THE INFLUENCE OF THE SUPPLIER ON THE SUCCESSFUL NEW PRODUCT DEVELOPMENT

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Abstract

The article explores the importance of involving suppliers in the development of new products. We identify driving factors, risk factors and success factors that are associated with the integration of suppliers in the development of new products. Based on these findings, we define criteria for successful evaluation and selection of suppliers that are potential candidates for inclusion. Integrating suppliers into the process of development significantly changes the relationship between the customer and the supplier. We determine whether the elaboration of a detailed supplier assessment increases the efficiency of the project group for the development of new products and how the integration of the supplier into the development process in the selection of technical goals and guidelines increases the efficiency of the project team. We are interested in whether the involvement of the supplier in the development process in the selection of business goals and orientations increases the efficiency of the project team and how such an increase affects the financial performance of the company and improves the design of the new product also from the perspective of the supplier.

Keywords: New product development; supplier; process; project group; efficiency.

1. Introduction

The process of new product development is a set of activities that allow an organization to launch a product on the market. In this case, the product can be in tangible form (product), or in intangible form (service) and represents a benefit for the manufacturer (added value) and for the customer (solving a problem or meeting expectations).

Over the years, various authors have provided several insights into the process of new product development:

- the process of developing a new product is all the effort focused on creating a new product, process or service [1];
- the process of developing a new product is the transformation of market opportunities and the set of assumptions regarding product technology into a product that will be available for sale [2];
- The process of developing a new product is to identify new product opportunities and transform these opportunities into product design, which can be successfully commercialized with the highest possible return on investment and compatible with the company's resources [3];
- new product development is a fundamental process that plays a major role in the success of a business in the global economy [4];

New product development has become an important process that helps to consolidate and secure a firm's competitive position in the market [5]. If a company fails to develop new products, then they risk a lot. Customers' needs are constantly changing, their desires, new technologies are being developed, the product life cycle is shortening and competition is increasing. Indicators that confirm this are the high shares of sales resulting from new products of individual companies. In the recent period, as much as 42% of European companies' sales were due to new or improved products that they have introduced to the markets. Businesses are increasingly investing in research and development (average annual growth in investment by European companies in the recent period was 1.3%, US companies 3.2% and Japanese companies 1.3%) [6].

With increasing competition in the markets, new product development must become an essential business activity. An effective new product development process has become a success factor for the introduction of new products [7]. Businesses must also face the pressure to produce products much faster while also improving them. Increasingly intense competition and changing customer demands are reducing the commercial life of products and thus reducing the period during which companies can recover their initial investment [6]. This ability of the company or organizations to launch new products faster, more frequently, with higher quality, the competitive advantage is recognized [7]. All companies operating in today's markets are aware of the fact that the cost of late entry can be very high [6].

Just as different authors give different reasons for new product development, we also know the different divisions of the new product development process. According to a study by Rochford and Rudelius on the number of phases in the product development process, companies most often implement the phases: brainstorming, product development, and product testing [8].

In addition to the development stages, the product life cycle is also important, which is actually an analytical model that displays and monitors a product with a lifecycle (PLC) and can be used as a method for forecasting appropriate demand and sales in a particular market segment. If a company knows the stages of a product's life cycle, it can determine marketing strategies accordingly [9].

Nowadays relationships between suppliers and companies are becoming more and more intense and collaboration between manufacturer and supplier has benefits for both partners. Therefore, the main purpose of this paper is to research how supplier involvement affects the effectiveness of new product development teams and whether the effectiveness of development teams affects the success introduction of new product into the market and overall business success. In that manner we firstly made an analysis of theory, secondly developed research model with antecedents (supplier assessment, technical assessment, business assessment) and consequences (financial performance and new product success) of the effectiveness of the new product development team and finally presented the result of empirical testing of research model in the sample of manufacturing companies in Slovenia. At the end of the paper, conclusion and future research intentions are presented.

