

# KEY SUCCESS FACTORS ON NEW PRODUCT DEVELOPMENT: A PRELIMINARY INVESTIGATION ON THE COOPERATION MODEL AT AN AUTOMOTIVE COMPANY

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*This paper is part of a major project on new product development process investigation in companies with business units operating in Brazil. It describes a case study with a main objective to identify and analyze the key success factors in new product development in an automotive company in Germany and its subsidiary in Brazil, concerning its cooperation model at new product development. The company chosen is a part of an international large automotive organization, producing trucks, busses, vans and cars. Empirical preliminary data was obtained by interviews at the subsidiary and structured based on the literature in four main groups concerning the key success factors on new product development: firm-level, financial, product level and customer acceptance measures. As preliminary results include that the company focuses its key success factors at the financial and customer acceptance measures, and measures like “speed to market”. As preliminary concluding points it is evident that the new product development process is measured by several factors at the Brazilian subsidiary, but without a clear “weight” or process of prioritization among them. Next steps of this investigation is to interview company members at the company headquarter in Germany as well as cross-analyse the results in order to generate possible improvement proposals.*

*Palavras-chaves: key success factors, new product development, automotive industry, cooperation model.*

## 1. Introduction

Due to the increasing global complexity and competitiveness, automotive companies are looking for ways to increase its operations in the world in order to remain competitive (MIGUEL, 2006). In the 80's, researchers showed that most subsidiaries of automotive companies in the developing countries had a very limited role with regard to technological development in these countries (KATZ, 1987; LALL, 1992). The main reason this finding lies in the fact that such subsidiaries were totally dependent on their headquarters in the development of new products (CONSONI, 2004). However, this framework has changed recently. Sugiyama and Fugimoto (2000) suggest four basic strategies in the development of new products: 1. Development of global products based on new platform, 2. Development of local product based on new platform; 3. Development of global product platform based on existing platform; 4. Development of local product based on existing platform.

Considering the complexity of the development of new products (ROZENFELD et al., 2006), especially in this international framework, the concept of "success or failure in the development of new products" has various dimensions and each can be measured in different ways (GRIFFIN and PAGE, 1993). For Griffin and Page (1996) success is not only hard to define but is multi faceted and difficult to measure. A company can predict the success or failure of a new product project in one or several terms, including customer satisfaction, financial return and technological advantage.

In this sense, the present study aims at critically examining the key success factors on new product development in an automotive company, within the context of a development cooperation model between its headquarter and the Brazilian subsidiary.

The paper has been structured as follows. Section 2 presents a brief review of the literature related to new product development. Section 3 outlines some main aspects of automotive industry in Brazil. Section 4 shows and summarizes a picture of the literature concerning key success factors at new product development. Section 5 describes the research design adopted to conduct this preliminary work and section 6 presents an analysis and discussion of preliminary results. Finally, section 7 draws some preliminary concluding remarks, next steps and implications of this work in addition to some issues for further research.

## 2. Theoretical background on new product development

New products development can be characterized as the processing of a chance to market into a product available for marketing (KRISHNAN and ULRICH, 2001). In turn, this is constituted by a series of sequential and parallel activities structured in a complex way in which its main characteristics differentiate from other processes, such as (ROZENFELD *et al.*, 2006): high degree of uncertainty and risk in its activities, difficulty in changing initial decisions, the activities follow a basic iterative cycle, the creation and interaction with a high volume of information and multiple applications has to be considered.

The new product development process generally follows the sequence of generation of ideas, research, formulation of the project, production of the product, packaging and storage of the ready product and launch on the market (MIGUEL and SEGISMUNDO, 2006). Several

models for new products development are being created in the last decades. It contains rules, guidelines and procedures to manage the development of products (ENGWALL et al., 2005).

Cooper (1993) suggests four stages that contain concept and development, product planning, product and process engineering, try-outs and ramp-up. The best practices of new product development can be supported by the implementation of the approach of "stage-gate" (GRIFFIN, 1997). This approach divides the development of new products in discrete and identifiable stages. Each stage is multifunctional and designed to work the information needed for the progress of the project for the next stage or point of decision. The key stages are (COOPER, 1993):

- a) Preliminary investigation: a quickly research and generation of the preliminary scope of the project;
- b) Detailed investigation: a much more detailed research, including the definition and explanation of the project;
- c) Development: design and development of the product;
- d) Test and validation: tests in laboratory, at the market, or in the plant to verify and validate the new product, including its production and market;
- e) Production and launch: start of full production, marketing and sales campaigns.

