

INTEGRATING SUPPLIERS INTO NEW PRODUCT DEVELOPMENT SUCCESS  
FACTORS

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# INTEGRATING SUPPLIERS INTO NEW PRODUCT DEVELOPMENT SUCCESS FACTORS

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## **Statement of the Problem**

The integration of suppliers into new product development (NPD) has changed the way many organizations have been able to operate in today's even changing market. The research suggests there are numerous factors which contribute to the overall success of the product. However, the term success can be measured differently from company to company and around the world. In order to determine the success factors used for integrating suppliers into NPD this seminar paper will focus on only the factors which have provided identification of key suppliers, collaboration between purchasing professionals and suppliers, the goals used for achievement, and the importance of information sharing. These success factors can and should be used as best practices for organizations to achieve cost, quality, delivery, and time improvement during the development of a new product.

## **Summary of Results**

Customer demands continue to drive organizations to reduce cost, shorten concept development time, and improve quality during NPD. Widespread research has found many organizations have been able to achieve such results when integrating suppliers into development process. Suppliers are able to provide companies with innovation, design support, along with speed and proficiency during the product development phrase. Furthermore, competition in the market place is also another persuasive reason for organizations to have suppliers directly involved in the NPD process.

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## **CHAPTER 1**

### **INTRODUCTION**

Every organization is driven by the wants and needs of customers. During the pursuit to satisfy these needs, many organizations work closely with their suppliers to develop new products. This process is most often referred to as supplier integration. During new product development (NPD), supplier integration is especially important because organizations use this relationship to meet customer requirements and expectations. Not to mention, supplier integration allows for recognition of core capabilities, a shared vision of all cross-functional teams, collaboration efforts between purchasing professionals and suppliers, and the ability to share information. Today, many companies want to cut development time and costs while improving quality in NPD.

#### **Statement of the Problem**

This seminar paper aims to answer three questions: 1) What are the main success factors when integrating suppliers in NPD? 2) What goals are used to achieve success when supplier integration is used in NPD? 3) Does successful supplier integration improve identifying key suppliers, collaboration efforts between purchasing professionals and suppliers, and the importance of information sharing?

#### **Purpose of the Study**

This study aims to find the success factors of integrating suppliers into NPD and review how these factors improve identification of key suppliers, collaboration efforts between purchasing professionals and suppliers, the goals used for achievement, and the importance of

information sharing. The paper will also suggest how these success factors are best practices which can be used by organizations to achieve cost, quality, delivery, and time improvements during NPD.

### **Significance of the Study**

Organizations will continue to development new products which will continue to require the use of suppliers. Since much of the total cost of the new product occurs during the concept and design engineering phases, successful early integration of suppliers usually allows companies to save on cost not to mention other factors such as product quality and cycle time. The relationship between buyers and suppliers is often established early in the NPD process. Critical decisions during the process also allow the buying company the chance to set goals which can be achieved by the suppliers. The collaboration created between the companies is not only important for one product but future long term relationships.

### **General plan of organization**

This seminar paper is organized as follows: literature review, analysis on the research, conclusions, recommendations, and references. The literature review provides the reader with background information on the main references used when writing this paper. The published references provide a basis for the study and demonstrate the proven success factors used during the development of new products. The analysis on the research section explains how these success factors can be used as best practices along with company case studies. This section is based off the information found while writing the literature review section. The conclusions and recommendations section reflects on the information shared during the analysis section and provides insight for future research.

## **CHAPTER II**

### **REVIEW OF LITERATURE**

The following information is a review of the literature used regarding supplier integration and how it is used during new product development (NPD). The current research addresses the success factors which can be used by organizations as possible solutions for improving the buyer-supplier relationship early in the design processes of developing new products.

