any questions and the answer categories were clear.

The questionnaire focused on the 20 core evaluation criteria of new product performances. Based on the research of Griffin and Page (1993, 1996) there were 15 cores measuring NPD, including performance *after launch*, with five additional criteria were identified: product uniqueness, market potential, marketing chance, technical feasibility, and intuition. In addition, evaluation criteria were adopted and developed from the literature (hart at al., 2003; Tzokas et al., 2004). These indicators were grouped into five

dimensions: market-based, financial-based, product-based, process-based, and intuition-based dimensions.

Six distinct evaluation gates used in the questionnaire of this study are:

1. Idea screening
2. Concept screening
3. Business analysis
4. Product testing
5. Analyzing test market result
6. After-launch assessment (Short term)
7. After-launch assessment (Long term)

3.3 Data Collection Methods and Sampling

This research uses a purposive sampling method to find these respondents. The purposive sampling is non-probabilistic sampling method where in elements are chosen based on the purpose of the study. Purposive sampling may involve studying the entire population of some limited group or a subset of a population. As with other non-probabilistic sampling methods, purposive sampling does not represent the large population, but it can be exactly what is needed in some cases – study of organization, community, or some other clearly defined and relatively limited group.

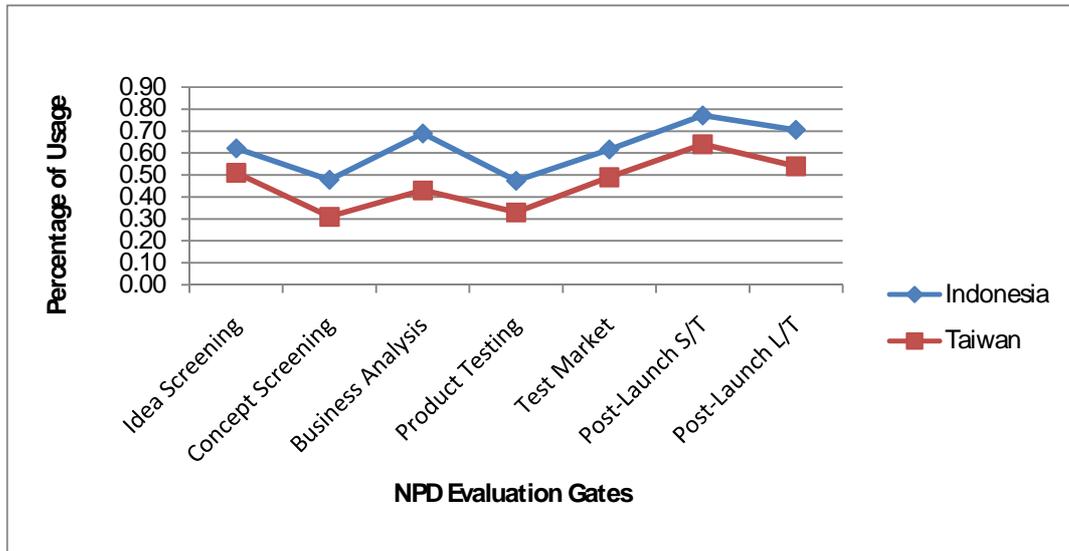
The selected firms for the sample are from industrial manufacturing firms that still involve at least the previous 5 years for their new product development. The people sampled can provide data that are expected to imitate required procedure.

Furthermore, the survey was delivered to 148 firms; 87 firms are from Taiwan and 61 from Indonesia industries. Because the difficulties of finding firms who met the prescreening test, several sources of respondent were using different survey distribution techniques. Of the surveys distributed, 148 usable responses were obtained for an overall. To also obtain a homogeneous sample of Taiwan and Indonesia respondents, only respondents from industrial manufacturing industries were included (N = 148). Because it is a business-level questionnaire, the total sample of 148 industrial firms is enough to conduct the research outcomes.