2. Suppliers and purchase function

Purchasing has always been one of the most important functions in companies. It is of strategic importance for companies, as it must provide the right goods from the best suppliers in the right quantity, at the right time and under favorable payment terms. Often in the business world the term management of supply and supply chains. This actually means connecting different suppliers (sellers), distributors and customers (buyers) into a kind of common process. The aim of such management is to engage different companies in the supply chain [10]. Because it is not easy to find precise instructions for designing a purchasing strategy, companies look at different models.

The purchasing function covers responsibilities for tasks designed [11]:

- defining the specification (quantity and quality required) for the material and services to be purchased;
- choosing the most suitable supplier;
- preparing to negotiate with suppliers for the conclusion of the transaction;
- ordering from the selected supplier;
- monitoring and control of order fulfillment;
- subsequent monitoring and evaluation of delivery.

2.1 The Impact of Purchasing on the Performance of a Business

The influence of the purchasing function on the overall business performance of an entity is reflected in the following [11]:

- **Material standardization:** Procurement can reduce its own cost by reducing the number of different types of material. This is achieved by standardizing certain standard materials (rather than brands of specific suppliers) and / or suppliers. This makes the company less dependent on certain suppliers, better able to make competitive offers and reduce the number of materials in stock;
- **Smaller inventories:** If a company imposes strict discipline on suppliers, carefully schedules deliveries, and / or has specific stock arrangements with suppliers (such as a commission stock contract), purchasing can significantly help reduce the capital needed;

- Contribution to innovation: As early as 1978, author Von Hippel has proven that through intensive interaction between suppliers and customers, industrial innovation can be generated. Procurement should strive for this kind of interaction, as this can contribute to a continuous flow of innovation and material improvement, which in turn leads to greater competitiveness of the company in the end-user market;
- Quality cost reduction: The cost of input and quality control of material purchased can be reduced by selecting suppliers who have good control over their production and a well-organized quality area;
- Increasing flexibility: Companies are now under increasing competitive pressure, and as a result, more and more companies are introducing flexible manufacturing systems, which improves the company's market responsiveness.

2.2 Criteria for evaluating and selecting suppliers to be involved in the product development process

Supplier evaluation criteria address product and production factors, other company characteristics, and third relationship criteria. They can be divided into [12]:

- Evaluation criteria and
- Selection criteria

Evaluation criteria are objective data that can be collected and assigned value by the customer's business. They are known from the literature as “solid data”. Selection criteria are more “soft criteria” that are harder to measure or quantify. These criteria are evaluated and judged by specific employees of the buyer's company. “Soft criteria” also require more effort and knowledge from employees to be able to properly evaluate and estimate [12].

The evaluation criteria are [12]:

- Product and production factors: cost, quality, product performance, timing, ability to increase production, ability to achieve goals, innovation, technical competences or competence and knowledge.
- Characteristics of the company: senior management support, culture, thinking and strategic orientation, supplier commitment and commitment of its top management, supplier readiness and ability to share information, supplier growth potential, mutual benefit relationship, future planning, business knowledge, employee education, technical support, stability and profitability, general competences, genuine interest, appropriate organization.
- Relationship criterion: Supplier's view of partnership, trust, openness.

However, the criteria for selecting a supplier are [12]:

- Product and production factors: quality, cost, delivery and reliability, performance or product capacity, production capacity, design capabilities, technological capabilities, speed in development, speed, or level of technological change, leakage of information (the supplier may have information or knowledge that the manufacturer does not wish to release), technical knowledge (the supplier may have more knowledge of a particular technology).
- Company Features: desired goals, economic performance and stability, management attitude, top management compatibility, cross level and functional compatibility, organizational structure and staff, business references and customer base, management support, future strategies, likelihood of becoming competitor, innovative reputation, business potential, market interest (whether the supplier has an interest in the market and is willing to explore the market).
- Relationship criterion: knowledge and experience of the past, empathy, ability to adapt, philosophy, relevance, trust, to believe in a project, learning ability, openness to discuss.