#### **Innovation and Supplier Integration**

For many decades, companies around the world have been hesitant to share research and development processes with customers, suppliers, and basically any individual who was not working directly on the project. However, as time progressed, the business processes and technologies have changed allowing many companies to learn innovation requires a more open approach especially with suppliers during NPD. Chesbrough (2011) examined previous management innovations which allowed others to gain a better perspective of where the concept is today. In the 1960s, the concept of Systems Analysis was brought into the U.S. government by Robert McNamara and his colleagues. Throughout the decade, this concept would become a significant tool for management innovation since it supported the development of many technologies of the time period.

By the 1970s, Program Evaluation Research Techniques (PERT) was developed to help companies assess trade-offs by using map sequences and dependencies on complex projects. In the 1980s, the Deming and Juran's principles of Total Quality Management were finally being widely accepted in the U.S. Then after several decades of change and innovation, the creation of new software in the 1990s allowed supply chain management the chance to become widespread.

During this decade, key suppliers become closely linked with businesses (buyers) and it is for this reason innovation management has continued to be significant at the concepts which allow relating, sharing and accessing of ideas (Chesbrough, 2011).

Open innovation environments allow organizations to see suppliers as knowledge sources which are just as important as customers. This explains why in 2000, 85 percent of the most technology-intensive companies relied heavily on external sources of technology compared to only 20 percent in 1992. Schiele (2010) found innovative firms have started to include purchasing into their NPD teams. Firms have become more willing to include external sources into the innovation process because there is increasing mobility of workers, venture capital, external options, and an increase in supplier capabilities. This improvement is significant due to the rapid changes in technology and the shift in sourcing strategies. According to Enkel, Gassmann, and Chesbrough (2009) the outside-in-process of open innovation allows suppliers and customers to be knowledge sources. When used during new product development, organizations are able to reflect on previous experiences while paving a new road of innovation.

The exchange of knowledge is also another important aspect of how the open innovation concept has transformed supplier integration into NPD. Colombo, Dell'era, and Frattini (2011) examined the open innovation strategies used by a leading NPD service provider on three collaborative projects. Their analysis found during NPD, the service provider used standard processes and organizational approaches, implemented these approaches based on the customer, and provided management useful insights on how the importance of trust during the knowledge process exchange. The authors' analysis also provided an understanding to how a company can gain knowledge from external sources such as suppliers and exchange processes used. The knowledge sharing process discussed was the exchange of formal information such as drawings

or written instructions and explicit information found within those items. Furthermore, knowledge sharing allowed the company and its suppliers the opportunity to standardize the exchange processes being used.

Strong relationships formed with suppliers during NPD can highly influence an organizations ability to be innovative. Wagner (2012) examined tapping into supplier innovation to better understand development capabilities for the NPD process. Supplier involvement early in the NPD process later dictates the direction of the relationship formed between the buyer and supplier. The fuzzy front end (FFE) phase in NPD allowed companies the chance to conduct early predevelopment work usually involving time to share ideas and time for project evaluation. During the FFE phase the main focus is the collaboration portion because this is where organizations can take advantage of supplier knowledge and capabilities. Furthermore, the study looked at whether supplier integration in FFE has positive effects on NPD outcomes and if the factors that companies use influence the integration of suppliers on NPD outcomes.

Beyond innovation research, product development practices and the role of suppliers vary by industry and organizations. The term early supplier integration (ESI) can also be referred to as early supplier inclusion and early supplier involvement. While the research thus far has suggested ESI is used in practice, Dowlatshahi (1999) examined the theoretical development of ESI based on four components: design, procurement, supplier, and manufacturing against the practice. The supplier portion of the research suggests the ability of the supplier is affected by the information given during the design and procurement phases and later impacts the manufacturing phase. The supplier is only one aspect of the ESI implementation but has direct and indirect effects on the other three components.

