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SUPPLIER INVOLVEMENT IN PRODUCT DEVELOPMENT PROJECT- assessing the future of suppliers' involvement on core competence activities of a firm.

Master's thesis in Project Management
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ABSTRACT

In order to succeed in a rapidly changing environment with the market demands and a complex product development cycle, many companies have increasingly extended their product development activities across organizational boundaries. Involving suppliers in product development activities provides benefits such as cost reduction, development time reduction, reducing the chances for project delays, and facilitates the incorporation of new technologies. Despite these benefits, many researches have produced contradictory results, with some studies showing a negative relationship between supplier involvement and project performance. Some scholars are of the opinion that supplier involvement should always be restricted to non-core activities, products, or components especially when the R&D activities affect a firm's core competencies.

The initial literature review provides an overall idea on the existing theories and models and gives insights into the background review of the product development, supplier involvement and future supplier involvement in core competence products and businesses. However, gaps in the literature was identified concerning identifying core competence of an Organization. What are the reasons? if after the empirical study, the suppliers are involve and / or not involve on core competency product.

The purpose of this study is to identify the core competence activities of an organization and establish a framework for involving suppliers on core competencies of a firm. The thesis provides the in-depth reviews and suggested framework to overcome the gap.

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ABBREVIATIONS AND SYMBOL

R&D	Research and Development
SBU	Strategic Business Unit
ROI	Return on Investment
NPD	New Product Development

CHAPTER 1

1. INTRODUCTION

The development of new products and improvement of existing products are critical to the survival of an organization facing tough competition and globalization. In order to keep up with the fast development of technologies, research has shown that organizations can accelerate their speed in developing products by collaborating with suppliers (Langerak & Hultink, 2005; López-Vega, 2012). Supplier involvement in product development has been around since 1958, though not under the names and programs currently in use, for example, Toyota was using resident engineers from their suppliers in its product development process (Nishiguchi, 1994). Japanese automobile industries were the pioneers in involving suppliers in a new product development activity. Research shown that the involvement of suppliers in product development is especially common in Japan and less common in the United States and Europe (Dyer, 1996; Birou and Fawcett, 1994; Wasti and Liker, 1997). Recently the differences have been decreasing (Liker *et al.*, 1996). The European and American car manufacturers have been responded to the challenges posed by their Asian competitors through the implementation of partnership arrangements with suppliers, Lamming (1993). Research have shown that increasing complexity of products is a challenge for firms (Mikkola, 2003).

Suppliers involvement in product development has increased considerably within the R&D, High-tech and manufacturers across industrial sectors and geographic boundaries (Proadhan and Routray, 2014). Dynamic market changes, customer expectation, reduced product lifecycle, rapid developments in technology and competitive pricing schemes has been the reasons supplier involvement in product development has been increased (Wu *et al.*, 2011; Wagner, 2006).

For decades, researchers have recognized that supplier involvement can enhance innovation performance, including increasing the speed of development, market timing of new products, and quality of new products and reduce production costs (Lau, 2010; Van Echtelt, and Duysters, 2008; Bonaccorsi & Lipparini, 1994; Bozdogan, Deyst, Hoult, & Lucas, 1998; Clark, 1989). Based on the research conducted by (Stephan M. W, Martin Hoegl, 2006), important drivers for supplier involvement in product development are the necessity to attain shorter time-to-market of new products and to achieve cost targets in product costs and R&D costs. From the supplier's point of view, research have also shown that supplier involvement is beneficial for their innovation, product quality and financial performance (Chung and Kim, 2003).

On the other hand, some scholars repeatedly found no benefits involving suppliers in product development. They believed that involving supplier in product development incurs certain risks and challenges for firms. Supplier involvement incurs high coordination costs and may require firms to put valuable knowledge and /or core competencies at risk of appropriation by the suppliers. (Wagner and Hoegl, 2006). Increased product and development cost, worse product performance, and longer development times are caused by involving supplier in product development projects (Eisenhardt & Tabrizi, 1995; Hartley, Zirger, & Kamath, 1997; Littler, Leverick, & Wilson, 1998; Wynstra *et al.*, 2001).

In another perspective, some scholars are of the opinion that supplier involvement should always be restricted to non-core technologies, products, or components especially when the R&D activities affect a firm's core competencies (Stephan M. W, Martin Hoegl, 2006).

1.1 Problem Statement

First, and foremost, studies show mixed results of supplier involvement in product development projects, technologies, products, or components, particularly when the R&D activities affect a firm's core competencies (Stephan M. W, Martin Hoegl, 2006). Prahalad and Hamel's defined core competencies as "the collective learning in the organization, especially, how to co-ordinate diverse production skills and integrate multiple streams of technologies. Many researchers like Eisenhardt & Tabrizi, 1995; Hartley, Zirger, & Kamath, 1997; Littler, Leverick, & Wilson, 1998; Wynstra et al., 2001; Stephan M. W, Martin Hoegl, 2006, all argue that supplier involvement in core competence products, components and services incurs certain risks and challenges for firms. Hence, the decision makers prefer to maintain the core activities in-house and involving suppliers on non- core activities (Ulli Arnold, 2000). J. Quinn and F.G. Hilmer (1994) believed that firms should concentrating on their core competence and outsourcing other activities to the suppliers, doing this managers can leverage their company's resources in four ways: they maximize returns by focusing on what they do best; they provide formidable barriers against the entry of competitors; they fully utilize external suppliers' strengths and investments that they would not be able to duplicate; and they reduce investment and risk, shorten cycle times, and increase customer responsiveness.

However, it is not clear how firms deal with these challenges. Therefore, to get a better understanding of this situation, this thesis is based on in-depth analysis and case studies of future suppliers' involvement on core – competence technologies, products, or services of a firms. Which kinds of core technologies, products and or components should organization involve suppliers are still surrounded in controversy.

Core competencies are the organization's fundamental strengths in that they are the things that the company does very well. Identifying these competencies by organization is the most difficulty tasks. Once core competencies are identified, the company can then examine possible opportunities where such competencies can lead to new products or new markets. The objective of this thesis is to assess the future challenges of suppliers' involvement on core competency technologies, products and or components of an organizations. The final expected result is to come up with a framework for involving suppliers on core competence activity. Hence, it will help the decision makers to distinguish their activities from core to non-core before implementing their supplier involvement decisions, as this will help managers and executives identify and take full advantage of their companies' core competencies.

This thesis focuses on three research questions:

- 1) How do companies identify which activities are core and which are non-core?
- 2) Are suppliers involve in the identified core activities or not?
- 3) If not, what are the reasons?

1.2 Scope and Limitation of the study

This study would mainly deal with identifying the core competencies of a firms and assessing the relationship with the supplier involvement. A framework for involving supplier on core competence would be formulated. This study would not determine the best possibly ways to involve suppliers in the core competency technologies, products or components of a firms.

CHAPTER 2

2. RESEARCH METHODOLOGY

In this chapter, the design and methods regarding the empirical research strategy are presented. Also, the research process is described in terms of the data collection and analysis. In the first part of this study, the research strategy is described, and the methods used for gathering information from the literatures are described. An explanation on how each research method has been used is also given. The structure of the chapter is as follows; First, the research strategy is presented, followed by the research methods. This method starts with the theoretical method (literature reviews), next is the empirical methods, utilized qualitative and quantitative methods of data collection. Quality of the research and result of the findings are discussed.

2.1 Research Strategy and Methods

Research methodology is a systematic way to solve a problem. This means having techniques and procedures for collecting data, analyzing, describing and explaining the phenomena. These techniques are called research methods (Karlsson, 2009). Polonsky & Waller (2005) described four different ways of research designs as exploratory, descriptive, casual research and definition research.

- Exploratory research provides insight into, and an understanding of, the problem confronting the researcher. Exploratory research focuses on the “why” questions. This type of research is being carried out when there is no prior knowledge of the subject in hand.
- Descriptive research helps to identify what is going on. It describes certain functions and characteristics of the issues in hand.
- Casual research is designed to examine the cause-and-effect relationships of certain variables that influences the problem.
- Definitional research seeks to define the domain of issues and is frequently used in developing ways to measure a given phenomenon (Polonsky & Waller, 2005).

Other research methods which are embedded within the above-mentioned research designs are quantitative and qualitative methods. Both methods have been utilized in this project.

The literature review part is more of descriptive in nature. In this part, description of product development, supplier involvement on core competency activities are carried out, whilst the empirical part deal with gathering data and documenting approach in order to understand what is going on within the industries, which was carried out through semi structured interviews with practitioners from the industry. In the analysis part, more of exploratory research approach were carried out. In this section, mostly “why question” is being asked to carry out the analysis. In the analysis part various perceptions, assumptions, inferences and subjective reasoning have been carried out.

This study has been performed as a research-based project consisting of a theoretical and an empirical part in order to answer the stated research questions. The research questions

are answered through a combination of information gathered via the literature review, research interviews and survey questionnaires.

2.2 Theoretical method

The theoretical part covers in-depth review on supplier involvement in product development projects and core competence products or services. The literature review gives insights into the background review of the product development, supplier involvement and future supplier involvement on core competence products and businesses. The literature provides an overall idea on the existing theories and models within the industries and academia. The literature review provides a basis to build on and relates the study to the larger academic discussion by finding the gap between the faced challenges and existing knowledge about it in the literature.

This part provides better understanding of the theories and models. The theoretical part helps to provide important data and information for better understanding of the empirical part. The two parts will be compared together to get evident and potential differences and/or similarities between theoretical and practical.

2.2.1 Review Procedure

The literature review focus on the research questions and the Problem Statement established. Five main headings were chosen to identify the needed information to answer the problems statement and research questions. These five headings were then further divided into sub- headings. The Literature review structures and sub-structures are presented in *Table 1*.

Table 1: Structures of Literature Review

Product Development	<ul style="list-style-type: none"> - Product Development Projects - Important of Product Development Projects - Challenges of Product Development - Product Development Processes
Supplier Involvement in Product Development	<ul style="list-style-type: none"> - Why Involve Supplier - Timing of Involvement - Early Supplier Involvement - Buyer-Seller Involvement and Collaboration
Supplier Involvement Success Factors	<ul style="list-style-type: none"> - Contingency Factors on the Organizational level - Management of Supplier Involvement on Project Level -

Core Competency	<ul style="list-style-type: none"> - Review of Core Competency - Understanding Core Competency - Identify Core Competency - Important of Core Competency - Future of Supplier Involvement
Summary of the Literature Review	

2.2.2 Quality of articles

In order to determine the quality of the articles that were review in this study, the works of several authors in each of the main headings in *Table 1* have been studied, reviewed and documented in this study. This part contains information collected from academic books, NTNUs internal database *Oria.no*, journals, research papers and current studies. Information were also gathered through searches of Google Scholar ProQuest, Science Direct, Emerald, Springer and other external sources.

In addition, the journals were also looked up at the home page of the Norwegian database of statistic and higher educations (Database for statistikk om høgre utdanning): (<http://dbh.nsd.uib.no/kanaler/>) where journals are ranked based on quality of the published articles.

2.3 Empirical method

The research methods are the techniques and procedures for collecting data, analyzing, describing and explaining phenomena (Karlsson, 2009). Research methods can be divided into, quantitative and qualitative methods. The research questions of this study would be solved utilizing qualitative and quantitative research methods or mixed methods.

2.3.1 Qualitative Method

Qualitative research is descriptive, non-numerical and aim to answer “why” and “how” questions (Bryman and Bell, 2011) and is the first chosen method for this study in order to gain deeper understanding about the subject and get practical information of the subject from the professionals in the field. A qualitative method enables the researcher to see through the eyes of the research object and experience their situation when conducting research within organizations (Jonker and Pennink, 2010). Theoretical understanding of the field and the subject formed the basis of the data collection, which would be executed through semi-structured interviews with top executive managers, product development managers, business development managers from the component developing and manufacturing companies across the globe.

2.3.1.1 Semi-structured Interviews

Semi-structured interviews are used in order to collect data by outlining the topic that allows the interviewee to talk about their opinion on a subject (Bryman and Bell, 2011). The method includes an interview guide to ensure that the relevant questions are discussed and to keep the conversation within the researcher's topic of interest. The guide was developed by creating a set of open-ended questions. The interviewees get guided in the right direction and then can talk more freely from their own experience. I conducted semi-structured interviews because the method had many advantages that are suitable for this research. The advantages of semi structured interviews method are as follows:

Firstly, no need to follow a strict order of questions; Semi-structured interview is adaptable to different participants and the method enhances flexibility within the interview, enables greater insights into the interrelationships between variables and issues and provides further information into the research subject while at the same time the interview guide ensures the comparability of the outcome (Bryman and Bell, 2011, Matthews and Ross, 2014).