Rozenfeld (*et al.*, 2006) also considers stages of "pre-development" and "post-development". Figure 1 shows the model proposed by Rozenfeld (*et al.*, 2006).

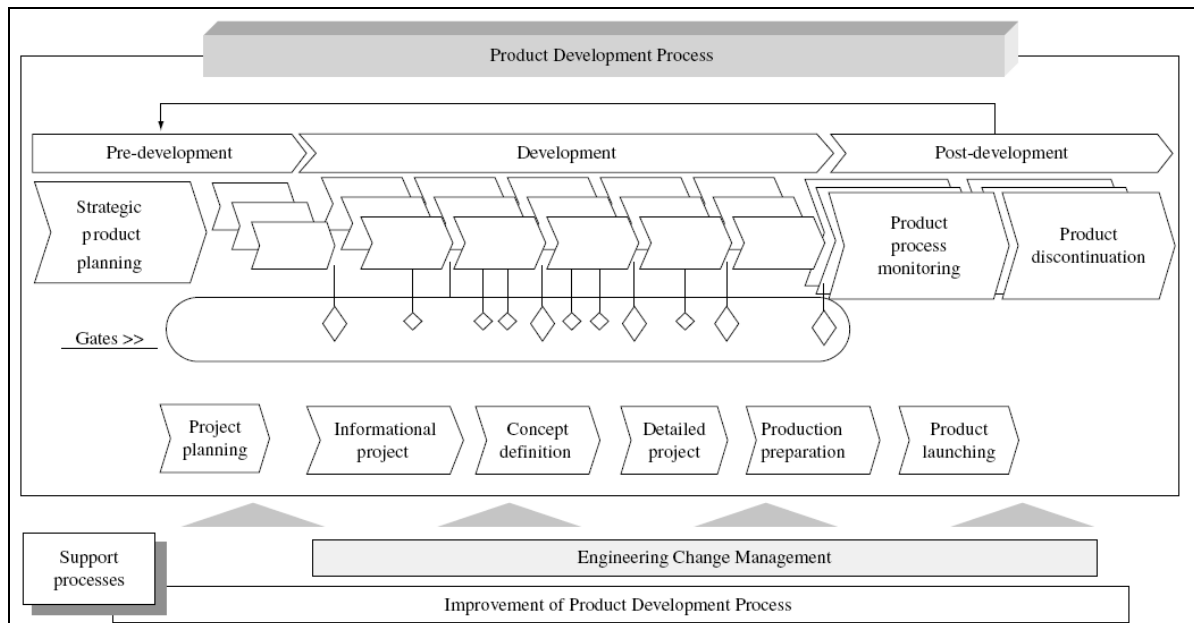


Figure 1 - Model of reference for new product development (ROZENFELD et al., 2006).

For Griffin and Page (1996), as a main outcome of an optimum process of development would be the perfect product ("shooting of silver"), which would be fully accepted by customers, which would love it; provide a huge financial return for the company and,

additionally, would be technically elegant and thus provide obviously great competitive advantage for the company. However, this product and situations do not exist.

It is in this sense that the search and structuring of success factors on product development appears extremely necessary (COOPER and KLEINSCHMIDT, 2007).

### **2.1 New product development in Brazil**

The automotive industry represents one of the most prominent industries in Brazil (MIGUEL and SEGISMUNDO, 2006). OEM (Original Equipment Manufacturers) settled productive plants in Brazil at the end of the 50<sup>th</sup> decade (Ford, GM, VW and Mercedes-Benz), and more specifically, the conditions for the Brazilian automotive industry development occurred after the installation of the Automobile Industry Executive Group (GEIA) in 1956, in the government of Juscelino Kubitschek (CONSONI, 2004).

Fiat began its operations in 1976 and was only in this decade that automotive companies installed in Brazil began to incorporate local requests into their projects definition, modifying aspects of motorization, body and chassis. These adaptation activities became known as "*tropicalization*" (CONSONI, 2004).