Early studies on ESI have also shown intensive supplier involvement in engineering helped Japanese manufacturers with lead times and cost advantages. Additionally studies since then have found performance benefits including faster development times, lower cost, and improved designs when organizations used ESI. Organizations want to be able to compete in the market place which may require using new technologies to be innovative. According to Parker, Zsidisin, and Ragatz (2008) who examined the contingency factors which affect the timing and level of supplier integration in NPD and how those varying levels of integration affect the project performance. Items which have a significant influence on the final product's performance require special attention. They found tight integration with suppliers during NPD leads to enhanced communication and establishes trust within the buyer-supplier relationship.

ESI usage also leads to successful integration of suppliers into NPD. Petersen, Handfield, and Ragatz (2003) examined case studies based on seventeen Japanese and American manufacturing organizations to validate the key activities which occurred after successful supplier integration into NPD projects. They found supplier involvement in product development increased knowledge, information sharing, technology information sharing, higher achievement of NPD team goals, and overall a higher level of benefits for the NPD team. However, some design teams are not open to suggestions but recent research studies provided information that suppliers on a NPD project team complement idea creation and enhance technology usage due the "spillover effect". This effect influences activities downstream such as future research and development (R&D). Furthermore, besides this effect works on low supplier involvement since technology uncertainty can create a lack of trust with the purchasing organization.

Another exploratory study conducted by Hartley, Meredith, McCutcheon, and Kamath (1997) surveyed product development engineers in 79 small to medium-sized firms to determine if the three techniques commonly used to for supplier integration into product development actually increased the supplier's perceived contributions as seen through the customer's eyes. They found previous empirical research suggested that the supplier's contributions to product development had little practical influence on the overall project technical success. However, their own research found early supplier involvement did increase the supplier's ability to plan accordingly to any changes occurring which could later be consider bottlenecks or supplier-related problems. Furthermore, there is more to learn about perceived supplier contributions during product development especially the role management plays into integrating supplier's skills and resources during product development.

Supplier contributions and early sourcing allow an organization the chance to design their supply chain because the relationships developed early in the NPD process between customers, manufacturers, and suppliers usually become long lasting. Handfield and Lawson (2007) conducted a survey on 134 global industrial organizations to gather information on the importance of collaboration between product design, process design, and the supply chain early in the NPD process. The results suggest early supplier integration (ESI), also referred to as early supplier inclusion or early supplier involvement, allowed companies to be successful because management could develop and manage the critical elements required for a solid supplier relationship while showing the financial benefits of supplier integration. Additionally, according to Zsidisin and Smith (2005) ESI can also be used as a supply risk management tool. The research further investigated the role of ESI through an in-depth case study of theory development and discovered NPD benefited from this form of risk management. Several

variables including outcome uncertainty, task programmability, goal congruency, and supplier performance monitoring occurred when managing supply risk through ESI. This study is another great example of how ESI is a major success factor during NPD.

### **Collaboration Strategies and Approaches**

The impact of various information-gathering techniques used by the buyer organization prior to engaging a supplier is essential to the implementation of the ESI strategies. Over the past several decades a lot of research has been done to determine the success factors involved in new product development. Ernst (2002) examined NPD success factors using 30 years of empirical studies. The article is divided into ten separate tables using three columns to show the publication, success measure, and the main results to display the success factors of new products. After further explanation, the author concludes NPD teams need to be given enough time to work on projects, cross-functional project teams have direct and indirect influences, and communication contributions to the final product. Furthermore, the team concept is essential for the whole NPD process which fosters the implementation of project-specific performance incentives.

Performance is enhanced when the entire chain is integrated. Frohlich and Westbrook (2001) investigated the supplier and customer integration strategies using a global sample of 322 manufacturers. The study found there is a forward physical flow through suppliers, manufacturers, and customers plus a backward coordination of data from customers to suppliers. The integration of suppliers along with customers into the supply chain has greater potential benefits. When classified there are five valid types of supply chain strategies followed by manufacturers including inward, periphery, supplier, customer, and outward-facing. These strategies have a direction and a degree of integration which allow manufacturing organizations

the ability to see the value in supply chain integration strategies. Nevertheless, organizations have critical strategic concerns when discussing the success of new products. The strategies and processes used are vital to the overall success of NPD which is why Moorman (1995) examined how utilizing information processes are strong predictors of new product performance.