On the other hand, there are limitation to the methods (Matthews and Ross, 2014)

1. The outcome of the method depends greatly on the researcher's interviewing skills.
2. Interviewing is a time-consuming data gathering, transcription, coding and grouping
3. Participants may focus on issues that are of interest to them, but not to the researcher. This can be eliminated to a certain degree by careful explanation of the research topic and the research aim in the beginning of interview
4. The method produces a large amount of raw data.

An interview is seen as the "scene for a conversation rather than a tool for collection of data" (Alvesson, 1996, p.465). Considering the limited time and resources available, semi-structured interviews approach were chosen as the first preferred method to collect data for this study.

Accessing the interviewees was very difficult as most of the participants were the top executives of their organizations. They were the people with the most information regarding their organizations' strategies, competing, visions and networking. Recording and verbatim transcription of interviews is currently common, yet there are divergence opinions both for and against it. Although audiotapes provide an accurate record of the conversation, the use of written field notes either during an interview or after has been reported by Fasick (1977) as being superior to the audio recordings. Halcomb and Davidson (2006), reported that verbatim record of the interview ensures the closeness between researcher and the text. In more generic mixed-method research such as this study, closeness is not as critical for the analysis of the data (Halcomb and Davidson, 2006). Therefore, as my aim of the interviews was to collect opinions and facts about the core competence of the organization and supplier involvement, detailed notes taken were considered a suitable method for recording the interviews. During the interviews, the answers to the questions provided were written down, because the interviewees declined recording the interviews. Nevertheless, one or two words may have been lost during the interviews, but as the aim was not to make a detail analysis

of the words or phrases used, no significant information was lost during the note-taking interviews.

The first difficulty is the language barriers, as most of the participants are more comfortable speaking Norwegian rather than English. The second difficulty was the complicated process for accessing the participants through switchboard telephone numbers, as many companies only provide switchboard numbers on their websites. I decided to send general email to many companies request participation in the research interview. A total of 20 emails were send to the executives, managers, owners, and other top managers. Some decline based on their tight schedules, company policies, whilst some did not reply. On my working trip to United State, I was able to do face-to-face interview with a product development manager of a subsea equipment manufacturing company in Houston Texas. Afterwards, a second interview was conducted with a similar company in subsea products developing company Trondheim, Norway.

The interviewees were given the general definition of a core competence and supplier involvement. Interview questions similar to survey questionnaire were asked; to elaborate on their companies' developments, their companies' competencies, what they considered as their core competence or strength and if they involve supplier in their core competencies or not, if not, they were asked to give reasons. The information provided by the interviewees was cross-checked with company annual reports, newsletters, business press reports and company web sites on the internet.

2.3.2 Quantitative Method

The quantitative research methods answer a form of research questions "what", "where" and "when ", and are non-descriptive. Quantitative data should be presented in statistical statements that could be tested in order to reach conclusions (Bryman & Bell, 2011). The collected data should also be considered measurable and presented in comparable numbers (Bryman & Bell, 2011). The quantitative research approach is a formalized and structured method of collecting empirical data and is considered the preferred approach when studying many respondents but with few variables involved (Neuman, 2003; Bryman & Bell, 2011).

2.3.2.1 Survey Questionnaire

Quantitative data was collected in the second phase using a web-based survey questionnaire designed using Google Drive, a tool to create forms to be distributed through the Internet. A link was provided which I spread via email to all the respondents and supervised the responses. The data is collected in a spreadsheet and analyze. The role of the quantitative data was to support the qualitative data. When designing a web survey, there are many choices to consider. In order to design high quality questionnaires with the objectives of this study in mind, the questionnaires were first sent to the supervisor for necessary correction. The quality of the data depends on the questions in the questionnaire, though, there are no common procedures to employ that guarantee a successful questionnaire there are still some guidelines (Aaker et al., 2010; Malhotra, 2010; Bryman & Bell, 2011).

I adopted the survey questionnaire method because it is fast, cheap, give the respondents enough time to reflect on the questions, thus give well thought answers. Since each respondent would be asked to respond to the same set of questions, it provided an efficient way of collecting responses from a large sample prior to quantitative analysis. (Saunders et al; 2007). Missing value is one of the demerits of the questionnaire and require no control over behavioral events. By distributing the survey through electronic solutions such as e-mail, the response rate will be lower, and the risk of misunderstanding is higher when the researcher is not present. This calls for highly deliberated questions (Yin, 1994). The questionnaire comprised both open-ended questions that allowed the interviewees to respond freely to the subject in their own words rather than being limited to choosing from a set of alternatives. (Churchill;2004).

The survey questionnaire consists of two main parts. The complete questionnaire is presented in (Appendix A). The first part aimed at revealing the respondents background and position in the organization and consisted of 2 questions. The second part of the questionnaire aimed at identifying the company's core competencies and determined if the companies involve suppliers on their core competence activities.

The companies represent the small and medium Enterprises (SMEs) with annual turnover ranges between €10 million to €50 million. Most responses came from Western and Northern Europe (UK, Norway, Sweden) and USA. One common challenge facing these companies are highly competitive environments and high rates of technological changes. Therefore, they are likely to rely heavily on suppliers as sources of quality improvements and optimize on cost and technology.

Each question in part 2 consist of the following description and explanation:

1. Could you please lists the competencies of your company?

As mentioned earlier, competencies are set of abilities, skills, experience and knowledge that sets a company apart from its competitors. They are any aspect of the value chain where the company does a particularly good job. In completing this question, the respondents will be able to identify whatever it is that their company performs very well.

2. Among the competencies listed above, list the one you consider is/are core-competencies of your company?

The question explained the core competencies as skills and areas of knowledge that are shared across business units; the source of competitive advantage and enable a firm to introduce an array of products and services in the market and an organization's strategic strength. The purpose of this question is to decide whether what the company does well is a capability (functionally based), a competency (SBU based), or a core competency (cross-SBIU). This question helps respondents to understand the existing level of value added by the know-how. As pointed out earlier, the higher the level of knowledge in the hierarchy of competencies, the greater the value added to the company.

3. Are we any better than, equal to or worse than our competitors? Please explain briefly what make your company better, equal or worse than the competitors?

This question enables respondents to identify the company's capabilities and competencies in the context of their industry. This question helps to identify the misunderstanding of linking competencies to competitive advantage. The fact that a company knows how to do

something very well does not necessarily result in a competitive advantage. If many competitors are as good in doing the same thing, then there is no source of competitive advantage.

4. Is your company involved supplier in its business activity? If Yes or No, please explain briefly.

The purpose of this question is to know whether the company generally involve supplier in their activities. Supplier Involvement is defined as a form of collaboration where the buying company acts as a system integrator and the suppliers bring in their specific know-how in purpose of executing a project together. This question provide insight into why the companies involve suppliers in their activities by offer a brief explanation.

5. Is your company involved supplier in the core activity? If Yes or No, please explain briefly.

The purpose of this question is to know whether the company involve supplier in their core activities. This question provide insight into whether the companies involve suppliers in their core activities by offer a brief explanation.

6. Is your company involved supplier in the non-core activity? If Yes or No, please explain briefly.

This question is to know whether the company involve supplier in their non-core activities. This question helps to check if respondent answers to questions 4 and 5 correlated.

2.4 Quality of the Research

The quality of research is a way to assess the accuracy of the result and a way to describe how useful the results are in other settings than in the actual case. For a reliable and accurate research outcomes, validity and reliability is of high importance when conducting the measurement instruments of the study. The measurement tools must be reliable over time and can be used by other researchers (Aaker, et al., 2010). Validity and Reliability are often used criteria for measuring the quality of a study. These would be described in this section.

2.4.1 Reliability

Reliability of a study usually concerns the repeatability and consistency of the collected data. If a research study is reliable, then the study is repeatable (Bryman and Bell, 2007). In other words, a reliable study should produce the same result if repeated. Reliability has no relevance and can be misleading when the research method is qualitative (Stenbacka (2001). Qualitative research method used is subjective, and is hard to replicate, because the interpretation of the answers is so depending on the person doing the research. (Bryman and Bell, 2011). I believed the reliability and consistency of this study would be difficult to repeat by any researcher because, interviews were conducted from different personnel with different companies and at different geographical areas. If the interviews

would be carried out with same personnel, company and with the same questionnaire that we have presented, the results would be the same.

In addition, this project topic is unique, it may not be possible to repeat a study of a project and obtain the same findings. Moreover, organizations are dynamics in their operations, as the exact conditions as during this study are not possible to re-create and even if they were, the answers would not be precisely the same as in this study.

For the empirical part, an interview and survey questionnaires guide were developed in order to collect the evidence and ensure the needed information were gathered throughout the interviews and survey. This guide may help others to come to the same conclusions from the data given in the interviews. This makes it possible for other to come to the same conclusions based on the answers given in the questionnaires, thereby strengthens the reliability of the study.

2.4.2 Validity of data

Validity is concerned with whether the findings are real about what they appear to be about (Saunders et al, 2007). This shows whether the means of measurements are accurate and whether they are measuring what they were intended to measure. I believed that validity in this study is rather high because I managed to measure what I premeditated to measure. I believed the interview guideline is well connected and founded on the theory. After the interviews and survey questionnaires, I have been able to equate the answers from the respondents with the theory of supplier involvement in core competence of a company. There are three different types of validity; content, construct and criterion validity:

Content validity imply that the measurement tool should replicate the concept in a way that makes it easy for the respondent to understand. To ensure content validity, a small pretest can be carried out to experts and respondents in the stated population to see if they understand the questions and if the instrument is representative for what it should measure (Bryman & Bell, 2011). In this study, the fact that the questionnaire was sent out by e-mail might also have decreased the content validity, as questions from the respondents could not be answered directly. To increase the validity, the questionnaire was vetted by the supervisor. Also, a small pretest was carried out, followed by a discussion with the respondent in order to improve the content validity.

Construct validity is to identify correct operational measurements for the case that is under investigation. To ensure construct validity during data collection, it is important to use multiple sources to gather data, to establish a chain of evidence, and to have key informants review the draft analysis. Data triangulation, which is the use of multiple data sources, is recommended during the data collection phase of a study (Yin, 2009).

Criterion validity, also referred to as concurrent validity, is the extent to which an operationalization can predict relations to other constructs (Bryman & Bell, 2011). This can include for instance behavioral and attitudinal measures as well as demographic and psychographic characteristics (Malhotra, 2010).

CHAPTER 3

3. FACTS FINDINGS AND ANALYSIS

The analysis of findings based mainly on the qualitative and quantitative information as obtained from the interviews and the questionnaires. The analysis will be based on the research questions of the thesis. As mentioned earlier, the research questions are formed to arrive at the results of the thesis. These findings were presented on tables and charts.

3.1 Semi-Structured Interviews

In this study, individuals from two different firms and with different positions within the respective firms were interviewed. Firstly, I provided explanation of the questions whenever any of the interviewees seemed unclear about a question. The questionnaire for the interviews were based on the theories that are presented in the theory chapters. In the beginning of the questionnaire, I briefly introduced myself and gave a short description of my thesis, and the purpose of this interview. After that I wrote down in my notebook the answers to the questions. The questions were asked in the sequence that I have written the questionnaire. Interview questionnaire consisted of total 9 questions, 2 questions is about the interviewees profile. Below is the summary of their responses to the interviewed questionnaires.

Table 2: Respondents Answered to the Interview Questionnaires

No.	Questionnaires	Interviewee 1 Response	Interviewee 2 Response
1	<i>What is your position in the company?</i>	Head of Department - Science & Technology	Chief Operation Officer
2	<i>How long have you held this job or a similar job in the company?</i>	4 years	4years
3	<i>Could you please list the competencies of your company?</i>	Offshore cathodic protection, risk-based integrity management, advanced manufacturing, quality of our process and products	Products Manufacturing, R&D, engineering consultancy an offshore field service
4	<i>Among the competencies listed above, list the one you consider is/are core-competencies of your company?</i>	Excellent reliability and quality of our products unique to the industry	R&D of products

5	<i>Does the core competence cut across the Strategic Business Units (SBU) of the company?</i>	Yes	Yes
6	<i>Are we any better than, equal to or worse than our competitors? Please explain briefly what make your company better, equal or worse than the competitors?</i>	It depends on the field, since we are so diverse. We are better than our competition in our core business technologies, but competitors can still win regional markets.	What makes us better is our very skillful employees and over 30 years of experience solving corrosion problems. Our nature of solving new challenging problems makes our company the best option in the market
7	<i>Does your company normally involve supplier in its business activity? If YES or NO, please explain briefly</i>	Yes, because we cannot produce all our products without them, just that we are very careful to keep our brands within.	Yes, especially on essential services and utilities.
8	<i>Does your company normally involve supplier in the core-competency activity? If YES or NO, please explain briefly</i>	We license, purchase and re-use other technologies to enhance our own, but rarely ever have a supplier making decisions or providing direct advice related to our core business	No, we dare not try it because of our unique brands protection
9	<i>Does your company normally involve supplier in the non-core-competency activity? If YES or NO, please explain briefly</i>	Yes. These are non-core activities such are stationaries, and other production goods. We always hire a competent 3rd party for these activities.	Yes, we use suppliers across the organization.