The most critical strategic decision is to choose the right supplier to be involved in the development of a new product. The supplier's ability should be among the most important. The ability can be interpreted in two ways. The first way is the supplier's ability to master new or complex technology. Another way is the supplier's ability to provide an outside aspect. Many managers are of the opinion that without this external perspective, they would never have used the idea of using innovative solutions and might prefer to stick to the traditional way. Most important criteria were confidence and reliability, openness and mutual support, and goal matching and mutual benefit. Some of the more important criteria that are important when selecting members of a project team to develop a new product include: communication capabilities, personal character relevance, and the competencies of each member. Other criteria include culture, motivation, confidence, project management, ability to work in a team, language and ability to work interdisciplinary [13].

2.3 Client-supplier relationship

Companies that have started to involve their suppliers in product development do not consider suppliers as only manufacturers of parts, but also as partners in the design of innovative products. Clients (producers) trust suppliers not only to produce parts, but also to develop specific parts and, increasingly, to even develop complete (sub) systems. Collaboration between client and supplier in the development of new products is becoming increasingly important. Managing such cooperation, however, is very complex, as there are many examples of unsuccessful efforts. Obviously companies have problems getting involved with suppliers that they are not used to. As today's market demands are

increasingly unpredictable and constantly need to be adjusted, the involvement of suppliers in product development processes is increasingly important for faster production, lower manufacturing costs and increased product quality and competitive advantage.

Manufacturers involving suppliers gain knowledge, capacity and can share costs and risk. Compared to previous years, the role of suppliers has changed a great deal today. The most important changes are [14]:

1. Increased added value: The role of suppliers (customers) has changed since they used to manufacture parts for the manufacturer (client) on demand, but now they are actually responsible for developing a specific part. This increases the added value of the products delivered to the manufacturer. At the same time, customers begin to require suppliers to deliver not only parts but entire subsystems that have even greater added value.
2. Longer duration cooperation: Traditionally, contracts last anywhere from 1 to 2 years. When the contract expires, it is necessary to renegotiate. In this way, it is possible for more than one supplier to participate in product development. In the case of long-term cooperation between the client and the supplier, the supplier is involved in product development already at the design stage. In such cooperation we cannot change the supplier as much as the process of product development is complex. As a result, such collaboration lasts throughout the product life cycle.
3. Greater interdependence: As suppliers bring greater added value and last longer client engagement, clients become much more dependent on suppliers than in the past. Suppliers and clients are more interdependent.

Fig. 1. Changes in the client-supplier relationship [14]

These changes have greater implications for customer collaboration. In a traditional relationship (asymmetric power balance), one side is dominant and usually imposes requirements on the other (Figure 1a). In the newer strategy (Figure 1b), there is greater equality between the parties, and both sides can set conditions. Neither side attempts to influence or control the other. In doing so, they gain both sides [14].

Author Helper distinguishes between two types of relationships. The first type is called an "outbound relationship," in which the client's company begins to look for a new supplier in the event of a problem with the supplier. The second type of relationship is called "voice relationship", where the client wants to solve this problem together with the supplier when the problem arises. In the past, customer-supplier relationships were mostly "outbound". More recently, however, manufacturers and customers want to build more long-term relationships with their suppliers. Collaboration between the client and the supplier in the processes of new product development increases the need for mutual agreement and communication. Mutual agreements relate to many factors in the client and supplier, at many levels of goals, processes, machines, methods, tools, people, knowledge and abilities, human relationships, organizational arrangements (defining tasks, roles, responsibilities and authorities) and culture. Too large changes between client and supplier organizations, or a lack of understanding of these differences, can lead to difficult or impossible cooperation [14].

Product development collaboration changes the role of suppliers and customers in the product development process. Customers and suppliers are becoming increasingly interdependent. The relationship between them is becoming more equal and less hierarchical [14].

It is evident that suppliers gain a new role, namely, companies invite suppliers to become their strategic partners in the process of development new products. This means that suppliers not only produce parts, but are also responsible for the design or design parts development. Companies are also looking for suppliers who can develop and produce subassemblies. Such suppliers are called system suppliers and are responsible for a specific subassembly in the design, production, and assembly process. In this way, the so-called stage structure is constructed. The system supplier becomes the first-tier supplier and the parts supplier becomes the second-tier supplier [14].

3. Research

The aim of the research was to determine how supplier involvement affects the effectiveness of development teams and whether the effectiveness of development teams affects the improvement of the return on investment in new product development and product design. A similar study was conducted by Petersen et al [15]. We have shown the links in the model presented in Figure 2, which also shows the hypotheses raised.

