The analysis of market knowledge competence effect and research & development (R&D) toward the policy making of new product development

Bambang Purwanggono, Agung Sesuko, and Wiwik Budiawan

The Analysis of Market Knowledge Competence Effect and Research & Development (R&D) Toward the Policy Making of New Product Development

Bambang Purwanggono [1, a)], Agung Sesuko[1], and Wiwik Budiawan[1]

Departement of Industrial Engineering Diponegoro University, Semarang, Indonesia

a) Corresponding author: b.purwanggono@gmail.com

Abstract. The increasing mobility of people without adequate provision of mass transportation infrastructures makes people choose private transportation like motorcycles. Such circumstances lead the motorcycle manufacturers in Indonesia competing to develop their products to meet the needs of customers. In addition, the new regulation of Central Bank of Indonesia dealing with the credit advances has raised the intense competition of motorcycles industries in Indonesia. One of the ways to win the competition is by developing new and improved products. In developing and improving the products, companies need to consider resource utilization. In this research, researcher utilizes the resources that exist both inside and outside the enterprise such as customer demands, intensity of competition, perception of the importance of market knowledge, importance of market competence, and internal R&D as well as external R&D is expected to develop new products that are superior. The study involved 150 employees as respondents. The method used in the study is Structural Equation Modeling (SEM) with AMOS 20.0 statistical software. The result shows that the demands of the customers and the intensity of competition lead to a positive effect on market knowledge competence, while the perception of the market knowledge importance does not influence the development of new products, and market knowledge competence, internal R&D and external R&D have positive effect on the development of new products.

INTODUCTIONS

Based on the sales data of motorcycle, PT. Triangle Motorindo as the company being studied is in the 4th rank in motorcycle's sales in Indonesia. The sales of 3-wheeled vehicles, which brand name is Viar is able to be sold up to 30,323 units per year, equivalent to 60% of the total sales of 3- wheeled motorcycles all over the country. This position is not fixed depending on the effort of each company, as intense competition between producers of motorcycles in Indonesia is always present. The emergence of new players in the market also adds to the intensity of competition.

TABLE 1. The Data of Motorcycle's Sales in 2011

Company/Brand	Sales (units)
Honda	2,100,603
Yamaha	1,655,684
Suzuki	255,786
Viar	51,430
Kawasaki	49,447
TVS	12,018

Source: (www.republika.co.id, July 22, 2012)

From the data sales in 2011, the competition among motorcycle companies in Indonesia is significantly increased. New product development is the right step to maintain and even boost up the market of motorcycle products. One of

the effective strategies to keep on surviving the motorcycle market is by implementing a strategy called New Product Development, either in the form of product innovation or production process innovation. In doing an innovation, the company does not have to produce new products, but they can also make improvements and additions on the existing products.

The company's ability to on understand the market demand is very important factor at this time so that they can develop new products according to the customer needs. The changes in a socio-economic system, society expectations, and costumer needs are playing both as an opportunity and a challenge that must be answered by motor companies through their products and services that can satisfy customers [1]. Changes in market demand that occur rapidly and constantly must be followed up by the personnel working behind the stage through improvement of knowledge and skills to support the innovation process.

Companies are required to constantly improve their market knowledge competence in planning the development of new products that have excellence and high competitiveness. The existing studies have enriched the research on the importance of market knowledge competence. Market Knowledge Competence can be a strategic asset of an organization Glazer [2] and Market Knowledge Competence is the main organization competence [3] [4]. Companies are highly recommended to use Market Knowledge Competence in developing the excellence of their new products [5].

One of the departments that have big influence in innovation is the department of Research & Development or often called the R&D department. This department is responsible for conducting research and development, which then, together with the department of Production, apply it to the manufactured products. In fact, to further intensify its innovative production, companies sometimes work with other agencies outside the company or called as the external R&D.