3.2 Survey Questionnaires

Out of 43 companies surveyed, 17 responses were received from various executives ranging from heads of supply chain managers, product managers, R&D managers and other top executives. This resulting in an effective response rate of 40 percent. The responding companies represented a wide range of industry groups, including industrial equipment, subsea oil and gas equipment manufacturers, consumer products and components manufacturing companies. All had held their position for a minimum of 4 years to a maximum 15 years. In this section, reports and analyses are based on the 17 respondents.

First, the respondents' profile with respect to the part one questionnaire's is summarized in *Figure 1* and *Figure 2*, then descriptive statistics are employed to analyze the data concerning the second part of the questionnaire.

3.2.1 Analysis of Respondent Profile

These 17 effective samples come from different companies, which develop their own products or have their own brand of products. The demographic characteristics of the respondents are described by their job titles and how long they have held that title or position in their company. The 17 effective respondents all have working experience with suppliers and play important roles in products development, research and development, supplier involvement and decisions making. Their frequent contact with suppliers is unavoidable, which makes their opinions and response to the survey more reliable. *Figure 1* presents the structure of the respondents' job titles, whilst *Figure 2* presents how long they have held the title or position.

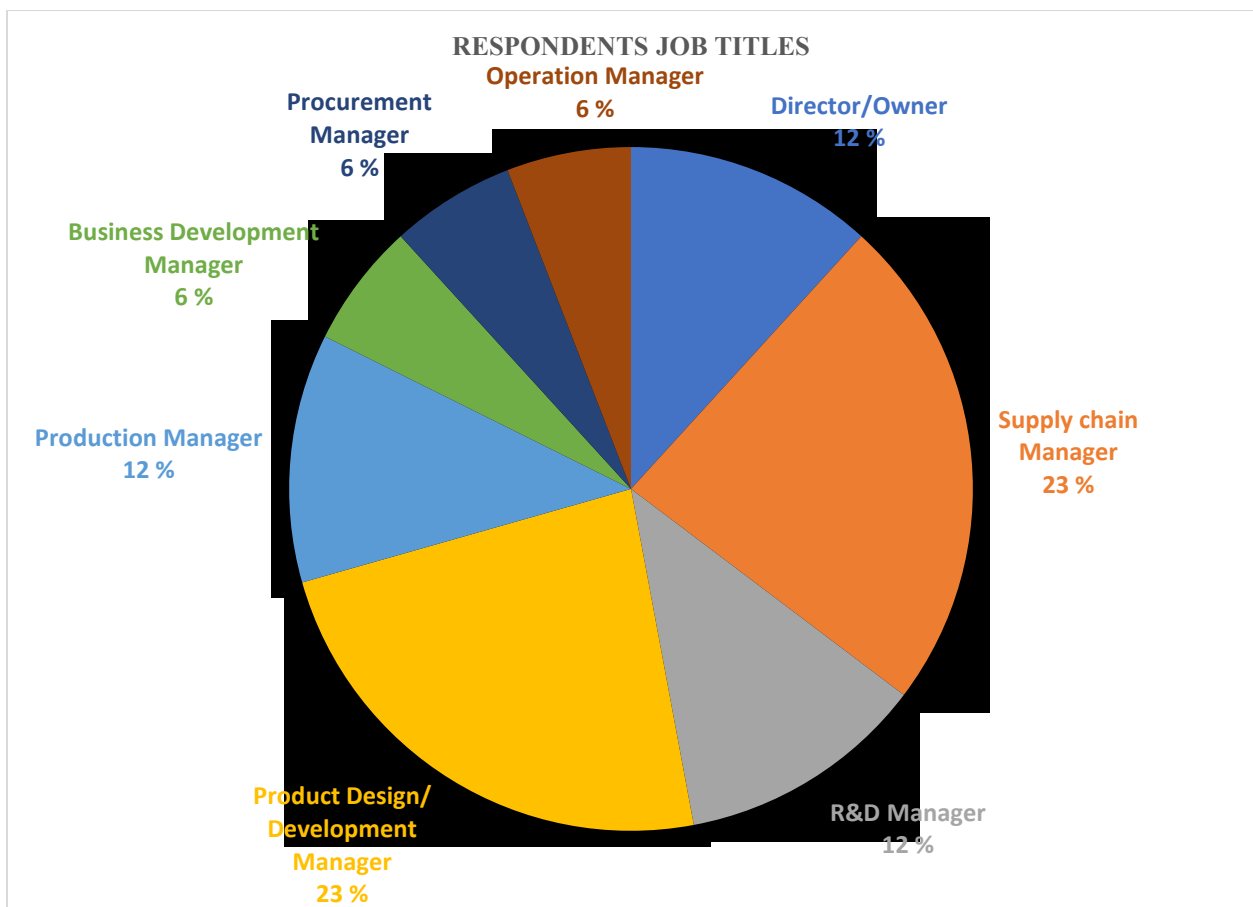


Figure 1: The Percentage of Respondents' Job Title or Position

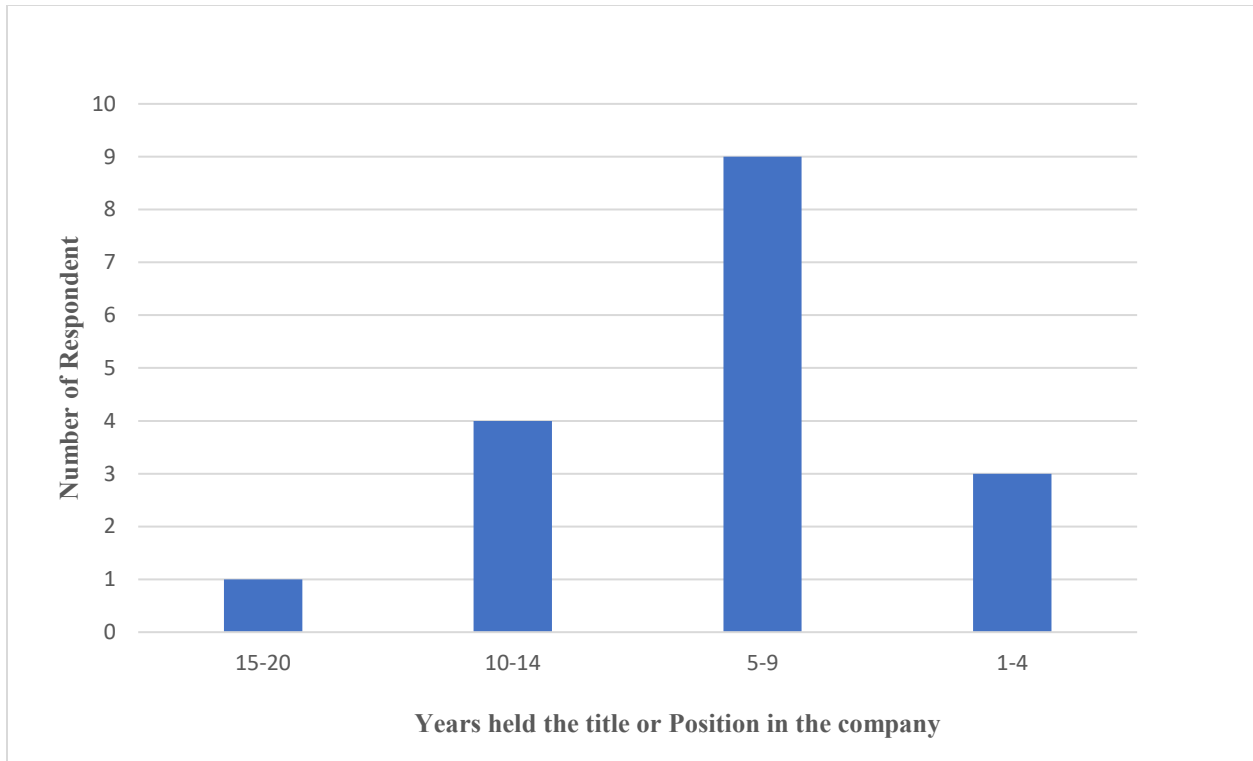


Figure 2: Respondents' years in holding the Title or Position

3.2.2 Competencies versus Core competencies

Competence is any area in which a firm or individual performs at a competitive level, something you are good at, whilst a core competency is any area that is essential to success in an industry or profession, something you need to be good at to thrive in an industry or profession. The idea of core-competency is used by businesses to form strategy. In the second part of the questionnaire, 2 questions are listed in order to help respondents to differentiate between the competence and core competence of a company. The *Table 3* below reveals the respondents' lists of the competence of their company. The identified competencies of the respondent fall into three types of competencies, according to Briance Mascarenhas, Alok Baveja, Mamnoon Jamil, (1998). They are superior technological know-how; reliable processes; and close relationships with external parties.

A technological know-how competence involves a in depth knowledge of the products or services area, such as knowledge of the scientific properties, inter-relationships, and latest developments in the technological areas of the products. This knowledge is valuable if competitors do not have a similar knowledge base and if the knowledge can be converted into superior products for customers.

A reliable process is about delivering an expected result quickly, consistently, and efficiently, with high quality that satisfy customers' needs. It can also be the ability to combine various inputs to customize a product to meet a customer's needs. Reliable processes could be in the areas of research and development of new products, lean

production processes, new products time to market. Reliability is important because customers increasingly consider the total cost of a product over its life, not just its initial purchase price Briance Mascarenhas, Alok Baveja, Mamnoon Jamil, (1998).

Developing close relationships with external parties such as suppliers, regulators, professional organizations, distributors, and customers are important. Relationships are useful and helps to reduce cost of production and product costs. For instance, suppliers can suggest ideas for new product development or execute rapid design changes needed in parts, professional organizations can provide superior talent. Regulators can facilitate and hasten product or manufacturing quality approvals. In some instances, buyer-supplier relationship helps suggest new competencies that the firm should develop.

Table 3: Respondents Competencies by Type

Respondent	Technological Know-How	Reliable Process	Close Relationship with External Parties
1	Research and development, design	-	-
2	-	Advance manufacturing, risk-based integrity management	-
3	Technical expertise, technology capabilities, engineering consultancy,	Products manufacturing	-
4	Research and development, employees' skills	Quality processes	-
5	Unique products, design, employees' skills,	Fast production processes, Product quality	Customer services to buyers and suppliers
6	Unique products	Product quality,	Customer services and maintenances
7	Innovative products	Quality control processes	Listen to customers innovations and suppliers
8	Teamwork	Good quality processes	Communication and cooperation
9	Training and research development	Product quality, fast and automated production processes	Low price

10	Niche products, skills engineer, training, cost control	Product quality	-
11	Technical expertise. R&D skills	Product quality	-
12	Innovative products	Quality	Marketing, customer care, after sale services, installations of products
13	Design and development skills, training and development of staffs	Reliable processes	-
14	Human capital, training, unique products	Product quality,	-
15	Design, Cost control,	Quality services,	Advertisement, on-site promotion
16	Product design	Quality	After sale services
17	Expertise	Quality and Durability of products	Supplier networking

From the number of findings on the table above, sixteen respondents out of seventeen equals to 94.1 per cent believed their competencies are from technological know-how and reliable process type. Product and process quality, innovative products, expertise skills are the dominant competence mentioned by the respondents.

Among the competencies listed in *Table 3* above, respondents are asked to mention one core competence of their companies', though some mentioned two core competencies, whilst some mention core competence that are not in the competencies mentioned. The *Table 4* and *Figure 3* below confirm among the competencies, the core competencies identified by the respondents.