3.1 Hypotheses

The hypotheses were summarized by Petersen et al [15]:

HYPOTHESIS H1 - Detailed Supplier Assessment: Creating a detailed supplier evaluation enhances the effectiveness of the new product development team. We have measured the supplier rating in detail with the following variables:

- The degree of agreement that the right supplier was selected at the start of the project.
- The degree of agreement that the capabilities of the supplier have complemented the capabilities of the customer.
- The degree of agreement that the culture of the selected supplier was in line with the culture of the buyer's company.
- The degree of agreement that the supplier selection process we have engaged in the development of the new product has been effective.

Fig. 2. Research model [15]

HYPOTHESIS H2 - Technical Assessment: Involvement of the supplier in the development process in the selection of technical goals and measures increases the efficiency of the Task Force for New Product Development. The technical evaluation was measured by the following variables:

- The degree of supplier involvement in the definition of technical efficiency measures.
- The degree of supplier involvement in the definition of technical efficiency targets.
- The degree of involvement of the supplier in the common agreement between the supplier and the customer regarding the technical objectives.

HYPOTHESIS H3 - Business assessment: involvement of the supplier in the development process in the selection of business goals and measures increases the efficiency of the new product development project team. Business assessment was measured by the following variables:

- The degree of supplier involvement in defining business performance measures.
- The degree of supplier involvement in defining business performance goals.
- The degree of supplier involvement in the supplier-buyer agreement on business objectives.

HYPOTHESIS H4 - Financial performance: The higher the efficiency of the Task Force for new product development, the higher the financial performance of the company. We measured financial performance with the following variables:

- Increased customer sales due to supplier involvement.
- Increased profits due to supplier involvement in new product development project.
- Increased return on investment due to the involvement of the supplier in the development of a new product.

HYPOTHESIS H5 - Product Design Success: The higher the efficiency of the new product development task force, the better the design of the new product from a supplier perspective. Product design efficiency was measured by the following variables:

- The degree of agreement that, due to the involvement of the supplier, such a product was developed that was easier for the supplier to produce than if the supplier had not been involved.
- The degree of agreement that a product has been developed as a result of the supplier's involvement, resulting in less cost to the supplier than if the supplier were not involved.
- The degree of agreement that engaging the supplier in the development project has helped to better shape the product.
- The degree of agreement that supplier involvement has helped to improve the design / technology of the end product / service.

The effectiveness of the project team was measured by the following variables:

- The degree of agreement that the involvement of the supplier in the new product development project has influenced the better functioning of the project team.
- The degree of agreement that supplier involvement influenced the better decisions of the task force.
- The degree of agreement that the involvement of the supplier in a new product development project has influenced faster problem solving during the design process.
- The degree of agreement that supplier involvement in a new product development project has influenced greater consensus on the decisions made by the project team.
- The degree of agreement that the involvement of the supplier in the new product development project has made it possible to set more realistic project goals.

3.2 Methodology

The questionnaire was summarized by Petersen et al [15] and converted into electronic form. For ease of understanding, we have provided some explanations for some of the issues. The companies we sent the questionnaires to are involved in product development. The questionnaire was highly structured with closed-ended questions. Respondents had to evaluate 6 constructs, and each construct was measured with several variables, with a total of 22. Respondents were asked to answer the questions they asked related to their last known project involving suppliers. In addition, we have also provided them with a definition of supplier involvement in product development.

The questionnaire consisted of 23 questions. On the first 22 questions, the respondents expressed their degree of agreement on the claims made on the basis of a five-point scale, where the grades indicated:

1- I completely disagree, 2- I disagree, 3- I don't know, 4- I agree, 5- I completely agree

The questionnaire was sent to 380 companies with the support of the Styria and Savinja-Sale Chambers and based on the entry of companies in PIRS, Ipis, Gvin, TiS, Bizi.si and similar databases. We received 57 responses, which means that the response rate was 15%.