It should be realized, that the success of innovation cannot be achieved by only relying on the R&D department, but also must involve other aspects such as costumer needs, the level of demand, and others. A department, which understands that matter, is the Marketing Department. In addition, there are other parts that also have a role in innovation. Department of Finance is responsible in controlling the financial activities; Department of Personnel is responsible for providing educated, trained and reliable employees, and then top management, which is responsible for the decision-making.

Because of this close relationship among the departments of production, marketing, personnel, and top management, the development of new products will depend on the role of these elements. In order to know what influences the development of new products, the best way is to distribute questionnaires to the related individuals dealing with their active role in the innovation activities. So that it can be seen from the questionnaires what factors that influence the new product development done by PT. Triangle Motorindo.

METHODS

Problem

Based on the earlier description, it can be seen that the competition among motorcycle companies in Indonesia is significantly increased. New product development is the right step to maintain and even boost up the market of motorcycle products. The appropriate new product development involves customer demands, intensity of competition, perception of the market knowledge importance, market knowledge competence, and R&D (both internal and external). Therefore, the issue to be discussed in this thesis is whether or not market knowledge competence and R&D affect the determination of new product development carried out by PT. Triangle Motorindo to compete in motorcycle production industry in Indonesia.

The purposes of the research are (1st) Indentifying the factors that affect new product development at PT. Triangle Motorindo as well as the magnitude of the relationship among these factors on new product development. (2nd) Providing recommendations related to new product development at PT. Triangle Motorindo.

In order to conduct a more focus research, the writers need to limit the area of the research. Limitations of the problem are: The study was conducted in all departments involved in the process of new product development at PT. Triangle Motorindo, Semarang, Central Java. Questionnaires are addressed to at least the staff level employees of the company.

SEM

SEM is an evolution of multiple equation models (regression) developed from the principle of econometrics and combined with the principle of arrangement (factor analysis) of psychology and sociology. Yamin and Kurniawan explain that the rationales underlying the use of SEM are [6]:

a. The SEM has the ability to estimate the relationship between the variables of multiple relationships. This relationship formed in a structural model (relationships between exogenous and endogenous latent constructs).

b. SEM has the ability to describe the relationship between latent constructs (unobserved) and manifest variables (manifest variables or indicator variables).

c. SEM has the ability to measure the magnitude of direct effect, indirect effect, and total effect between latent constructs (the effect of decomposition).

AMOS is an abbreviation of Analysis of Moment Structures, used as a general approach of data analysis in Structural Equation Model, known as SEM. SEM is also known as Analysis of Covariance Structures also called as causal models (causal modeling). By using AMoS, complicated calculation in SEM will be much easier to do, compared to using other software. Moreover the use of AMoS will accelerate in making specifications, view and perform modification models graphically using a simple tool.

CONCEPTUAL MODEL

Customer Demands

Higher customer demands will direct the company to improve its knowledge of customer needs, which has implications for the improvement of the company's market knowledge competence. According to Porter [7] in Hanto [2], there is a relationship between customer demands with customer knowledge process. The company is expected to search the most demanding customers for a motivating factor to get better knowledge about the market needs.

H₁: Customer Demand positively affects the market knowledge competence.

Intensity of Competition

The intensity of competition shows the degree of competition happening in the market where the company products take place. According to Kohli and Jaworski [8], in an intensive market competition, competitor information is needed for two reasons; First, the intensity of competition increases market uncertainty and market unpredictability, so that monitoring of the competition conditions can help companies to anticipate changes in their new product strategy of their competitors and reduce market unpredictability. Second, Day and Wensley [9] stated that the intensity of competition makes products and market become more volatile, and according to [10], the need toward market intelligence is real in the competition intensity of high-tech companies, so that in a highly intense competition, a better understanding of the market is required.

H₂ : The intensity of competition has a positive effect on the determination of the competence of new knowledge strategy.

The Importance of Market Knowledge Perception

According to [11] and [8] top management has an important role in the formation and activities of the organization. According to [12], Top Management is needed to create an environment that supports the process of the market knowledge making in a company. The commitment of management toward market knowledge will assist the company to improve their corporate market knowledge competence. Jaworski and Kohli empirically suggest that a number of top managers consider market information as part of the market intelligence activities toward their customers and competitors, in line with the need for coordination and cooperation between the departments of the company [2] [13].