Table 4: Respondents Core Competence

Respondent	Technological Know-How	Reliable Process	Close Relationship with External Parties
1	Design	-	-
2	-	Excellent reliability track record unique to the industry	-
3	Technical experts.		-
4	Research and development		-
5	Design,	Product quality	-
6	-	Product quality,	-
7	-	Quality control processes	-
8	-	Good quality processes	-
9	Design and development		-
10	Niche products		-
11	Technical expertise.		-
12	-		After sale services,
13	Design and development skills,		-
14	-	Product quality,	-
15	-	Quality services	-
16	-		After sale services
17	-	Quality and Durability of products	-

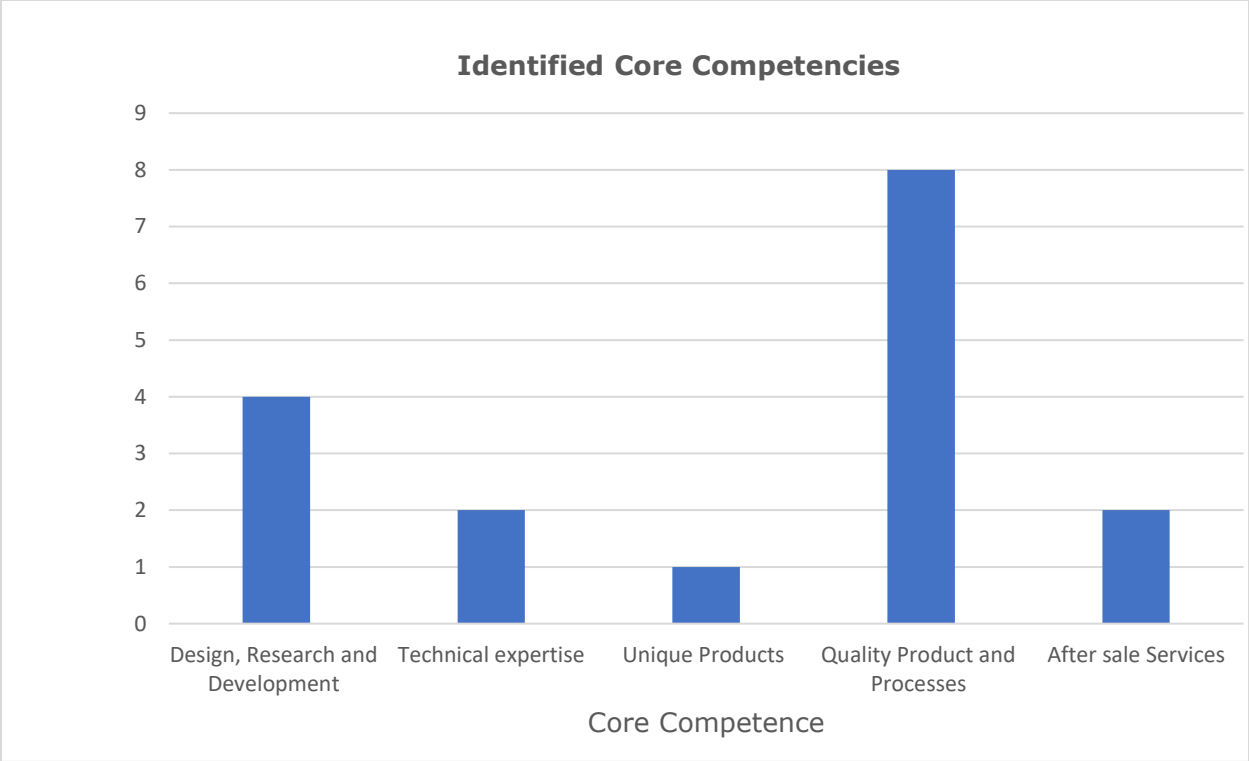


Figure 3: Respondents Identified Core Competencies

From *Table 4* and *Figure 3* above the main categories of core competencies identified by the respondents are technological know-how and reliable process type. They are any aspect of the value chain where the company does a particularly good job. As can be seen from *Table 4*, eight sets of know-how were identified by the various respondents. Similarly, 8 out of 17 respondents believed their core competence lies in reliable processes and technological know-how expertise of their employees. The reasons might be their researchers are prominent in their fields or higher professional and ethical standards in their research than other competitors. More so, the companies might have stringent internal control processes, employees go through training programs where quality is emphasized.

3.2.3 How do companies identify which activities are core and which are non-core?

In order to identify a company’s core competence, a skill must meet three tests (Mahammad Abu Faiz, (1998), as mention earlier in this report. In addition, a core competence must cut across Strategic Business Units SBU’s and other parts of the company. The purpose of this question is to decide whether what the company does well is a capability (functionally based), a competency (SBU based), or a core competence (cross-SBIU). Questions 5 and 6 are listed in the questionnaire to help identify the company’s core competence.

Question 5, "Does the core competence cut across the Strategic Business Units (SBU) of the company?" gives the following results from the 17 respondents.

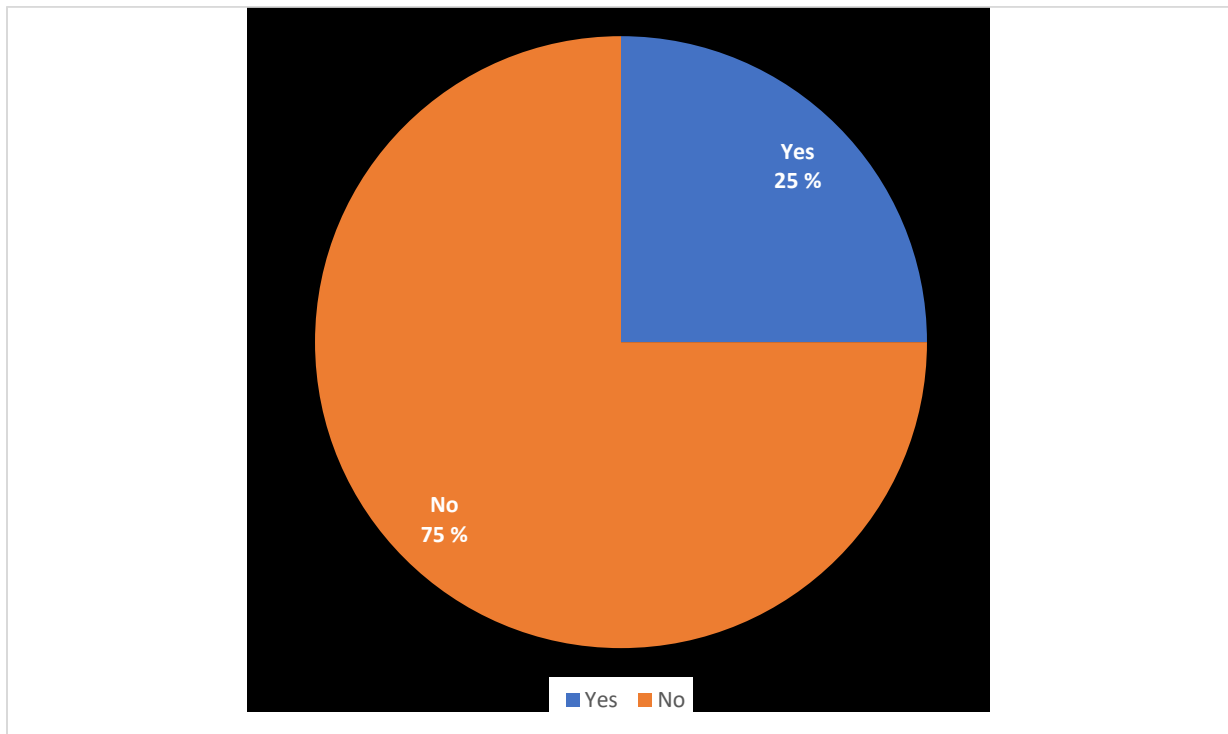


Figure 4: Core Competence versus Strategic Business Units (SBU's)

Most of the respondents is of the opinion that the core competence of their company's cuts across the business units and other parts of the company. It is not clear why 2 respondents answered "No" on question 5, and still believed core competence is "*excellent reliability track record unique to the industry*".

The purpose of question 6 "*Are we any better than, equal to or worse than our competitors?*" is to initiate the process of linking competencies to competitive advantage. The fact that a company knows how to do something very well does not necessarily result in a competitive advantage. If many competitors are as good in doing the same thing, then there is no source of competitive advantage. Most of the respondents believed they are better than their competitors, whilst three respondents cannot say.

3.2.4 Are Suppliers involve in the company's business activities or not?

This is a general question about supplier involvement in business activities. The findings show that 100 per cent respondents are in favor of supplier involvement in companies' activities irrespective of whether core or non-core.

3.2.5 Does your company normally involves supplier in the core activities? If YES or NO, please explain briefly?

Only 12 respondents filled the questionnaire out of 17 with 9 respondents say "No", whilst 3 respondent says "Yes". 75 percent believed that suppliers' involvement in core activities is not a good practice and it's against the company policy. Some of the extracts say, "No. We keep this to ourselves and it's the company's policy concerning trademark". On the other hand, some says "Yes, in very specific cases". Which help us to continue enhance our experience based." I also realize that some respondents didn't answered question pertaining to core competence because they considered requested information as confidential.

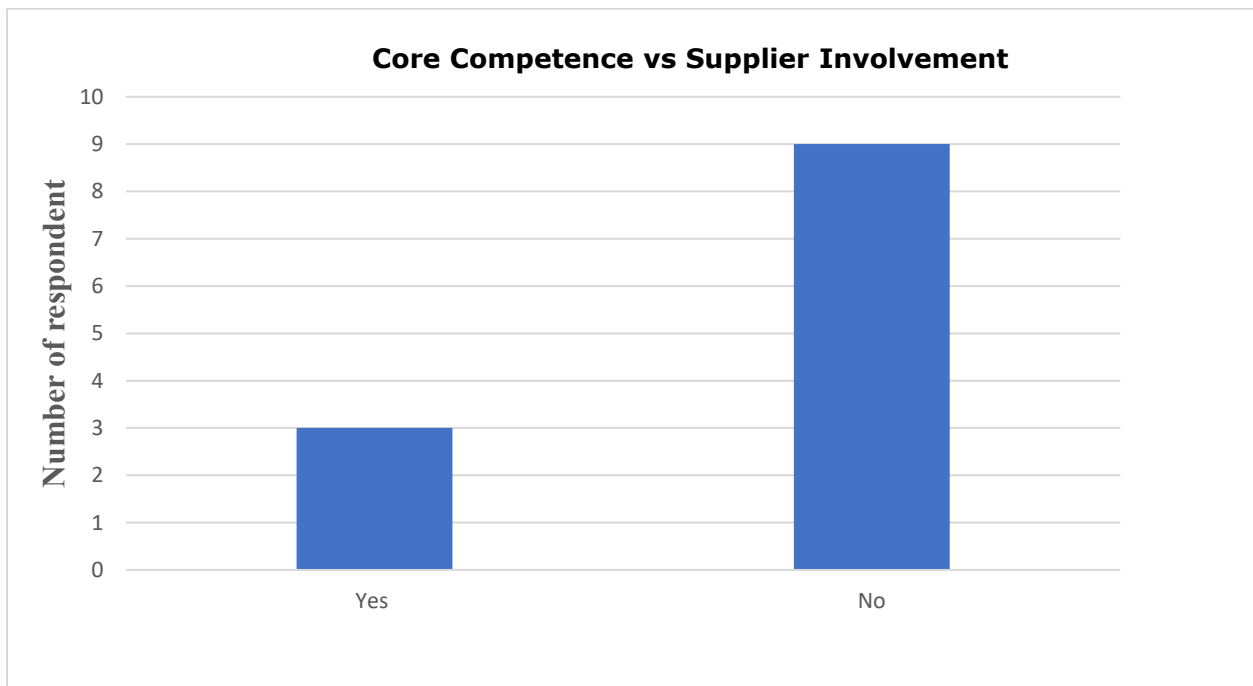


Figure 5: The graph shows Supplier Involvement in Core activity

3.2.6 Does your company normally involves supplier in the non-core activities? If YES or NO, please explain briefly?

100 per cent respondents agreed with involving supplier in the non-core activities, with some says, *"Yes. For instance, we do not own boats, nor construction equipment and do not have any divers on payroll. We always hire a competent 3rd party for these activities."*. Another response and says, *"Yes, we use suppliers across the organization and always looking forward to identify new option that could bring competitive advantage to our future offering."* and *"Yes, suppliers delivered our other components and software's"*.