The Honda was the first plant installed after many years: it was inaugurated in October 1997. Following, other companies inaugurate plants in the country, particularly after 1998, such as Audi, Mercedes-Benz (Automobile in Juiz de Fora, MG), Mitsubishi, PSA-Peugeot/Citroen, Renault and Toyota Automobile.

More recently other companies settled plants in the country, such as Nissan and Hyundai. As a main consequence, the national automotive industry has become more international and more integrated with international supply chain of automotive parts. Until 2011 are expected around US\$ 6 billion investment in the industry (MIGUEL and SEGISMUNDO, 2006).

In this context, new products development and project activities assumed a greater role through the introduction of the "global platform" development strategy. Indeed, the most common strategy is to adopt a global platform that allows adaptations requested for local markets needs (HUMPHREY *et al.*, 2001). This strategy increases the possibility of redirecting new product development activities in emerging countries, resulting in positive effects in terms of attraction of new investment and achievement of greater strategic importance for operations in Brazil (SALERMO *et al.*, 2002).

As a consequence, the initiatives of new product development centres introduction have been growing at the past 5 to 10 years (MIGUEL, 2006). This recent initiative opens a series of opportunities of researches on new product development, particularly in the international scenario, which is the scope of this study.

### **2.2 Key success factors in new product development**

According to Griffin and Page (1996), the key to maintaining a competitive position in the market is the ability to repeatedly commercializing new products of success. Since the first report on product failures prevention, from the *Industrial Conference Board* in 1968, a lot of researches have been carried out regarding to new product development success. However,

according to Cooper (1999), even so project leaders and teams usually fall into the same traps that their predecessors of the last decades.

Taking into account that in relatively recent research from PDMA (Product Development and Management Association) on best practices, innovative firms showed that among companies with better performance 49% of its sales were derived from new products (products launched in the latest 5 years) (DI BENEDETTO, 1999) and, considering the complexity of the new products development, especially in this international framework, it is possible to conclude that the concept of "success or failure in the development of new products" can be very complex and divided into various dimensions and each can be measured in different ways (GRIFFIN and PAGE, 1993).

For Cheng (2000), in his review on product development management, three are the main sources of knowledge about success criteria in developing new products. The first is the *Product Development Management Association* (PDMA), particularly through the studies from Griffin and Page (1993, 1996, and 1997). The second source is based on the research of the Canadian group of the Marketing Department at the University of McMaster, Hamilton, which results are documented in researches of Cooper (1999) and Cooper and Kleinschmidt (1996, 2007). The third source is the search from Brown and Eisenhardt (1995), which proposes the construction of a network of factors, quite complete, through the division of the new product development management in three different currents: rational planning, communication network and systematic problems resolution.

According to Griffin and Page (1996) previous researches determined that the success of a project consists of three independent dimensions: customer based success, financial success and technical success or based in the process. In addition, the authors consider a strategic level, called "Firm level", which transcends the project. On this tri-dimensional classification, the authors generate the assumption that the most appropriate set of factors to measure the success of a project depends on the strategy of the project, and that the factors to measure success on new product development (or program of products) depends on the innovation strategy of the company. Thus, these propose a model to determine and classify factors of success on new product development based on a classification of project strategy (adapted from Ansoff Matrix (1957) of product/market analysis) and on business strategy (adapted from MCDANIEL, 1987; MILES, 1978). Figure 2 illustrates the ranks of the projects strategy.

		Newness to the Market	
		Low	High
Newness to the Firm	High	New-to-the- Company	New-to-the- World
		Product Improvements	Add to Exist- ing Lines
	Low	Cost Reductions	Reposi- tionings

Figure 2. Project strategy typology (GRIFFIN and PAGE, 1996).

In relation to business strategy, it can be classified as follows:

- a) Prospectors to the risk: the value of "being the first" with new products, markets and technologies, even without the certainty yet to be profitable. Respond quickly to opportunities. At the automotive industry Griffin and Page (1996) cited Chrysler and Honda as examples;
- b) Analyzers: rarely are the first on the market with new products. However, through careful monitoring of the main competitors, they can rapidly achieve the "Prospectors". Examples are Ford and Toyota.
- c) Defenders: meet the local demand and keep a market niche relatively stable of products or services. They protect their niche offering quality or superior services, or even, lower prices. Examples are General Motors, Nissan and Mazda.
- d) Reactors: are not aggressive even in keeping their markets under threat from competitors. They respond only on high pressure. The automotive company Subaru is an example of reactive company.