H₃: The importance of market knowledge perception positively effects on the market knowledge competence determination of new knowledge.

Market Knowledge Perception

In his work, The Impact of Market Knowledge Competence on New Product Advantage: Conceptualization and Empirical Examination, Li & Calantone [14] state that Market Knowledge Competence has a positive influence on the development of new products. In his study, Glazer [15] argues that market knowledge competence is a strategic asset of a company. Hamel & Prahalad [3] and Sinkula [4] find that Market Knowledge Competence as a key of organizational competence. Day [5], and Griffin and Hauser [17] suggest that the use of Market Knowledge Competence is vital to acquire the company new product excellence [2].

H_4: The Market Knowledge Competence has positive effects in determining new product development of the company.

Internal R&D

R&D has a very important role in innovation activities. Activities conducted by R&D including market research, applied research and development, both for product innovation and production innovation in order to improve the competitiveness and efficiency of the company products.

The skill of workers is a very important factor in supporting innovation. The knowledge gained from human effort, human basic strength, the ability to take action and energy are the factors that widely vary in order to overcome the difficulties faced by R&D . Science, intelligence, manpower and expertise are needed to innovate.

In addition, the availability of R&D facilities also affects the ability of R&D in the innovation process. The availability of a complete facility allows the company to conduct its own product innovation.

H_5: Internal R&D has a positive effect on the determination of new product development of the company.

External R&D

External R&D is a part that cannot be separated from the innovation process. The involvement of external R&D can be based on several things such as their competence as the organizations or private institutions, limitations of the technology, the cost of the external R&D which usually is more expensive than internal R&D [16].

Beside, the internal R&D of companies can collaborate with external R&D in the innovation process. Through external R&D, companies can also learn things that have not been found in their internal R&D, especially in terms of the utilization of technology, science, organizing, and others [18].

H_6: External R&D has a positive effect on the determination of new product development of the company.

Determination of Conceptual Model

The conceptual model used is the result of a review of the literature and previous research that has been done. Furthermore, the formulation was developed as a research hypothesis that will be carried out by the authors.

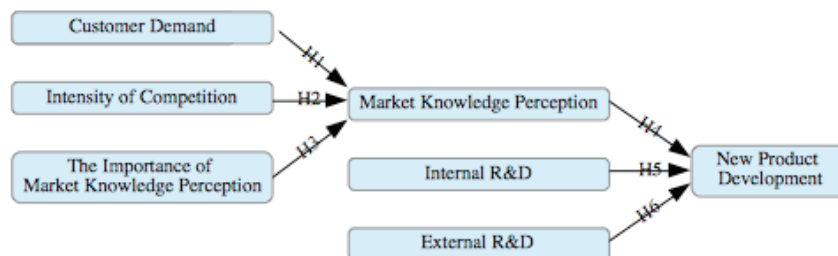Here is a picture of conceptual model used:

FIGURE 1. Conceptual Model

TABLE 2. Statements Used in the Study

No.	Variable	Statement
1		The reliability of motorcycle will not be decreased although it is used for more than 5 years.
2		PT. Triangle always conducts the improvement of motorcycles quality in order to achieve the standard of Japanese-made motorcycles.
3	Customer Demand	Customer satisfaction is increased along with the quality improvement.
4		The engineers will directly respond any complaints from customers.
5		Motorcycle pricing is adapted to the quality and economical condition of society.
6		Customers tend to choose motorcycles with low price but are able to meet their needs.
7		The interest changing of customers causing difficulties in predicting the market.
8		Focus on one market will reduce the level of market uncertainty.
9	Intensity of Competition	There are about 10 companies that considered as our competitors.
10		Cheap price and quality have become the current trend of motorcycle competition.
11		The company has launched a new variation every 5 month.
12		The company has a great attention toward knowledge sharing activities.
13	The perception of market knowledge importance	Knowledge sharing activities are conducted every one-month.
14		Through customer surveys, we can know the advantages and disadvantages of Viar motorcycle.
15		Customer survey is conducted every one year.
16		The information obtained from customer surveys can be used as input to the future improvement and development of the motorcycles.
17		The company has complete information about the customers demand toward our motorcycle production.
18		The company has created a motorcycle according to the demand of customers.
19	Market knowledge competence	Our company continues to accommodate and respond to any input from the customers.
20		Information about the company's competitors is sufficient.
21		The company has applied the information obtained from the benchmarking information (comparative studies) toward the competitors.
22		The budget provided is sufficient to conduct product development.
23		Budget issued is equal to the development cost new products.
24		Cooperation between departments is needed to develop the new products.
25	Internal R&D	Results of teamwork are more satisfactory than individual work.
26		Product development facilities provided have been used optimally.
27		Facilities provided to develop the products are adequate and used optimally.
28		Doing collaborative research with other institutions can reduce funds spent on product development.
29		Doing collaborative research with other institutions will reduce losses suffered.
30		Doing collaborative research with other institutions can minimize risk of failure on product development.
31	External R&D	Information leakage occurs more easily within collaborative research compared to individual research.
32		Employee's skill involved directly in collaborative research with other institutions will be improved.
33		Technology acquired when doing collaborative research with other institutions may be applied within the company.
34		Improvement of motorcycle function and quality is the right way to improve the performance of the motorcycle.
35	New Product Development	Developing the existing motorcycle can do reproduction of motorcycle variation.
36		The company has more than 5 variations of the motorcycle.
37		All motorcycle's parts are installed perfectly so it is comfortable to ride.
38		Motorcycle still can function well although it has been used for more than 1 year

The hypotheses used by the author for the study are:

H1 : Customer Demand has positive effect on the market knowledge competence.

H2 :The intensity of competition has a positive effect on the determination of new knowledge competence strategy.

H3 : The importance of market knowledge perception has positive effect on the determination of new knowledge competence.

H4 : Market knowledge competence has positive effect on the determination of the companies' new product development.

H5 : Internal R&D has a positive effect on the determination of the companies' new product development.

H6 : External R&D has a positive effect determination on the new product development.

THE FOLLOWING STATEMENTS USED IN THIS STUDY HAVE BEEN ADJUSTED WITH THE VARIABLES USED

RESULTS AND DISCUSSIONS

Confirmatory Test

The results obtained after conducting a confirmatory test of exogenous variable are that the P regression weights values of exogenous constructs are all below 0.05, so no elimination is needed. Then, for the Standardized Regression Weights of exogenous constructs, there are 4 indicators that have estimate values less than 0.5, namely F1, F6, R4, A6 and therefore they should be eliminated. After that, the results of the goodness of fit after performing re-specification are in Table 3.

TABLE 3. The Results of Goodness of Fit of Exogenous Construct Index

Goodness of fit Index	Cut off-value	Result of analysis	Evaluation of Model
CMIN/DF	< 2	1,646	Good
Probability	≥ 0,05	0,000	Poor
GFI	≥ 0,90	0,835	Marginal
AGFI	≥ 0,90	0,796	Marginal
TLI	≥ 0,95	0,895	Marginal
CFI	≥ 0,95	0,908	Marginal
RMSEA	0,05 ≤ 0,08	0,066	Good

Then the results obtained after performing the confirmatory test for the endogenous variables shows that there is no indicator that should be eliminated for the regression weight and the standardized regression weight. So, the goodness of fit obtained is as in the Table 4.