CHAPTER 4

4. LITERATURE REVIEW

4.1 Product Development

Companies around the globe are increasingly being pressured on price competition and for a faster time to market. At the same time new markets are appearing and many companies are seeing changes and shifts in their main markets. These factors have enabled the rapid growth of company's various business activities throughout the product development process from research and development (R&D) to production. Product development is a set of activities starting with the perception of a market opportunity and ending with the sale of a product (Ulrich & Eppinger, 2008). Product development may involve modification of an existing product or discovering revolutionary new product that meet the customer needs or niche markets. The objective of product development is to cultivate, maintain and increase a company's market share by satisfying a consumer demand. Hence, companies which are into production of products, components and / or services have been investing heavily on the R&D, product development activities.

The concept of product has varying meanings, for instance to an automobile manufacturer, a car is the product which consist of several components that are often supplied by different suppliers or manufacturers. However, product development activity has various dimensions. The product concept needs to go to the next stage that is the development. It can be complicated and challenging, individual step of the process must be examined and approached as though it were a "development project", whether we look at the car as product or as one of the components used to make it.

4.1.1 Product development Projects

Companies carried out product development as a project in order to be successful (Eppinger and Ulrich, 2003). Nevertheless, few development projects fully deliver, as many goes wrong during the development due to poor leadership, essential skills and the way companies approach the development process (Wheelwright & Clark, 1992). The aggregate project plan method suggested by Wheelwright and Clark (1992) addresses all the problems mentioned above. It helps management to create plan, categorizes projects based on the resources they consume and their contribution to the company's product line. When the projects are mapped out based on the types, management would be able to make more informed decisions and control of resources allocation and utilization (Wheelwright and Clark, 1992).

In creating an aggregate project plan, product development projects are classified into five different types, with two dimensions for classifying. They are degree of change in the product and the degree of change in the manufacturing process. The more the change along either dimension, the more resources are allocated for the projects. It also allows for better planning and sequencing of projects over time.

The first three project types are derivative, breakthrough, and platform. These three are commercial development projects. The remaining two categories are research and development (precursor to commercial development) and alliances and partnerships (commercial or basic research). See below Figure 6. Each of the five project types requires a unique combination of development resources and management styles (Wheelwright and Clark, 1992).

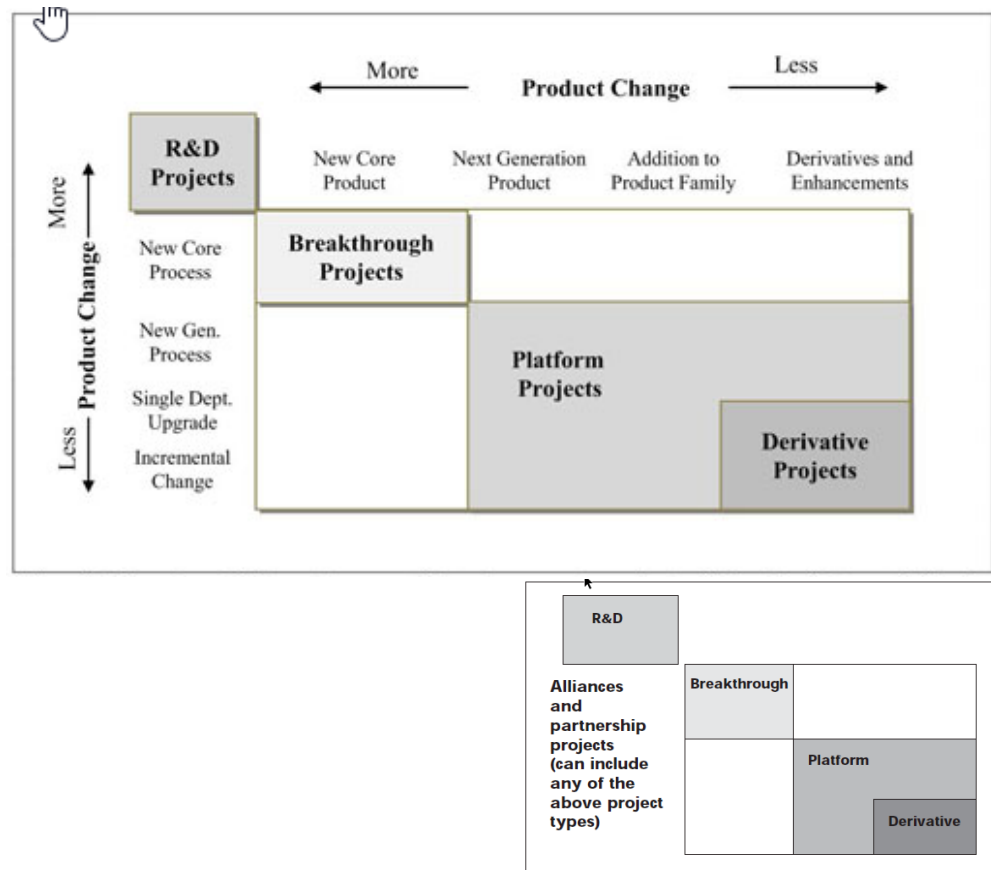


Figure 6: Mapping the five types of development projects (wheelwright & Clark, 1992)

- 1) *Derivative projects* range from cost-reduced versions of existing products to add-ons or enhancements for an existing production process. There are three categories of development work on derivatives projects: Incremental product changes or process changes such as new packaging, a minor change in materials used, with little or no product change.
- 2) *Breakthrough projects* are at the other end of the development spectrum because they involve significant changes to existing products and processes. It's often incorporates revolutionary new technologies or materials; they usually require revolutionary manufacturing processes.
- 3) *Platform projects* are in the middle spectrum, between breakthrough and derivative projects. This type of development entails more product and/or process changes than

derivatives projects. Well managed platform products would have improvements on costs, quality, and performance over preceding generations.

4) *Research and development* are the creation of the know-how and know-why of new materials and technologies that eventually translate into commercial development (Wheelwright and Clark, 1992). Research and development are the precursor to product and process development even though its outside the boundaries of commercial development. It competes with the commercial projects in term of resources allocation. Research and development are a creative and high-risk process.

5) *Alliances and partnerships lie outside the boundaries of the development map and the resources allocation and type of development varies.* The partnering company can have the responsibility over R&D projects, breakthrough, platform and derivative project. The acquiring company must devote in-house resources to monitor the project, capture the new knowledge being created, and prepare for the manufacturing and sales of the new product (Wheelwright and Clark, 1992).

4.1.2 Importance of Product Development

Product development is increasingly important to a firm's profitability and competitiveness. A successful product development activity offers a sustainable competitive advantage and, is the key driver of a firm's overall success (Loch, Stein, & Terwiesch, 1996). Product development and innovation allow companies to gain competitive advantage, attract new customers, retain existing customers, and strengthen ties with their distribution network (Kotler and Keller, 2006; Cooper and Kleinschmidt, 1990). Continuous development of new products can potentially provide satisfaction to customers, meet their changing needs and market requirements.

4.1.3 Challenges of Product Development

However, despite the importance of product development, for both the present and future growth of the company, a high percentage of new products fail when released into the market. Research (Liberatore & Stylianou, 1995; Twigg, 1998) demonstrates that most new idea concepts fail to become commercial successes, without the aid of a structured process. As new product failure rates are high, and high costs associated with product development, companies have been reluctant to provide the resources to advance the new product development process (Cooper, 1998). Therefore, balance of investments, risk and returns is a major criterion in deciding whether to proceed with a new product development (Kuczmarski, 1992).

4.1.4 Product Development Processes

Product development process consists of the activities carried out by firms when developing and launching new products. The development process consists of several identifiable stages which can be organized sequential or overlapping, with each stage provides the input to the

next one. Different literatures have several models and description of the product development processes with a little difference (Ulrich & Eppinger, 2011; Wind, 2001; Cooper, 2001; Crawford, 1987; Scheuing, 1974). A best-known model from (Booz, Allen & Hamilton, 1982) will be introduced and explained in this study Figure 7. A new product that is introduced on the market evolves over a sequence of stages, beginning with an initial product concept or idea that is evaluated, developed, tested and launched on the market (Booz, Allen & Hamilton, 1982). This widely recognized model also known as the BAH model, contain all the basic stages of models found in the literatures. It is based on extensive surveys, in depth interviews, and case studies and, as such, appears to be a good representation of prevailing practices in industry.

The stages of the model are as follows:

- 1) New Product Strategy: Links the NPD process to company objectives and provides focus for idea/concept generation and guidelines for establishing screening criteria.
- 2) Idea generation: Searches for product ideas that meet company objectives.
- 3) Screening: Entail initial analysis to determine which ideas are pertinent and worth developing further.
- 4) Business Analysis: Further evaluates the ideas based on quantitative factors, such as profits, Return-on-investment (ROI), and sales volume.
- 5) Development: Turns an idea on paper into a product that is demonstrable and producible.
- 6) Testing: Conducts commercial experiments necessary to verify earlier business judgments.
- 7) Commercialization: Launches products.

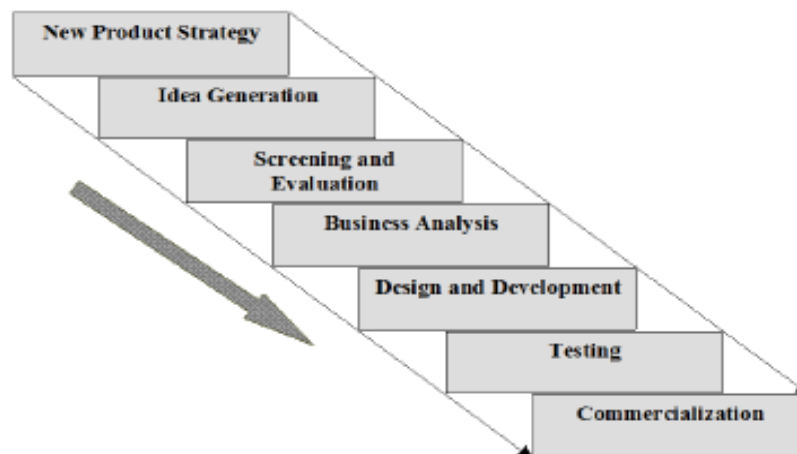


Figure 7: New Product Development (NPD) stages (Booz, Allen & Hamilton, 1982)

4.2 Supplier involvement in Product Development

4.2.1 Why Involve supplier?

Supplier involvement in product development holds great potential, both in the short and long run. It can also result in major benefits in terms of money and time. In many industries, the overall aims of involving supplier in product development are to better leverage suppliers' technological capabilities and expertise and to improve product development efficiency and effectiveness (Burt and Soukup, 1985; Kamath and Liker, 1994; Ragatz *et al.*, 1997). The short-time goals of involving supplier in product development leads to development efficiency and effectiveness (Clark, 1989; Birou and Fawcett, 1994; Mendez and Pearson). Introducing design changes earlier by means of early and intensive communication with the supplier can lead to the reduction of development costs and the reduction of development lead-time. Effectively, supplier involvement leads to reduction of product cost and increase product value, when suppliers are mobilized and leveraging their expertise on Design for Manufacturing (DFM), quality and alternative materials (Wasti and Liker, 1997). Long-time goal is another reason why suppliers are involved, in order to get access to the technological knowledge of suppliers, technology roadmaps may be draw up together with the suppliers.

4.2.2 Timing of involvement

The timing of involvement is defined as a stage of the New Product Development (NPD) process at which the lead manufacturer begins to search for suitable suppliers and make them aware of the project, irrespective of the overall nature of the process, that is either sequential or overlapping Bonaccorsi and Lipparini (1994). The timing of involving suppliers in a development process are controversial among the scholar. Suppliers involvement can take place in any stage of the processes, it could take place during the concept stage, development stage, after detail design have been completed and technical specifications issued. It could also take place in the feasibility stage, before detailed design but after the concept design has been completed.

Suppliers involvement of simple, less critical and critical items are different. The less critical items don't need to be involved before engineering of prototype phase, and critical items should be involved in the early stage (ESI), during the idea generations (Monczka, 2009).

Eisenhardt and Tabrizi, (1995) believed that the unpredictable and complex projects should involve suppliers at the early stage in the process, while in predictable and simple project, supplier could be involved later in the process. Supplier can be involved at any stage in the development. The level of "early" or "later" depend on different criteria's, such as the complexity of the project, technology and the strategic alliances with the supplier (Handfield *et al.*, 1999).

4.2.3 Early Supplier Involvement

Early supplier involvement (ESI) is a strategic type of vertical collaboration between buyer - supplier (Cousins, 2005). The buyer tries to involve the supplier in the product development process from a very early stage and widely researched among the scholar in the context of new product development. ESI is widely practiced by the Japanese auto industries and are the reasons for their superiority over US and European in terms of quality, productivity and lead time (Clark, 1989, Womack et al., 1990). Though many firms are adopting a more Japanese-like policy toward suppliers. Early supplier involvement is defined as “an important coordinating mechanism for decisions that link product design, process design and supply chain design together” (Petersen et al., 2005:372).