Continuous information sharing and utilization was used throughout organizations to determine positive and negative performance outcomes. Conceptual utilization processes influence the behaviors of the way organizations process information. The research was able to demonstrate leveraging knowledge through processes is valuable because information utilization processes increase performance, timeliness, and creativity of new products.

### **Concurrent Engineering**

The integration of suppliers early is part of the key measures of concurrent engineering (CE) including sourcing as well as the number of parts and suppliers. This result was found by Balasubramanian (2001) who examined how integrating product efforts into supply chain strategies to reduce direct and indirect costs can be achieved through the planned implementation of CE. Supply chain management (SCM) implementation is enabled by the use of CE since it allows for the elimination or minimization of supply chain risks which occur during the introduction new product. Supplier integration was included in the eight processes and deliverables on the procurement checklist which is part of implementing CE concepts into the product management process (PMP). The integration of key suppliers into the early design and development process will help to reduce the time it takes to create functioning prototypes while improving the transition to the production line. These measures allow the focus to be on product development and improve the performance of the SCM strategy through CE implementation.

An integrated CE type approach in NPD is required by SCM to be efficient. Tracey (2004) conducted research to provide evidence on how production, purchasing, and logistics areas plus suppliers and customers should be used in NPD to make an early positive impact on manufacturing, delivery service, and organizational performance. According to the research, using CE in NPD promotes building a competitive advantage especially when the inclusion progress includes suppliers, customers, and members from every functional area. When CE is used correctly, collaboration among all team members allows for more intense information processing, development, and a better understanding of the capabilities as well as what is being required from the team members for successful integration. In Tracey's research SCM is referred to as another name for logistics. The efforts of CE in NPD allow logisticians to contribute to the delivery of the product and be effective in reducing supply chain costs because the SCM doctrine supports the synchronization of processes internally and with supply chain partners. Better supplier performance, improved manufacturing, and process advancements are just a few ways in which supplier involvement add to an organization's performance. This study further exposes the importance of an integrated approach using the combined strategies of CE and SCM efforts during NPD to be successful.

### **Supplier Selection**

The variation in project performance as mentioned above may be due to the selection of suppliers. Kouferos, Vickery, and Droge (2012) examined the critical strategic selection of suppliers based on buyer performance capabilities are facilitated by supplier integration. The selection process requires looking at buyer quality, buyer competitive pricing, supplier new product development capability, supplier quality capabilities, and supplier cost capability which directly and or indirectly enhances the buyer's performance. Thus according to Kouferos et al.,

companies are dependent on suppliers and the quality which is provided. The buyer may expect to see enhanced performance output in product innovation but not necessarily in other areas including quality or competitive pricing. They also found supplier integration does benefit the buyer but must be managed to insure trust and dependability while minimizing supply risk.

Selecting the right supplier has a connection to supplier involvement which attributes to a sustainable competitive advantage for companies. Wagner and Hoegl (2006) conducted an exploratory and descriptive case study with five companies focusing on the key issues to be considered when involving suppliers in NPD based on interviews with R&D directors and project managers. Their research showed organizations involved suppliers in NPD retained the responsibility for development, design, integration, manufacture, qualification, delivery, target performances, and agreed target prices. Another important aspect of their research was discovering the most critical strategic decisions required the selection of the “right” supplier. Not all suppliers are created equal and the selection of the right supplier requires looking at new or complex technology competency along with the ability to provide an outside point of view. Furthermore, the organizations also wanted to have trust, openness, and goal alignment with their suppliers.