TABLE 4. Results of Goodness of Fit Index of Endogenous Constructs

Goodness of fit Index	Cut off-value	Result of analysis	Evaluation of Model
CMIN/DF	< 2	1,583	Good
Probability	≥ 0,05	0,170	Below Good
GFI	≥ 0,90	0,937	Good
AGFI	≥ 0,90	0,899	Marginal
TLI	≥ 0,95	0,960	Good
CFI	≥ 0,95	0,970	Good
RMSEA	0,05 ≤ 0,08	0,063	Good

After that, the next step is to conduct confirmatory test for the overall model and the result is the following Table 5:

TABLE 5. The Results of Re-Specification of Goodness of Fit Index on The Overall Model

Goodness of fit Index	Cut off-value	Result of analysis	Evaluation of Model
CMIN/DF	< 2	1,843	Good
Probability	≥ 0,05	0,000	Marginal
GFI	≥ 0,90	0,746	Marginal
AGFI	≥ 0,90	0,710	Marginal
TLI	≥ 0,95	0,816	Marginal
CFI	≥ 0,95	0,829	Marginal

Then it is continued with the testing of hypothesis which shows that customer demand and the intensity of competition have a positive effect on the market knowledge competence while the perception of the importance of market knowledge does not have positive effect on the market knowledge competence because the value of c.r. < 1.96 and P value > 0.05. The market knowledge competence, internal R&D and external R&D have a positive effects on the new product development.

SEM Assumption

The analysis of structural model assumption can be done by observing data normality, evaluation of outliers, and multicolinearity evaluation. The samples used were 150 samples based on the maximum likelihood criteria [19]. Looking at its univariate, the data is considered normal because the value of c.r. skewness is smaller than 2.58. But in multivariate analysis, the data is not normal because it exceeds 2.58, which is 3.737. To find the data outliers, mahalonobis distance is used. Mahalanobis Distance values obtained is (34,0.001) = 66.25, and there is no data that exceeds such value. Then for multicollinearity, the result is 0.00. So, there is still a problem with its multicollinieirity.

CONCLUSIONS

The following are the variables that affect the new product development:
a. External R&D has a positive effect toward the determination of company new product development. This can be seen from the result of critical ratio value of 4.55 and probability value, which is below 0.05. The estimation value is 0,679, which means that external R&D has a positive effect by 67.9% toward the new product development.

   It can be said that PT. Triangle Motorindo has an external R&D source which is more advanced than its internal R&D. PT. Triangle Motorindo has a co-operation with Chinese enterprises producing the motorcycles The motorcycle samples from China will be tested first and adjust them according to the conditions in Indonesian market by company's internal R&D.

b. Market knowledge competence has positive influence toward the determination of company new product development. This can be seen from the value of critical ratio of 2.681 and the obtained probability of 0.007. The estimation value obtained is 0.269, which means that market knowledge competence has 26.9% of influence to the determination of company new product development.

   Market knowledge competence is an important foundation for PT. Triangle Motorindo to compete with other motorcycle companies. Because by having the market knowledge competence of both the consumers and the competitors, PT. Triangle Motorindo can create a quality motorcycles.

   Market knowledge competence itself is affected by the following variables:
   i. The intensity of competition has a positive effect toward the market knowledge competence. This can be seen from the value of critical ratio which is 4.701, and the probability value which is below 0.05. The estimation value is 0.525, which means that the intensity of competition has a positive effect by 52.5% to the market knowledge competence.

      PT. Triangle Motorindo produces motorcycle according to the motorcycle segment in Indonesia to compete with other motorcycle companies. Through the competition, customers will increasingly recognize motorcycles produced by PT. Triangle Motorindo and want to give a try. So, customers will

give feedback to the company. Other than that, from the competition, PT. Triangle Motorindo can also identify the strategies used by competitors to win the competition.

    ii. Customer demand has positive influence on market knowledge competence. This can be seen from the critical ratio value of 4.304 and the probability value, which is below 0.05. The estimation value is 0.465, which indicates that customers' demand has positive impact by 46.5% of the market knowledge competence.

The more PT. Triangle Motorindo pays attention and responds well to complaints, suggestions and demands of costumers, the more market knowledge competence they will get. So that company will have solid foundation if they want to produce or develop more motorcycles.

    iii. The perception of the importance of market knowledge has no positive effect on the market knowledge competence. This can be seen from the value of critical ratio of 1.726 and a probability of 0.08, which mean they do not meet the criteria.