The involvement can occur at any stage in the process and range from consultation for information to full responsibility for products, components or systems development.

ESI benefits are short time and longtime. Short time benefits include better production quality, decrease development cycle and costs, and production costs (Birou and Fawcett 1994; Ragatz et al, 1997; Handfield et al, 1999; Hoegl and Wagner, 2005; Van Echtelt et al, 2008) as well as improvements in product manufacturability (Monczka et al, 2009). Long time benefits include joint research programs, aligned technology strategies, risk sharing and better efficiency and effectiveness of future product development projects (Van Echtelt et al, 2008). Despite the benefits, ESI also poses some challenges in its implementation such as lack and/ or risk of cooperation among the buyer-supplier (Bruce et. al. 1995), intellectual property conflicts and over estimation of the development skills of suppliers.

4.2.4 Buyer - Supplier Involvement and Collaboration

The degree of the supplier responsibility varies in the product development process. The extend of involvement is related to the degree of integration (Wagner & Hoegl, 2006). They are divided as follow: White box, Gray box and Black box integration. White box integration means that development or own design is made by the buying company while the supplier is involved in a sort of ad hoc manner. In grey box integration the buying together with the supplier company initiates a joint development effort where both are having responsibility in the design and development phase of the product. They shared technology and makes joint decisions regarding design specifications. In black box integration the supplier is informed on the design specifications and then takes the full responsibility for the design process (Petersen et al, 2005). When used efficiently, black box collaboration has been proven very effective in terms of development time and quality. The overall benefits can only be achieved where there is high level of trust in the collaborations. The Figure 8 below shows the assigned responsibilities of each supplier.

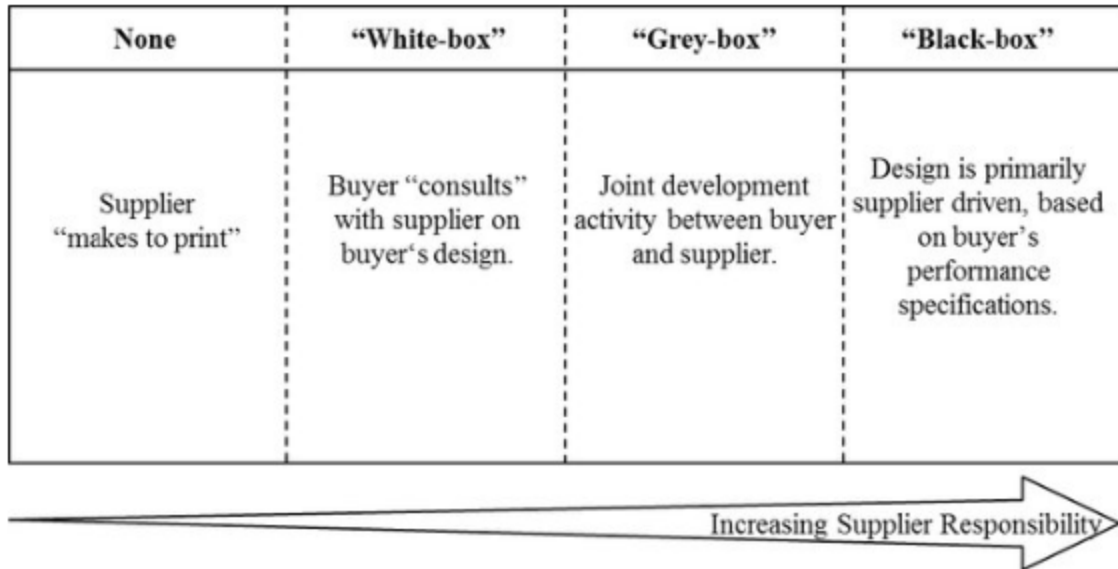


Figure 8: Supplier Integration spectrum based on Petersen et al. (2005).

4.3 Supplier Involvement Success Factors

Studies show mixed results of supplier involvement in product development projects. The varying results of these studies shows that the process of supplier involvement is a complex and not understood completely. It is believed that supplier involvement needs to be managed properly on the organizational and the project level has only recently emerged. For a supplier involvement strategy to be successful, contingency factors on the organizational level and the management of supplier involvement on the project level are critical.

4.3.1 Contingency factors on the Organizational Level

Technically, one contingent factor on the organizational level is the product architecture. The type of design and development interaction with suppliers must match (Boutellier & Wagner, 2003). Researchers have recommended that supplier involvement strategies are contingent on the architecture of the product and the design and development interfaces with suppliers, ranging from “none” and “white box” to “gray box” and “black box” supplier integration (Monczka et al., 2000).

Supplier’s R&D capability and ability to select the right supplier to be integrated in the firm's product development activities is another contingent factor on the organizational level. Selecting the right suppliers requires strategic supplier assessment and is very important for effective use of suppliers’ knowledge. Strategic supplier assessment is to achieve alignment in suppliers’ cultural/behavioral and technical capabilities and the buyer’s needs (Petersen et al., 2005). Some suppliers are unable to take on certain R&D responsibilities due to their inability to possess component knowledge and architectural knowledge of the firm’s

product (Henderson and Clark (1990). All the suppliers involved in the product development should be able to have design knowledge about the component, not the product itself (component knowledge) and architectural knowledge (ability of suppliers to integrate and coordinate knowledge, capabilities, activities, or products from different suppliers and the buying firm).

Partnering and cooperative among the buyer-supplier is another critical factor at the organizational level (Bonaccorsi & Lipparini, 1994). Cooperative norms, high level of trust and commitment, and open exchange of information among both firms should be establish (Sobrero & Roberts, 2002; Walter, 2003).

4.3.2 Management of supplier involvement on Project Level

Unlike organizational level, the positive effects of supplier involvement, are not easily achieved in product development processes on the project level, because of the criticality of the management of supplier involvement on the project level (Hartley et al., 1997). The project success is significantly related to the quality of the collaborative working between the buyer's and the supplier's project members (Hoegl & Wagner, 2005).

In general, the problems of managing supplier involvement can be attributed to relation between the buyer-supplier, the supplier, and finally the buyer's itself. Lack of communication and trust between the partners may lead to the unclear agreement, large potential risk and conflicts, which hinder the collaboration's effectiveness and efficiency. For instance, communication problem may occur when the buying firm have incompatible design software to that of supplier.

The level of supplier's in-house technical capabilities is one of the main determinants of successful supplier involvement (Wasti and Liker, 1997). If suppliers with little or limited experience in joint product development are selected such that they are focusing on price, the supplier would not be able to perform to its capabilities. In order to improve the results of supplier involvement, technological and innovative capabilities of the suppliers must be considered in the selection criteria (Hartley, 1994, p. 67).

Unclearly defined product development process and strategy may arise from the buying firm, which may lead to involving the wrong suppliers in the product development projects. Timely involvement of supplier is a more appropriate strategy, suppliers need to be involved at different moments, and in different ways (Wasti and Liker, 1997; Wynstra and Ten Pierick, 2000). Problems at the buying firm may also arise due to resistance of the development engineers. They may constitute barriers for supplier involvement when they feel their work is threatened. Efficient and effective buyer-supplier collaboration in product development project can only be achieved if the supplier firm is open and prepared to face the challenges laid out in this report.

4.4 Core Competence

4.4.1 Review of Core Competence

The origin and history of core competence started from the 1990 article titled "The Core Competence of the Corporation," (C.K. Prahalad and Gary Hamel) published in *Harvard Business Review*. The article asserted that business executives in the 1980s were judged on their ability to restructure, declutter their organizations, but in the 1990s they are judged on their ability to identify, cultivate and exploit the core competencies that make growth possible. Prahalad and Hamel observed that successful enterprises viewed themselves as "a portfolio of competencies versus a portfolio of businesses,". These competencies help the businesses to adapt quickly to dynamic changing opportunities. Hamel and Prahalad (1994) defined core competence as the collective learning of the organization, especially how to coordinate diverse production skills and integrate multiple streams of technology. It is also about the organization of work and the delivery of value. Core competencies are the organization's fundamental strength and are things they do very well.

The use of core competence as a tool for better integration, co-ordination among Strategic Business Unit (SBU) strategies was stressed by Prahalad and Hamel. They wrote that close co-operation among SBU's in relation to their core competencies will facilitate organizational learning and enhance the company's ability to leverage its resources. The concept of core competence act as a vehicle for SBU's to find common interests, problems, capabilities or opportunities (Hamel and Prahalad,1994).

4.4.2 Understanding Core Competence

The terms competence, core competence and capability as synonymous has generated confusion as to the relationship between competencies and capabilities (G. Stalk, P. Evans and L. E. Shulman, 1992). For a company to be able to sustain its competitive advantage it must understand fully their core competencies and capabilities, effectively exploit its resources to the extent that its competitors are unable to imitate its strategies. For sustainable competitive advantage, corporations must devise ways to identify, cultivate, and exploit the core competencies that make growth possible (Prahalad and Hamel, 1990). Possession of core competencies itself will not result in competitive advantage; it is the successful identification, nurturing, development, and deployment of the core competencies that is important for adding value to the firm. Competencies are commonly agreed to reside in individuals and teams of individuals, implying that the competence concept involves a cumulative hierarchy. Competency hierarchy has been adopted by researchers to understand the concepts of core competencies, capability and organizational resources. Each level in the hierarchy is based on the level below. It results from the integration of the elements in the lower level, see Figure 9.

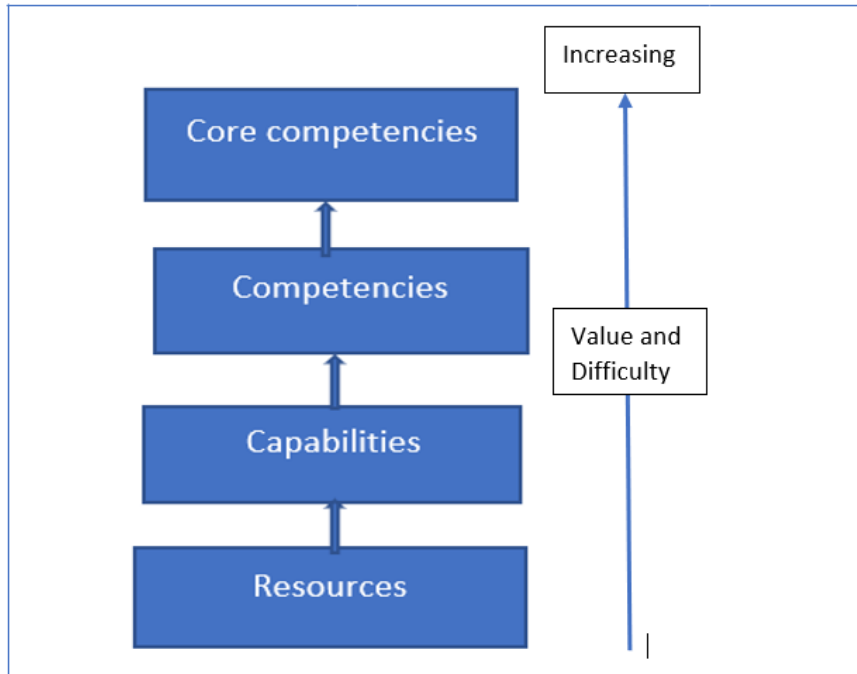


Figure 9: The Competencies Hierarchy (Mansour Javidan (1998)).

4.4.2.1 Resources

The lowest of the competency hierarchy is resources and it's the building blocks of competencies. Resources are the inputs into the organization's value chain and add little value on their own. Every company has many resources, but not every company can put its resources into best use. It can be tangible like plant, equipment, raw materials, human resources (e.g. experience) or intangible like a brand name. There are three categories of resources: physical resources such as plant, equipment, location and assets; human resources such as manpower, management team, training and experience; and organizational resources such as culture and reputation (Barney, 1991).

4.4.2.2 Capabilities

They are the second level in the hierarchy and consist of a series of business processes and routines that manage the interaction among its resources. It is the organization's ability to exploit its resources. Knowledge and skills for solving technical problems are defined as capabilities. Capabilities are functionally based, it resides in a function, for example, there are marketing capabilities, production capabilities, distribution and logistics capabilities and human resource management capabilities. Functional capabilities generate value by deploying resources (Mansour Javidan (1998)).