### **Buyer-Supplier Relationship**

The intensity and frequency of communication between the buyer and supplier explains the differences in project performance but does not completely account for the variation in project success. According to Handfield, Ragatz, Petersen, and Monczka, (1999) buyers benefit from involving suppliers especially when timing new products, product quality, development cost, and product cost. When engineers decide to learning new systems, procedures, and processes to improve communication with purchasing professionals this information is later

better translated to suppliers. Hoegl and Wagner (2005) examined collaboration between the buyer and supplier positively relates to product quality, product target costs, development budgets, and development schedules. They found communication frequency and an inverted U-shape relationship with project development budget and product cost. Supplier involvement at a strategic level can happen when specific conditions are supported at the project level. Successful implementation of suppliers into NPD requires continuous supplier involvement in the project, supplier contribution into the development and design work, and interaction between the buyer and the supplier throughout the entire project.

Suppliers need to be given expectations. Lakemond, Berggren, and van Weele (2006) studied six different product development projects to distinguish the various forms of coordinating suppliers into product development. They found proactive management of supplier involvement during product development can contribute to the competitive position of organizations. Suppliers and buyers form dependencies which if done correctly allow product development activities a chance to form coordination and balance the numerous activities within the process to be completed. Suppliers are able to be involved while carrying out close cooperation with the company developing the product. The relationship between the buyer and supplier became the basis for project integration coordination and enabled the company the chance to further develop a common understanding along with mutual expectations for the supplier.

Cross-functional teams may be large or small as seen through an examination done by Marion, Friar, and Simpson (2012). Their case study used two small newly established organizations which adopted cross-functional teams, market planning during innovation development, and structured processes for the development team to improve NDP. They found

there was a difficulty for new organizations to form cross-functional teams similar to the ones used in large established firms. Cross-functional teams used in large organizations are usually comprised of engineering, sales, marketing, and manufacturing whereas small companies only may only have project teams which include the owners and a few design engineers.

Furthermore, the study was able to find both organizations were highly successful despite the lack of structured processes used at these firms.

### **Speed and Proficiency**

Developing new products takes time but is important to the overall success of many companies. According to Millson and Wilemon (2010) the relationships between the four factors thought to be important to organizations developing new products including the speed of how long it takes for the product to be produced and introduced into the market, the degree of integration among the participating various group members during the NPD process, the proficiency in the tasks performed by those group members, and the success which follows the completion of the NPD process. The results found suggest NPD speed might have been directly caused by changes in NPD proficiency, organizational, or new product market success but proficiency might have also increased NPD speed at some point during the next product development cycle. There were significant associations discovered but the sample studied was limited to 131 new product projects predominately in heavy construction equipment, electrical equipment, and the medical device industries. Further research questions are needed to provide more details on the surrounding relationship between speed and proficiency.

Finally, the world is a very competitive place and companies must use speed as an advantage to develop and launch new products quickly while still effectively. Lynn, Skov, and Abel (1999) studied the learning practices of 95 new product teams and uncovered several

factors that improve the team's ability to learn, innovate faster, and be more successful. When organizations are developing new products there are many complex issues surrounding the team's learning practices. This research suggested individuals with various backgrounds and perspectives enable NPD teams to be innovative but only when learning is encouraged within the team environment. The NPD process is able to provide teams with a desired goal to work towards. Learning in the group setting to achieve a goal focused around a new product has a direct impact on the cycle time and ultimately this leads to the product's success. Furthermore, learning also allows the NPD team to develop a product made entirely through various perspectives and multiple functional experts.

### **Case Studies**

Based on investigation, Motoyama (2011) explained how innovation is geographically concentrated. This study is important because it showed how the product development of Sony's Vaio 505 laptop was achieved through the use of innovation. This case study also provided insight into the engineering and technical aspects of innovation along with the use of technology, prototyping, and testing. This research also shared information on how Sony collaborated with suppliers to develop and create the new laptop.

Supply chain best practices can be achieved by many of the success factors involved in NPD. According to Nelson (2002) John Deere has optimized operations by using supply management efforts. During the development of new products, the company began to formalize new strategies for selecting suppliers, managing supply chain costs, utilizing e-procurement, and creating lean supplies. The company was able to use supplier integration along with strategic sourcing, supplier development, and cost management to find the right suppliers to close

performance gaps. However, supply management alone did not allow for the savings but rather the collaboration, coordination, and cooperation of engineering, manufacturing, and suppliers.