4. Data Analysis and Discussion

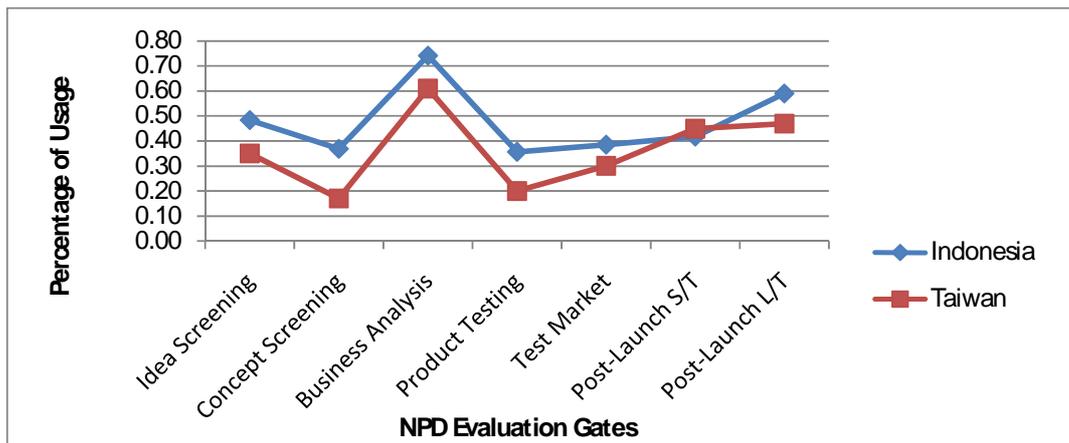
This section examines the H_1 which asserts the differences between Taiwan and Indonesia industries in using of evaluation dimensions at NPD gates. Five dimensions of evaluation criteria are as follows: market-, financial-, product-, process-, and intuition-based. To statistically test the evaluation dimensions from one gate to the next one, data were submitted to a test of differences in means for independent samples *t*-test.

From Figures 2 to 6, the patterns of market-based in evaluation dimensions over the NPD gate show similar patterns between Taiwan and Indonesia samples. Examining Figure 2, it shows that both countries used the market-based dimension more in business analysis, test market and after market launch gates. In both countries, market-based dimension seems to permeate in the end of the evaluation gates in the NPD process. Figure 3 shows the country variations in financial-based dimension for both countries.



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Figure 2 Usage in Market-based Dimension

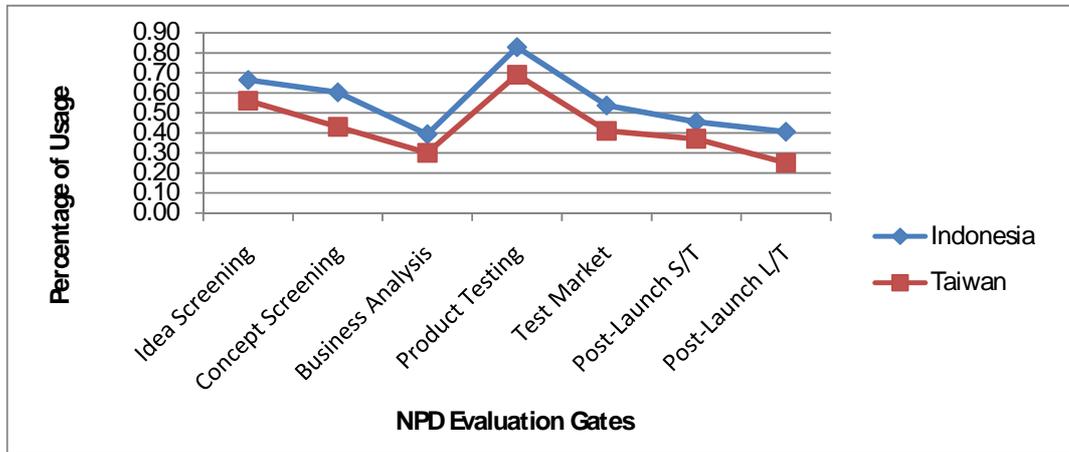


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Figure 3 Usage in Financial-based Dimension