4.4.2.3 Competencies

The combination of single capabilities is defined as competencies (Mansour Javidan (1998)). Competence is the third level in the hierarchy, a cross-functional integration and co-ordination of capabilities. In a multi-business organization, competencies are a set of skills and know-hows housed in an SBU. They result from interfaces and integration among the SBU's functional capabilities. For example, SBU may possess the competency of developing successful new products, because of integrating management information systems MIS capabilities, marketing capabilities, R&D capabilities and production capabilities. Competencies add greater value because they expand the boundaries of capabilities (Mansour Javidan (1998)). Competencies result from the synergies among the capabilities and expand the capabilities boundaries.

4.4.2.4 Core Competence

Core-competencies arise from the synthesis of selected competencies (Schuh G, Kampker A. (2011)), which are necessary to establish competitive advantages (Bouncken RB. (2000)). A core competency is the highest level in the hierarchy and a collection of competencies that are widespread in the corporation. As Prahalad and Hamel pointed out that, core competencies require collective organizational learning, involvements and a commitment to cross-SBU integration, for instance, new product development is a core competency if it goes beyond one SBU (Mansour Javidan (1998)). Core competence is defined by Hamel and Prahalad (1994) as a bundle of skills and technologies that enable a company to provide a particular benefit to customers. Core competencies are not product specific; they contribute to the competitiveness of a range of products or services.

Core competencies add the greatest value since they exploit resources and capabilities at the broadest level, across the whole organization (Mansour Javidan (1998)). Exploiting core competencies depends on the corporation's ability to achieve integration, communication and co-operation between the different SBU's and other parts of the company. Core competencies are not necessarily about high spending or investment in core technologies; they are about effective coordination among all the groups/people involved in bringing the product to the market through effective utilization of core technologies and processes across a wide variety of products/markets.

Core competencies are more difficult to attained due to its higher levels in the hierarchy. Developing a functional capability requires co-operation of the individuals in one function. Achieving competencies requires the integration and co-ordination of many functions in the same SBU.

4.4.3 Identifying Core Competence

The process of identifying which core competencies to develop is a difficult task. Any organization's management group attempting to implement Prahalad and Hamel's ideas in their organizations are faced with the challenges of understanding the organizational process for identifying core competencies and capabilities. Identification is arguably the starting point of all core competence research (Clark, 2000) and is the matter on which

most previous research has focused (Eden and Ackermann, 2000; (Mansour Javidan (1998). The process of identifying core competencies usually entails having employees identify core competencies by scanning and assessing company-critical resources, capabilities, and competencies (Prahalad and Hamel, 1990). These are the three fundamental characteristics of core competence: It creates perceived value for customers; It has a wider market applicability and makes difficult for the rival firms to imitate. Core competence is the technical and managerial know-how, experience and expertise, that makes a deadly combination of capabilities and resources for the organization, which helps the organization to get an edge over its rivals (Mansour Javidan (1998). A products or services offered by an organization should be uniqueness, if the products or services offered by the company cannot easily be copied. If such products are offered by the company, then the company can consider it as core competence.

Core competencies are the source of competitive advantage and enable a firm to introduce an array of products and services in the market. Core Competence refers to that set of distinctive capabilities that provide a firm with a sustainable source of competitive advantage and contributes to its long-term success. Core competence is something a company does especially well relative to its competitors. In order to identify a company's core competence, a skill must meet three tests (Mahammad Abu Faiz, (1998). They are as follows:

4.4.3.1 Customer Value

Skills that help the company to deliver a fundamental customer benefit are core competencies. The competence must give the customer something that strongly influences him or her to patronize the product or service. If it does not, then it has no effect on competitive position and is not a core competence. For instance, Honda's skills of producing superior less fuel consumption, less noise and vibration engines does provide customers with highly valued benefits.

4.4.3.2 Competitive differentiation

A capability of a company must be competitively unique. The core competence should be difficult to imitate. This allows companies to provide products that are better than those of their competitors. A company must also sustain its competitive position in the market. For instance, Honda's power train is a unique competitive advantage over its rivals.

4.4.3.3 Extendibility

A company's core competitive should open a good number of potential markets. If it only opens a few small, niche markets, then success in these markets will not be enough to sustain significant growth. The in-depth understanding of core competence would lead to a better match between supplier opportunities and internal strengths because once the corporation knows its areas of strength, it can search the external environment to identify possible ways of better exploiting those strengths.

4.4.4 Examples of Companies Core Competencies

- Intel - core competencies is design of complex chips for computers
- Microsoft - has the core competence of designing office software products that are user-friendly
- Federal Express - has a core competence in logistics management - on time delivery
- Motorola - wireless communication
- Honda – core competence in small engine design and manufacturing
- Sony – core competence is miniaturization
- Microsoft – core competence in designing office software products that are user friendly.

4.4.5 Importance of Core Competencies

The core competence enabled the managers to focus on the essentials and encourage them to identify those things that were not “at the core”. A core competence provides potential access to a wide variety of markets, it makes a significant contribution to the perceived customer benefits of the product. Organizational core competencies are the unique resources of an organization, it affects many products and services and provide a competitive advantage in the marketplace (Johnson & Scholes, 2002). Core competencies lead to the development of core products. These core products are used to build a larger number of ends – user products. Core competencies provide focus for long- term goals and helps firms focus their energies. It helps pave way for above – average performance over the long – run and provide focus for long-term goals. Core competencies lead to the development of core products which are used to build a larger number of ends – user products. Finally, core competence helps to improve chances for long – term success as competencies are enhanced with time.

4.4.6 Future of Supplier Involvement

The important drivers for supplier involvement in product development are the needs for shorter time to market of new products, product cost and R&D costs. Some companies treated supplier involvement as a cost reduction concept and tried to externalize their non-core activities to supplier partners in order to focus on their core competences. Gene M. Grossman (2003) describes that we live in an age of supplier involvement.

The question is how to determine which parts of activities are core activities and which parts are non- core activities? The market is dynamics as time goes by, some activities they decide to keep in-house today may be worth nothing as time goes by, thereby become non-core activities; whether the activities they decide to be given to supplier would not become core competencies in the future? Hence, it is necessary for the decision makers to distinguish their activities from core to non-core before implementing their supplier involvement decisions.

Based on the interviews with the R&D directors and project managers on their view about involving suppliers in product development in the future (Stephan M. Wagner, Martin Hoegl, 2006), majority predict an increasing importance of such a strategy, nine expect a similar level, whilst only one predict that the supplier involvement in product development will decrease. Looking to the future of supplier involvement, some scholar also mentioned impediment relates to core competencies of the firms and stated that, supplier involvement will always be restricted to non-core technologies, products, or components (Stephan M. Wagner, Martin Hoegl, 2006). For instance, in order to develop a reliable process for international sourcing, Boeing decided to retain in-house wing design and production (core competency) because it was a critical component (affecting safety, lift, efficiency, strength) and one in which it had accumulated substantial expertise. Most of the scholars hold the opinions that the company's core activities are not proper to be given to the supplier. (Quinn and Hilmer, 1994; Arnold, 2000), as involving supplier on the core activities may reduce the incentives in company's innovation, disclose of the critical technologies and increase the potential competitors, thus offset the benefits brought by involving supplier. Hence, the decision makers prefer to maintain the core activities in-house, whilst involving supplier in the non-core activities (Arnold, 2000).

4.5 Summary of the Literatures Review

The future supplier involvement on product development projects have been studied from the core and non-core competencies perspective. The literatures review provides that the suppliers involvement is very important for an organization cost savings on products life cycle, products cost, and R&D costs. The literature findings suggest that involving supplier would help firm's to fast development of technologies, competitive pricing, innovative performance and improved quality. Contrary to these believes, some literatures emphasized on the demerits on supplier involvement as caused of high coordination costs, valuable knowledge at risk, especially when the activities involved core competence of a firm. It is also known from the literatures that, there is no time or standard rule on the timing of the involvement of suppliers. The involvement can occur at any stage in the process and range from consultation for information to full responsibility for products or system development.

The literatures review into the future supplier involvement on core competency predict an increasing importance of such a strategy, that supplier involvement will always be restricted to non-core activities. The major concerned mentioned in the literatures are the challenges of understanding the organizational process for identifying core competencies and capabilities. Identifying these core competencies would help an organization to develop their core product and access to wide markets. It would help the management to focus on the essentials and decision making.

CHAPTER 5

5. FRAMEWORK FOR INVOLVING SUPPLIER IN CORE COMPETENCE

Core competency is a firm's basic business and area of greatest expertise. Hamel and Prahalad (1990) hold the view and state that in the long run, competitiveness generates from an ability to build a core competence, at lower cost and more speedily than competitors. Gary Hamel and C. K. Prahalad (1996), developed three ways to identify a core competence: provides potential access to a wide variety of markets; makes a significant contribution to the benefits of the product as perceived by the customer and core competence should be difficult for competitors to imitate. Based on the views from Mansour Javidan (1998) and Hamel and Prahalad (1990). I develop two ways to identify a core competence:

First, the firm's activities, products and or businesses must be unique in the eyes of the customers. For instance, IKEA uniqueness in modular design and innovation are their core competencies. They focused on its core competences, and continually worked to build and reinforce them. It always sells goods with high quality at lower price than other manufacturers in the market and its products built up more and more of a market lead.

Second, the core competence should cross SBU boundaries and result from the integration and harmonization of Strategic Business Units (SBU) competencies. For instance, a consulting firm to oil and gas industry with several offices located in different cities. Each geographic location may have developed, over time, a series of specific skills to the upstream oil industry, to the extent that the firm can leverage this knowledge across its network of offices. The firm can develop and possess a core competency in upstream management consulting by ensuring that the office with this expertise is available to others business units and that it helps other offices develop the same set of skills. The activities which possess the characteristics above should not be outsourced to supplier and must be treated as the core competences in the company.

Combining the views of Eisenhardt & Tabrizi, 1995; Hartley, Zirger, & Kamath, 1997; Littler, Leverick, & Wilson, 1998; Wynstra et al., 2001; Stephan M. W, Martin Hoegl, 2006; Ulli Arnold, 2000; J. Quinn and F.G. Hilmer (1994), a modified framework based on the theoretical arguments and hierarchy of competencies defined by (Mansour Javidan (1998) is developed. A framework for supplier involvement in core competence is formulated as shown in below.

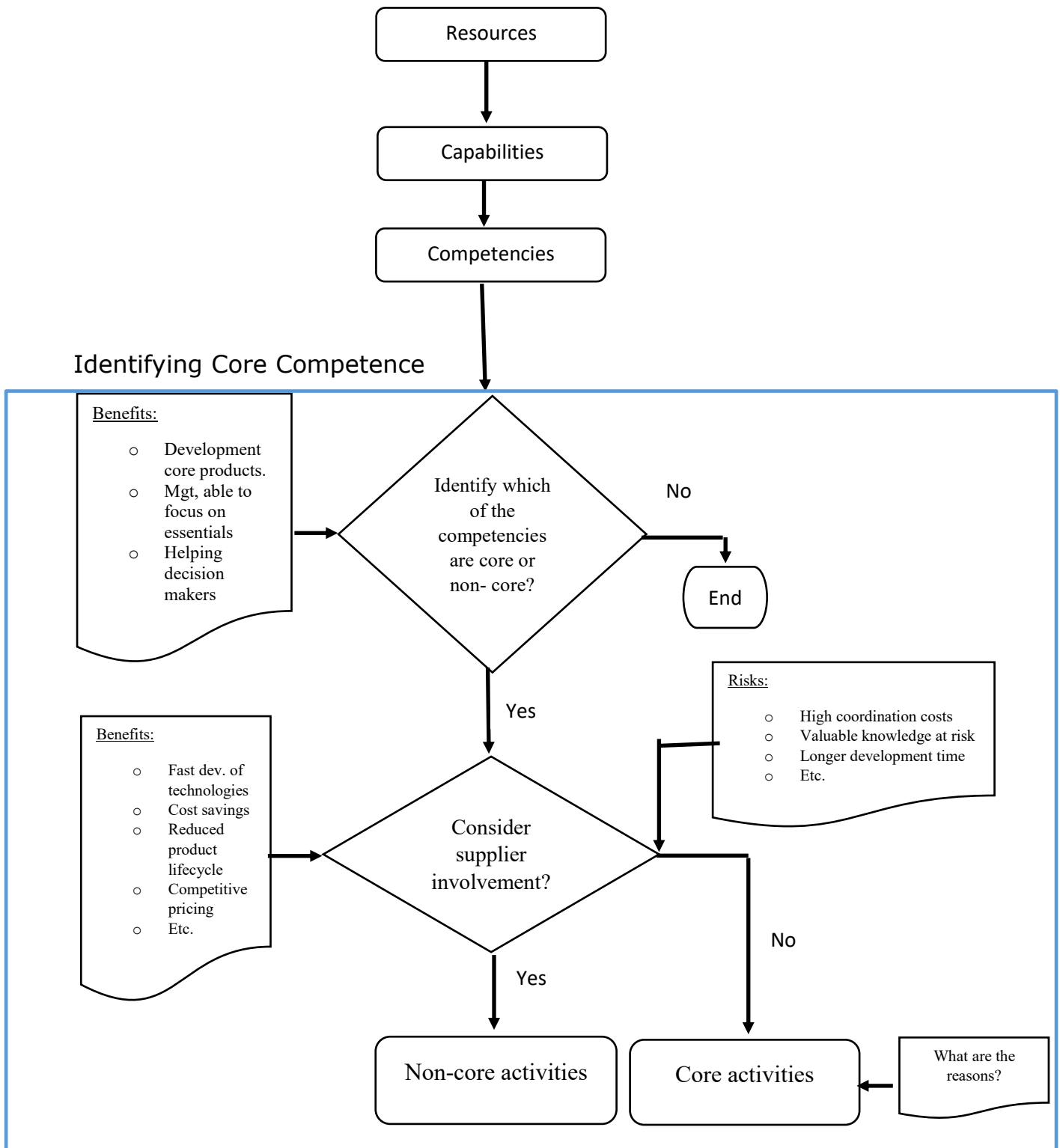


Figure 10: The Modified theoretical framework that relates the hierarchy of competency with the process of identifying supplier involvement on core competency activity (Mansour Javidan (1998)).