As results of their research, Griffin and Page (1993, 1996) conclude that the factor of success more widely used by large companies is technical or based in the process, straight connected to performance measurement during the evolution of a project. However, the factor based on the customer satisfaction presents great importance by the interviewees, but is rarely used in practice. The financial factor is widely used, but not always effectively, given the complexity of the development costs compilation (several iterations, suppliers, prototypes, etc.).

Cooper and Kleinschmidt (2007) propose nine factors of success on new product development, which according to the authors, the first four have a role more important than the others, see below:

- a) A high quality process for definition of new products: a system that provides clear definition of activities, a clear product definition from the beginning, clear points of decision clear, quality in implementation, yet flexible;

- b) A defined strategy of new products set for the business unit: there is a long term plan, goals for new products, the role of the new products are clearly communicated;
- c) Sufficient resources of people and budget: high management prove resources and budget needed for the projects in development;
- d) Expenditure on research and development to the new products development is considered as a percentage of sales revenue;
- e) High quality project teams;
- f) High management involved and committed to the new products;
- g) Innovation culture and environment;
- h) The use of matrix project teams (cross-functional);
- i) Responsibility of the high-manage regarding the results of the new products.

In addition to this classification above, Cooper (1999) on his study on "The invisible success factors in product innovation" concerns that basically two classes of criteria of success are not treated in the literature: the first class is related to "make the right projects" and the second class "do the projects right". The first classification can be very well compared to the dimensions proposed by Griffin and Page (1993, 1996), related to business and projects strategy ("make the right projects").

Montoya-Weiss and Calantone (1994) suggest 16 factors grouped into: strategic, development processes, market and organizational.

Table 1 presents the success factors on new product development structured and grouped according their authors and categories cited earlier. The factors were allocated in each row in order to show where the similarities or gaps between different authors are presented. Note that for Griffin and Page (1996) the organizational issue is not evident, while for Cooper and Kleinschmidt (2007) the customer satisfaction also appears not so explicit, however as a consequence of other factors.

### 3. Research design

This work can be categorized as an empirical research and it is a preliminary part of a major project on new product development process investigation in companies with business units operating in Brazil.

The present research has as general objective to identify and analyze the key success factors in new product development in an automotive company. The methodological option used was the case study, whose criteria of selection were beyond the sector of the company, the importance of the new products development at the actual economical scenario (COOPER and KLEINSCHMIDT, 2007). The research has been carried out by analyzing current publications in this field and by getting empirical non-structured data from some company visits and interviews. Figure 3 illustrates the analytical process frame work adopted as the methodological approach. It consists of identifying issues to be investigated, next what the literature have to say, followed by data collection about each situation, and, finally, data analysis supported by the theory. The cycle is closed and continuously restarted.

Montoya-Weiss and Calantone (1994)	Griffin and Page (1993)	Cooper and Kleinschmidt (2007)
<b>Strategic Factors</b> Product advantage Marketing synergy Technological/Manufacturing synergy Availability of resources Strategy of the new product	<b>Firm-level Measures</b> % of sales by new products  <b>Financial Performance</b> Break-even time Attain margin goals Attain profitability goals IRR/ROI	<b>R&amp;D spending for new product development (as a % of sales)</b>  <b>A defined new product strategy for the business unit</b>  <b>Adequate resources of people and</b>
<b>Development Process Factors</b> Proficiency of technological activities Proficiency of marketing activities  Proficiency of up-front (homework) activities Top Management support Speed to market  Proficiency to financial/business analysis	<b>Product level Measures</b> Development cost Launched on time  Product performance level Met quality guidelines Speed to market	<b>A high quality new product process</b>  Senior Management committed to, and  Senior Management accountability for new product results
<b>Market Environment Factors</b> Market potential/size Market competitiveness External environment	<b>Customer Acceptance Measures</b> Customer acceptance Customer satisfaction Met revenue goals Revenue growth Met market share goals Met unit sales goals	
<b>Organizational Factors</b> Internal / external relations (of team) How team was organized		High-quality new product project teams An innovative climate and culture The use of cross-functional project teams

Table 1 - Structuring new product development success factors based on the literature (source: authors).