Nonetheless, at the product testing gate it shows the same result between Taiwan and Indonesia firms. Figure 4 shows that the patterns of product-based dimension are used higher in the product testing gate than the other gates. The statistical analysis for product-based dimension shows the same result with the patterns. But in Taiwan, the product-

based dimension emerged prominently at some gate such as concept screening and product testing.

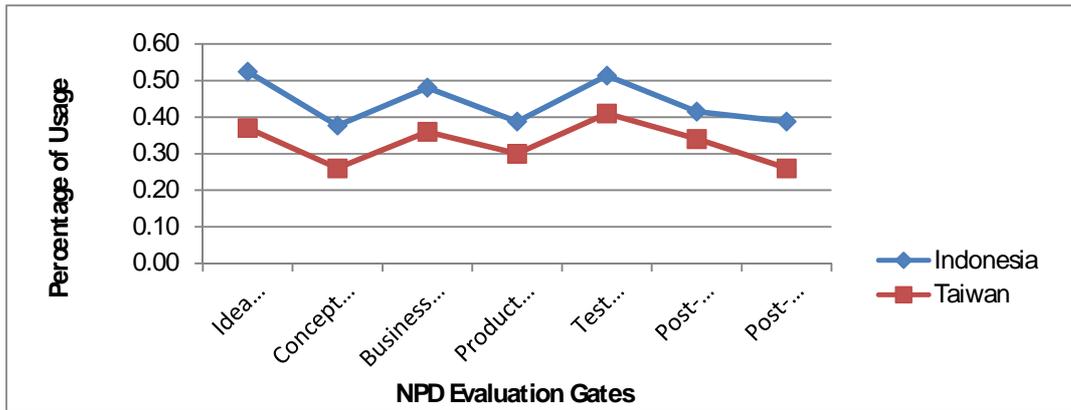


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Figure 4 Usage in Product-based Dimension

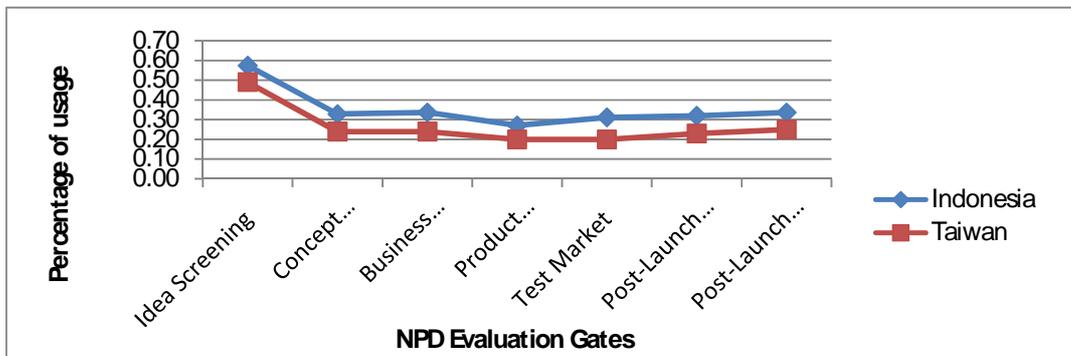
Figures 5 and 6 show the patterns of process- and intuition-based dimensions seem to be used higher in the idea screening gate. However, the criteria in process- and intuition-based dimensions show infrequently use over the entire range of the NPD evaluation gates. The statistical result also shows that there is no significant difference in the first gate for process- and intuition-based dimensions of these two countries.

In summary, the collected data show that the result for both countries is consistent. In fact, only one gate in Taiwan and three gates in Indonesia to appear statistically significant at the NPD process.