This could be caused by a reason that only few people holding certain positions in PT. Triangle Motorindo have good perception toward the importance of market knowledge.

  c. Internal R&D has a positive effect on the determination of the company new product development. This can be seen from the value of critical ratio of 2.925 and a probability of 0.003. The estimation value is 0.212, which means that the internal R&D has a positive effect by 21.2% to the determination of company new product development.

Although the Internal R&D of PT. Triangle Motorindo cannot create their product completely by their own design, the internal R&D of the company still has an important role, especially in testing the samples and evaluating the motorcycles so that the motorcycles will be produced according to their customer expectations.

REFERENCES

1. Siringoringo, Revoldi H dan Madya, Widyaiswara, 2011, Manajemen Proses Inovasi. BPKP, Jakarta.
2. S. Hanto," Analysis of Internal and External Factor to Market Knowledge Competences in New Product Development (in Bahasa)", Diponegoro University Eprint, 2002.
3. G. Hamel, & C.K. Prahalad, "Competing for The Future," Harvard Business School Press, 1994, pp.105-108.
4. J. M. Sinkula, "Market information processing and Organisational Learning, "Journal of Marketing 1994, pp. 58, 35-45.
5. G. S. Day, "The Capabilities of Market-Driven Organizations." Journal of Marketing 58 (October) 1994, pp.37-52.
6. S. Yamin, and H, Kurniawan, "Structural Equation Modeling: Analyisis Technique Questionaire Data with LISREL-PLS (in Bahasa)," Jakarta: Salemba Infotek, 2nd Edition, 2009.
7. M.E. Porter, "The Competitive Advandtage of Nations,"Harvard Business Review, 1990.
8. A, K. Kohli., and B.J. Jaworski, "Market orientation: the construct, research propositions, and managerial implications," The Journal of Marketing, 1990, pp.1-18.
9. G. S. Day, and R. Wensley, "Assessing Advantage: A Framework for Diagnosing Competitive Superiority." Journal of Marketing, 1988, pp. 1-20.
10. E. Bridges, K.B. Ensor, J.R. Thompson., "Marketplace Competition in The Personal Computer Industry," Decis. Sci, 1992, 23, pp. 467-477.
11. R. Deshpandé, J.U. Farley and F.E. Webster," Corporate Culture, Customer Orientation, and Innovativeness in Japanese Firms: A Quadrad Analysis, "Journal of Marketing, Vol. 57, No. 1 (Jan.,), 1993, pp. 23-37.
12. Gupta, Raj, and Wilemon, "A model for studying R&D - marketing interface in the product innovation process", Journal of Marketing, 50 (2), 1986, pp. 7-17.
13. B.J. Jaworski, and A.K. Kohli, "Market orientation: antecedents and consequences", The Journal of Marketing, 1993, pp. 53-70.
14. T. Li, R. J. Calantone, "The Impact of Market Knowledge Competence on New Product Advantage: Conceptualization and Empirical Examination," Journal of Marketing, Vol. 62, 4, 1998, p. 13-29.
15. R. Glazer, "Marketing in an InformationIntensive Environment: Strategic Implications of Knowlede as an Asset," Journal of Marketing, Vol. 55, !991, pp. 1-19.
16. C. K. Prahalad, and G. Hamel, "The core competence of the corporation, "Boston (MA), 1990, pp. 235-256.
17. A. Griffin, J. R. Hauser, "Patterns of Communication Among Marketing, Engineering and Manufacturing- A Comparison Between Two New Product Teams," Management Science, 38-3, 1992, pp. 360-373.
18. Huang, Yu-an, Chung, Hsien-Jui, and C. Lin, "R&D sourcing strategies: Determinants and consequences", Curtin University of Technology, Australia, 2009.
19. I. Ghozali, "Structural Equation Modeling and Aplication with AMOS 19.0 (in Bahasa),"Diponegoro University Press, Semarang, 2011.
20. www.republika.co.id, "Motorcycle Sales Data," Access at Juli 22, 2012.