Strong supply chain relationships are important because the integration of suppliers into new product development allows a company a chance to see collaboration capabilities plus positive knowledge sharing opportunities. Curwen, Park, and Sarkar (2013) conducted a study document the current challenges the apparel industry faces when developing sustainable apparel. They studied Eileen Fisher, a women's apparel manufacturer, and found five challenges encountered by the design team on their Peru Project. During the study the researchers determined the root cause, countermeasures, solution, and effect for these five challenges. Throughout the study the challenges identified led to involvement with suppliers to adjust timelines and more information being shared. The research also proved the company's strategy was able to produce a sustainable product while improving fulfillment, design business goals plus interaction between the design team and the supply chain. The data also revealed the company already had a collaborative culture but was missing the key points of oversight.

Toyota has been rapidly growing in Japan and around the world over the past few decades. Sobek, Liker, and Ward (1998) studied how Toyota has continued to be successful even as many American companies have hit a plateau. The vehicle development process and managerial practices have allowed this company to stay grouped into six organizational sections. This study also found the company is successful at achieving integration across all projects even when new twists enter into the implementation and production factors. From the research, the authors found standardization, standard skills, and design standards remain constant to provide the framework necessary for suppliers to support the company's visions.

Teresko (2007) investigated the Toyota Production System (TPS) and the first step towards optimizing all the functional processes so the company can move onto the competitive step of the Toyota Product Development System. Toyota has been well-known in the industry for the past few decades due to TPS. The lean product development practices studied have allowed the company to share several in-plant quality improvements and launch the automakers forward. Development may have been the reason light was shed on the company but to remain on the competitive frontier; Toyota is focused on functional experts and cross-functional integration.

Samsung Electronics and Apple, Inc. is a great example of the buyer-supplier relationship. Samsung has rival products against Apple but is also its biggest supplier. Based on research done by Vergara (2012) technology changes how value chains work within the market. The dynamic consumer electronics market is demanding but two of the largest technology firms in the world show how vertical integration is possible. This case study demonstrates how a specialized integrated supplier manages to achieve results while competing to produce results. Furthermore, the supplier integration process is also important to a company's bottom line.

## CHAPTER III

### ANALYSIS OF THE RESEARCH

Around the world today, companies continue to study all factors used during new product development (NPD) to make improvements for future developments. After reviewing numerous references several key success factors emerged including innovation, early supplier involvement (ESI), collaboration strategies and approaches, concurrent engineering (CE), supplier selection, buyer-supplier relationship, speed and proficiency. The research also suggested these success factors led to the achievement of goals especially those related to cost, quality, delivery, and time improvements. This section will further discuss the information found during the literature review of the current research available and share how these factors can be used as best practices when integrating suppliers into NPD. The final portion of this section will share case studies where these factors were actually used by companies.

#### **Best Practices**

Companies gain many advantages over the competition when integrating suppliers into NPD. According to Petersen et al. (2003) suppliers are able to provide increased knowledge and information sharing early in the process which can lead to higher achievement of the NPD team goals (p. 287). Over the past decade, more organizations have found an innovation environment opens the door to suppliers sharing knowledge (Schiele, 2010, p. 138). Combining the use of an open innovation environment concept along with early supplier integration (ESI) or also referred to as early supplier inclusion and early supplier involvement provides a positive direction for any organization. Innovation is important for organizations looking to enhance ESI efforts however, there are several challenges which can occur during the development stage of new products and

companies should build up a strong supply chain relationship to empower suppliers to share collaboration capabilities.