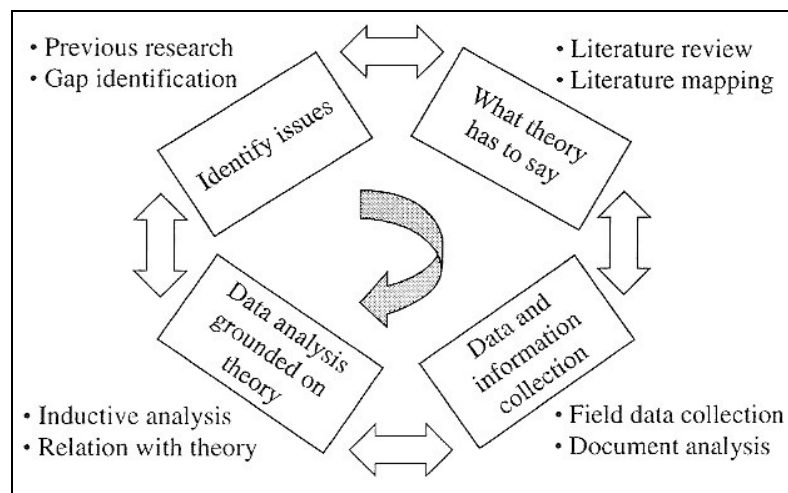


Figure 3 - Research project cycle (MIGUEL, 2006).

To realize the research a case study approach was employed, as already mentioned. In order to answer the main research question, how is the current practice regarding new product development efficiency measurement, it was opted for semi-structured interviews (YIN, 1994). The interviews are planned to be done with new product development senior managers of two plants of the same business-unit – on plant located in Germany and its subsidiary



located in Brazil. As preliminary results, it will be presented at the next section the analysis of the first interviews at the Brazilian company. Next steps will be to interview the main company in Germany and cross-analyze the results identifying similarities and improvements potential.

The company chosen as object of this study is a part of an international large automotive organization, producing trucks, busses, vans and cars. The truck group is the world's leading manufacture of trucks, and boasts six strong independent and complementary vehicle brands. One of the brand (or business unit) is within the scope of the present study. The main business units for new product development, located in Brazil, comprise trucks, busses and power train development. This study is limited to the truck business unit that consists of about 30 models of trucks divided into four families of products in Brazil and, about 40 models divided into three families in Germany.

During the past years the company has consolidated the implementation of a local technological centre for developing new products. This enables the automaker to design and launch truck and bus platforms and components (engines, gearboxes, axles). The Brazilian technological centre employs more than 500 people and its correspondent in Germany employs around 1800 people.

The product development process was created in its headquarters and it is based on ten stages and gates. The development process is a framework similar to Cooper's stage-gates but requirements of APQP (Advanced Product Quality Planning) are also considered. Gates decision meetings are based on a number of criteria in a document called "delivery fulfilment list". This document considers costs, quality and performance objectives including risk analysis.

The project management is based in concepts and areas of knowledge proposal by PMBOK (PMI, 2004), showing a methodology itself of management of projects, and the technological centre located in Brazil is in the level 2 (basic) of maturity proposal by the Project Management Maturity Model (CARVALHO and SEGISMUNDO, 2006).

#### **4. Preliminary results and discussion**

Based on the model of GRIFFIN and PAGE (1993), a first interview was done with a member of the senior management of the Brazilian subsidiary technological centre, with the main objective to validate the method.

The sixteen critical success factors on new product development were carefully described and, through closed questions, classified as: if these are known and disseminated in the culture of the company, concerning its current use ( if they are, or not are, actually applied) and if there is the desire to apply then as performance metrics for the new product development process. The results of this first approach can be seen at Table 2.

As a first interesting result, it is observed that the company identifies use, even if not in a complete form, of 12 performance factors, while the literature identifies the use of 4 success factors in average (COOPER and KLEINSCHMIDT, 2007; GRIFFIN and PAGE, 1993)

Currently, strategic factors have not been identified as to be applied (in the level of the firm). The same occurs with three factors associated with the product: launched on time, product

performance level and speed to market. The focus stays clearly on the factors of financial performance and customer acceptance measures.