5.1 Framework Descriptions

Figure 10 above is a framework that shows how the hierarchy of competencies relate to the process of identifying supplier involvement in the core competence activities. The first step in successfully identifying a company's core competencies is to create universal understanding of concepts of organizational resources, capability and competence. The second step in the framework is the process of identifying the organizational core competence. For a company to successfully exploit their resources, they need to fully understand their core competencies.

The benefits of the two decision processes are highlighted in the framework. If a company refuse to identify the core and non-core competence activities of its organization, then the process "END" and there won't be any risk or benefit.

CHAPTER 6

6. DISCUSSION

6.1 Introduction

This chapter presents research discussions whereby the researcher presents his discussion by use of objectives. The results have been summarized and presented in tables and charts. This research thesis aimed at assessing the future of suppliers' involvement on core competence activities of a firm. The study was guided by the following specific objectives: -

- 1) To identify which activities are core and which are non-core among the company's' competencies
- 2) To determine if suppliers are involved in the identified core activities or not
- 3) To find out the reasons why suppliers are involved or not

The findings contained in this chapter originates from 17 respondents from the questionnaires and two managers interviewed to collect primary data. The collected empirical data in this study led to an analysis that generated some interesting results.

6.2 To identify which activities are core competence and which are non-core among the company's' competencies

The first objective was to find out the competencies of a company since many previous researchers have defined and used the concepts of competence and core competence interchangeably. In this study, "being customer value", "competitive differentiation" and "extendibility" are the three attributes which can be used to describe a core competence (Mahammad Abu Faiz, (1998). In addition, core competencies require collective organizational learning, involvements and a commitment to cross-SBU integration (Prahalad and Hamel (1990), Mansour Javidan (1998). Based on these researchers' attributes, this thesis has distinguished core competence from competence and provided a clear definition for core competence. The attributes are proposed based on the literature review and hence have sound theoretical basis. The results obtained from the interviews and questionnaire survey have shown that the use of such attributes is feasible. Question 5 "*Does the core competence cut across the Strategic Business Units (SBU) of the company?*" gives 75 per cent respondents say their core competence cuts across SBUs.

The respondents identified design, research and development, technical expertise as know-how of their companies, and quality of their processes and products. Most of the respondents believed they are better than their competitors which agreed with the attributes of the core competence, because doing something very well does not necessarily result in a competitive advantage. Although this information about how they perceive their competitors is totally subjective and needs to be externally and objectively verified. The internal views could be validated by information collected from outside sources, its key stakeholder groups and those groups that are in frequent contact with it and are able to provide useful feedback.

6.3 To determine if suppliers are involved in the identified core competence activities or not.

There exists a conflict in the literature as to whether firms should involve suppliers in their core activities. Some studies indicate that, supplier involvement is beneficial for their innovation, product quality and financial performance (Chung and Kim, 2003). Other studies point to the fact that supplier involvement helps firms increasing the speed of development, market timing of new products, and reduce production costs (Lau, 2010; Van Echtelt, and Duysters, 2008; Bonaccorsi & Lipparini, 1994; Bozdogan, Deyst, Hoult, & Lucas, 1998; Clark, 1989). The results of my thesis show that, generally firms tend to involve suppliers in their activities, as 100 per cent responded that supplier involvement is important to their businesses.

Further results from this study indicate that firms find it more difficult to involve suppliers in their core activities or services than with a non-core activity. The survey questionnaires returned 75/25 per cent in favor of not involving supplier in core business. This thesis supports the claim by some scholars that found no benefits involving supplier in core activities (Wagner and Hoegl, (2006), Eisenhardt & Tabrizi, (1995), Hartley, Zirger, & Kamath, (1997), Littler, Leverick, & Wilson, (1998), Wynstra et al., 2001). The 3 out of 17 respondents say "yes" without given reasons but did not give reasons. The reasons might be that they did not understand the concept or maybe they agreed with some researchers that believed supplier involvement can enhance innovation performance, including increasing the speed of development (Lau, 2010; Van Echtelt, and Duysters, 2008; Bonaccorsi & Lipparini, 1994; Bozdogan, Deyst, Hoult, & Lucas, 1998; Clark, 1989).

6.4 To find out the reasons why suppliers are involved or not in core competence

The respondents that supported non involving supplier in their core activity gives the reasons as due to trademark policy of their organization, protection of the core business and brands from leaked to the competitors through supplier. Although, one of the interviewees believed that involving supplier in core business depend on the situation, He said "*in very specific cases we involve suppliers because it helps us to continue enhance our experience based*".

6.5 Applicability of the Framework

The proposed theoretically derived framework for identifying core competence suggests a plausible method for identifying core competence of an organization and using the core competencies for creating a sustainable competitive advantage for the firm. This framework can be used not only for identifying core competencies, but also for charting out its future strategic decision making. This indicates that the framework has descriptive as well as prescriptive ability which means that the framework can be used, for charting out the future core competence framework for an organization.

CHAPTER 7

7. CONCLUSION

The concept of core competency has received increasing attention by managers and decision makers. A lot has been written on what it is, but there is little information on how or whether suppliers should be involve in core activities. The aim of this study is to assess the future of supplier involvement in core activities of a firm.

A clear operational definition of the important concepts of resources, capabilities, competencies and core competencies were explained in this study. I also provide a framework to incorporate these concepts into the process of identifying core competence, based on the theoretical findings. The study also presents a framework for identifying a firm's core and non-core competencies. The fundamental premise of this study is that any organization would benefit from a systematic and methodical identifying its core competencies.

The results from this study have shed more light on the topics of core competency and supplier's involvement as an important to competitive advantage. The study has been able to identify several competencies in the areas of technological know-how and reliable processes type. This study also confirms researchers in the field (Langerak & Hultink, 2005; López-Vega, 2012), concerning suppliers and its positive effects on the firm's innovation, product quality and financial performance (Chung and Kim, 2003). There is clear agreement from all the respondents and the interviewees that supplier involvement in the company's activities would yield development of new products, reduce the ramp-up time, and make better products.

After analyzing all the statistical data, I found that among the competencies, quality products and processes, design/or research and development are major core competencies of the respondent's companies, see *Figure 3*. The results suggest that respondent's firms do not involved suppliers in their core competence activities. Majority of the respondents, 75 per cent agreed with the researchers Stephan M. W, Martin Hoegl, (2006), and Wagner and Hoegl, (2006), who believed involving supplier in core activities may require firms to put valuable knowledge and /or core competencies at risk of appropriation by the suppliers. Even though one interviewee believed involving supplier in core competence in some special cases is a common practice in their company, additional empirical data from the questionnaires makes it almost certain to think that:

- 1) supplier involvement in product development benefits the companies.
- 2) suppliers are involved in the non-core competence activities.
- 3) companies are not in favor of involving supplier in their core competence activities due to various reasons such as trademark policy, protection of brands and competition.
- 4) companies that do not involving suppliers in their core competence are better than their competitors.
- 5) it may be difficult to predict the future trends of supplier involvement in core competence activities because of the number of the respondents in this study.

6) that the framework can be used for identifying core competencies and strategic decision making by the executives.

7.1 Limitation of the study

While the study makes significant contributions to research and practice, there are limitations that might have affected the outcomes of the analysis.

Firstly, the small number of respondents may not reflect all the opinion of Small and Medium Enterprises (SMEs) companies, as only 17 respondent's data were analyzed with the two interviewees. This study does not determine the best possibly ways to involve suppliers in the core competence activity of a firms. I also realize that some companies didn't participate in the study or give reasons because they considered requested information as confidential.

Another limitation of this study was the lack in control of the respondent since the questionnaire was sent out by e-mail. The use of e-mail also made it more difficult for the respondents to raise questions about the questionnaire.

7.2 Future Research

This study focused on small and medium sized firms, as these are more eager to innovate radically and are more assessible for questionnaire distribution. Comparing the supplier's involvement on core competence in a multi-national company could bring interesting results. Another interesting area of investigation could be how to manage the involvement of supplier in a core competence activity.

This study leads me to the conclusion that for achieving sustainable competitive advantage, firms need to have a framework for identify, nurture and develop its core competence.

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APPENDIX A

The Survey Questionnaire

(I) The Cover Letter

Dear Sir/Madam,

.....have been identified and selected by Norwegian University of Science and Technology (NTNU), as one of the best and manufacturer in I'm currently working on a research thesis project "Supplier Involvement in Product Development" and your company have been chosen among many companies as a relevant organization for this master thesis. To complete this project, I have prepared this survey and I'd really appreciate it if you could spend 5 minutes to complete it. All your responses will be anonymous.

Thank you for your valuable time.

Best Regards,

Ebenezer Olawoye

(II) The Questionnaire

Master Thesis Survey Questionnaires

Topic: Supplier Involvement in Product Development.



1. What is your position in the company?

Your answer

2. How long have you held this job or a similar job in the company?

Your answer

3. Could you please lists the competencies of your company?

(Competencies are set of abilities, skills, experience and knowledge that sets a company apart from its competitors.)

Your answer

4. Among the competencies listed above, list the one you consider is/are core-competencies of your company?

(Core competencies differentiate an organization from its competition and create a company's competitive advantage in the marketplace. An organizational core competency is an organization's strategic strength. Examples, 1. Honda's core competency lies in its engine and propulsion systems; 2. Sony's core competency lies in it specialize in the miniaturization of electronic devices.).

Your answer

5. Does the core competence cut across the Strategic Business Units (SBU)of the company?

Yes

No

6. Are we any better than, equal to or worse than our competitors? Please explain briefly what make your company better, equal or worse than the competitors?

Your answer

7. Does your company normally involves supplier in its business activity? If YES or NO, please explain briefly

yes

No

Other: _____

8. Does your company normally involves supplier in the core-competency activity? If YES or NO, please explain briefly

Your answer

9. Does your company normally involves supplier in the non-core-competency activity? If YES or NO, please explain briefly

Your answer

APPENDIX B

Confirmation Letter to the Respondents

**Norges teknisk-
naturvitenskapelige universitet
NTNU**

**Institutt for industriell økonomi
og teknologiledelse**



Førsteamanuensis Tim Torvatn

**Postadresse
Alfred Getz vei 3
7491 Trondheim
Telefon 73 59 34 93
Telefax 73 59 35 65**

20. June 2019

Re: Confirmation Letter for master student

This letter confirms that Ebenezer Titunlola Olawoye is a master student at NTNU within the 2-year international master program in Project Management. He is currently working on his master thesis and is in the process of finding relevant companies or organizations that can function as case for his master thesis, which is about supplier involvement in product development.

If you need further confirmation and/or want to discuss how your company can be a case or source of information, please do not hesitate to contact me. I am his supervisor and can be reached on phone numbers 9716 3061 (cellphone) and 735 93493 (office). At NTNU, we hope that you can help us by functioning as a case and/or information source, as we are dependent upon co-operation with external companies and organizations in order to succeed in our goal to educate good candidates.

Best regards

Tim Torvatn

IØT, NTNU