3.3 Data processing methods

We used the SPSS statistical program to process the data. Because each of the factors studied was measured by several variables, an exploratory factor analysis was performed to explain the relationship between a larger number of variables and a smaller number of factors. We also performed a regression analysis for six factors or constructs. This was followed by hypothesis testing.

4. Results

We measured each of the factors studied with several variables, so we first performed exploratory factor analysis. Factor analysis seeks to clarify the links between a larger number of variables and a smaller number of factors that represent common dimensions. Inside the data, it looks for directions of maximum variance and uses them to classify the data into some dimensions, which it interprets as factors. Factor values cannot be directly measured. Factor analysis aims to determine whether the relationships between the observed variables are explained by a smaller number of indirectly observed factors. If the measured variables are not related to each other or there is only a weak relationship between them, the use of factor analysis does not make sense. Under the factors we mean latent (immeasurable) causes that cause correlation between the original variables [16].

Fig. 3. Evaluated research model

First, we determined the reasonableness of combining the variables into factors and confirmed by calculating the level of characteristic p that was less than 0.01. We also measured the strength of the association between variables with the Kaiser-Meyer-Olkin (KMO) test, where a value of 0.760 indicated that factor analysis was appropriate. The reliability of the variables in the measurement system was confirmed by calculating Cronbach's α coefficient, which ranged from 0.700 to 0.915 for individual factors. Confirmation or rejection of a particular hypothesis was accepted on the basis of the calculated level of characteristics, which in all cases was less than 0.01 (Figure 3). The quality of the regression model was evaluated by the coefficient of determination R^2 (values at the connections in Figure 3), which verifies the individual claims.

In the first hypothesis (H1), making a detailed supplier assessment is positively related to increasing the effectiveness of the development team and therefore the hypothesis is accepted ($p < 0.01$). In the second hypothesis (H2), the involvement of the supplier in the development process in the selection of technical goals and measures is positively related to the increase in the effectiveness of the development team and the hypothesis is accepted ($p < 0.05$). The third hypothesis (H3), which states that the involvement of the supplier in the development process in the selection of business goals and measures is positively related to the increase in the effectiveness of the development group, was not confirmed ($p > 0.05$). In the fourth hypothesis (H4), increasing the effectiveness of the new product development team is positively related to improving the financial performance of the firm and therefore the hypothesis is accepted ($p < 0.01$). In the fifth hypothesis (H5), increasing the effectiveness of the new product development task force is positively related to improving the design of the new product and the hypothesis is accepted ($p < 0.01$).

5. Conclusion

The study examined the area of supplier involvement in new product development. For the purposes of this, we have defined the related concepts in the initial steps. Procurement has a wide range of tasks within companies and one of them is precisely the evaluation and selection of suppliers. For the purposes of this, we proposed criteria that can help companies make the right choice for suppliers. The benefits of supplier involvement can be of great importance to the company, but it should also have in mind that there are also risks involved in supplier integration that can dissuade many companies from engaging suppliers in product development.

The research aimed to identify how supplier involvement affects the effectiveness of development teams, and whether the effectiveness of development teams affects the improvement of the return on investment in new product development and more successful product design, consisted of several steps. We developed initial research model and proposed five hypotheses. The questionnaire was summarized by Petersen et al (2005), but our questionnaire was in electronic form and we further provided explanations of certain terms to be more understandable for managers. Following the statistical analysis, it was found that a detailed supplier assessment increases the effectiveness of the new product development task force, that involving the supplier in the development process in the selection of technical objectives and measures increases the effectiveness of the new product development team to greater than the effectiveness of the project team for new product development, the greater the financial performance of the company and the higher the efficiency of the new product development task force, the better the product design will also be from the supplier's perspective.

The companies that participated in the analysis positively evaluate the results and are determined to pay more attention to suppliers in the development cycle in the future as well. They will certainly consider suppliers as development suppliers, who will be involved in the early stages of development in product design and in defining the technical requirements and functional characteristics of a component or new product.

The results of the survey will help decision-makers to integrate suppliers into product development processes to help them make better decisions and think more positively about the interaction between their company and the supplier company in product development.

Future research will focus on digitizing the development process in terms of integrating development suppliers into creatively creating new solutions.

6. References

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