This fact coincides with the literature identified in the 90's decade per Griffin and Page (1993, 1996), whose research type survey identified as most used, with great advantage, the customer measures (Market share, Volume, Customer Acceptance and Customer Satisfaction) and Financial Measure (Margin level). However, the recently literature (Di BENEDETTO, 1999) and after (COOPER and KLEINSCHMIDT, 2007) identify an evolutionary change of this framework, where a tendency for appliance of the strategic factor (e.g., percentage of sales by new products) and the factors related to a high-quality product development process (sharp and early product definition, better defined go / kill decisions points, speed to market, etc.) can be noted. As a consequence of that, a consistent financial return becomes more feasible.

Figure 4 shows the distribution of the sixteen factors of success in relation to their knowledge, their current and desired usage at the studied Brazilian subsidiary.

Key Success Factors	Know Measure	Current Usage	Desired Usage
<b>Firm-level Measures</b>			
% of sales by new products	yes	no	yes
<b>Financial Performance</b>			
Break-even time	yes	yes	yes
Attain margin goals	yes	yes	yes
Attain profitability goals	yes	yes	yes
IRR/ROI	yes	yes	yes
<b>Product level Measures</b>			
Development cost	yes	yes	yes
Launched on time	yes	no	yes
Product performance level	yes	no	yes
Met quality guidelines	yes	yes	yes
Speed to market	yes	no	yes
<b>Customer Acceptance Measures</b>			
Customer acceptance	yes	yes	yes
Customer satisfaction	yes	yes	yes
Met revenue goals	yes	yes	yes
Revenue growth	yes	yes	yes
Met market share goals	yes	yes	yes
Met unit sales goals	yes	yes	yes

Table 2. Responses of the Brazilian subsidiary (framework adapted from GRIFFIN and PAGE, 1993).

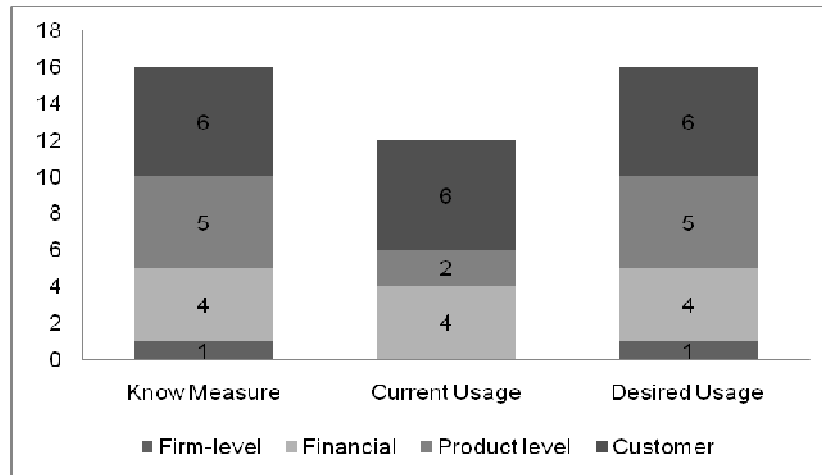


Figure 4. Responses distribution by category of success factor.

## 5. Concluding remarks

Since this work is not fully completed, the conclusions of this research are limited. However, some concluding points can be mentioned. At a general level, key success factors in new product development are installed at the Brazilian subsidiary of the investigated company.

It is possible to evidence that the new product development process is measured by several factors, but without a clear “weight” or process of prioritization between them. It is evident the concentration at the traditional factors of financial return and, of course, the acceptance and satisfaction of the customer. The lack of a success criterion at the strategic level is consistent with the issue that an official prioritization of projects portfolio throughout these life cycles is relatively recent and still in the process of internal acceptance (MIGUEL and SEGISMUNDO, 2006).

It is evident also that the factors of "speed to market", and "launched on time" are desired, however they don't have a formal role at the actual practice on new products development measurement at the subsidiary. This fact needs to be investigated further as part of the next steps of the work.

As next steps of the research can be cited the search of the success criteria on new product development of the company object of study in its headquarter, and its deepening on the subsidiary with further interviews and data collection. Based on this data obtainment, it is intended to examine the relations and implications of the cooperation model "headquarter-subsidiary" in the prioritization and measurement of these criteria of success in product development, as well as their possible differences and/or similarities between main company and its Brazilian subsidiary.

Finally, based on the obtained results and on the existing theory, develop suggestions for integration/optimization regarding the success criteria systematization, based on the model of new product development in cooperation subsidiary-headquarter, and still identifying and documenting potential for future research.

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