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Figure 5 Usage in Process-based Dimension



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Figure 6 Country Variations in Intuition-based Dimension

Table 1 presents the data of firm samples from Taiwan and Indonesia regarding the evaluation dimensions. Only market-based is significant in this gate ($P = .008$). Differing with the concept screening gate, the business analysis gate shows that only market-based dimension has significant differences ($P = .006$). Result from the t -test reveals that in the last fourth gates it shows that there are no significant differences between Taiwan and Indonesia industries in the evaluation dimensions ($P > .05$). This finding provides partial support for the H_1 proposing that there are significant differences between Taiwan and Indonesia industries in evaluation dimensions at NPD gates.

Table 1 Independent *t*-Test for Evaluations Dimensions at NPD Gates from Taiwan and Indonesia Industries

Gate \ Dimension	Market-based	Financial-based	Product-based	Process-based	Intuition-based
Idea Screening	.008	.204	.245	.128	.453
Concept Screening	.032	.025	.046	.208	.258
Business Analysis	.006	.205	.315	.192	.269
Product Testing	.081	.071	.165	.292	.388
Test Market	.121	.432	.172	.268	.141
Post-Launch S/T	.187	.744	.324	.417	.260
Post-Launch L/T	.066	.206	.053	.139	.388
Note. * P<0.05.					

5. Concluding Remarks

5.1. Discussion of Results

This study has provided a conceptual framework for understanding the use of different evaluation criteria at NPD gates. This research contributes to the literature in two ways. First, this study has filled the gap in the study of how the stages of an NPD process accommodate the different dimensions of evaluation criteria. Second, this study has provided empirical evidences of the frequently used evaluation criteria at different NPD gates and difference in evaluation dimensions between newly developed economic bodies (by using firms in Taiwan as the representatives) and developing economic bodies (by using firms in Indonesia as the representatives). Accordingly, our finding from this study set out a potential set of benchmark for firms of to use when deciding the criteria to be employed to evaluate new product at NPD gates.

This study has shown that most of the firms prefer to use several specific criteria simultaneously at distinct NPD evaluation gates. Whereas such market potential criteria are stressed in the idea screening gate of the NPD process from both countries, customer acceptance and technical feasibility are the criteria the most frequently used at concept screening gate. Besides, profit objectives are considered dominant in the business analysis gate, and after the prototypes being developed in the product testing gate, quality and technical feasibility are most important criteria at this gate. During the market launch and after launch, customer acceptance and customer satisfaction are primarily considered.

Interestingly, Taiwan and Indonesia industries have the same result shows no significant difference in the later phases of NPD gates. The study has revealed that firms from Taiwan and Indonesia employ the dimension of market-based in the end of NPD gates to evaluate the new product throughout the NPD process. This result is consistent to Pinto and Slevin (1988) study which proposed that factors such as customer needs and satisfaction become particularly important in the later phases of the NPD process. Another interesting result is that during the product-testing gate both of the countries are stressed in the product-based dimension. According to Hart et al. (2003) it shows technical feasibility was one of criteria that group under the product-based of evaluation dimensions, which is the most frequently used criterion at new product testing. This finding encourages the result from Hart et al. (2003) and Pinto and Slevin (1988) and undoubtedly explanation for the high level success of the projects from this study.

Regarding the differences of evaluation dimensions at NPD gates of Taiwan and Indonesia firms, this study has shown that the usages of go/no-go criteria dimensions were different in the beginning of NPD gates. Particularly, in the idea screening gate market-based criteria from both countries are significantly different. The usage of product-based dimension is higher in the concept screening gate for Taiwan firms, whereas in Indonesia the usage of the market-, financial-, and product-based dimension are relatively the same. In the business analysis gate, the financial-based dimension appears prominently from both countries. In Indonesia, not only financial-based dimension was considered, the market-based dimension emerges prominently at this gate.

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