The market demand for new products continues to grow which is why many companies are trying to be innovative. Keeping this in mind, companies can use the open innovation method to share knowledge. Technology exchange between organizations continues to play an important role in NPD. It should be noted too much openness can negatively impact a company's ability to perform long term due to the loss of control and core competencies but the closed innovation method can lead to increased time to the market and longer innovation cycles (Enkel et al., 2009). Furthermore, based on research done by Colombo et al. (2011) organizations need to collaborate with clients throughout the different phases of the NPD process even through the most difficult challenges in the early stages.

Companies need to find a balance when using open innovation method. According to Enkel et al. (2009) open innovation has three core processes: the outside-in, inside-out, and coupled. The outside-in process allows the company's knowledge of supplier integration, customers, and external sourcing to be enriched. The company is able to reflect on past experiences and expand innovation networks. The inside-out process enables a company's ability to transfer ideas to an outside environment. Innovation using this process brings ideas to the market faster. The third process otherwise known as coupled uses the company's alliances, cooperation, and joint ventures to combine the outside-in and inside-out processes to develop joint innovation (pp. 312-313).

Technology is also a unique aspect of the innovation process. Businesses often use variety and speed when introducing new products to the market. Customers demand new products and technology has allowed this to happen faster than ever before. As Chesbrough

(2011) discovered over the last several decades, priority assignments and resource allocation is crucial for competing projects due to the total costs and benefits. Companies spend millions of dollars each year to develop new ideas and technologies but better business models are still in top demand. Future generations will continue to push the envelope and management needs to continue to be ready to support these thoughts and theories.

The ESI theory and practice provides growth. The ESI theory is made up of four components including (1) design, (2) procurement, (3) supplier, and (4) manufacturing. These four components are important because the three internal functional areas (design, manufacturing, and procurement) combine with the external area (suppliers). Significant decisions are made in each area which is especially true during NPD. Companies can use the ESI theory during NPD to conceptualize product, determine raw material costs, improve quality controls from a supplier's factory, troubleshoot problems, and so much more (Dowlatshahi, 1999). Besides, the four components defined by the ESI theory, Zsidisin and Smith (2005) also discussed another theory. The agency theory allows companies to investigate how ESI benefits the supply chain through effective management. ESI allows purchasing and critical suppliers the ability to form an established and long lasting relationship all the while working to meet customer demands. This is just another way the agency theory is able to influence the approaches and efforts used by supplier management and companies of all sizes.

The ESI theories explain how NPD can benefit when used in practice but other significant pieces to remember when discussing supplier involvement early in the process are the independent variables of timing, supplier's responsibility for design and frequent communication. Organizations use ESI to help reduce development time while increasing product quality and eliminating future production problems. Suppliers have cost goals and

identify opportunities to reduce costs whenever necessary. When suppliers are able to reduce costs while standardizing processes, buyer organizations benefit. The supplier's responsibility for design also reduces the time required for NPD. The supplier will design the high-quality components, allowing the buyer time to work on other aspects. Finally, frequent communication during product development enables information gathering and processing. Many products fail to achieve success due to poor communication (Hartley et al., 1997).

Another important aspect to integrating suppliers in NPD is the selection of collaboration strategies and approaches. When companies involve the use of cross-functional teams as part of the collaboration strategy it allows for direct and indirect influence on the success of the NPD process. These influences occur because the supplier is a team member. Organizations need to foster collaboration because these efforts enhance performance (Frohlich & Westbrook, 2001). However, not every collaboration strategy will work for every new product so the development plan will need to be modified. This is an important area where the use of the supplier selection process should be used along with the collaboration strategy and approach. Organizations can also tap into supplier innovation at this time. The integration of suppliers into NPD allows manufacturability of the product along with improving the innovation capabilities. Supplier integration at the project level is critical (Wagner, 2012).

Long-term NPD strategies have many objectives. First, organizations need to focus and develop goals for each product. The strategic focus will be the guide for the team's collaboration efforts. Ernst (2002) found the strategic framework is critical to the direction to NPD projects. However, Hoegl and Wagner (2005) also stress certain technical demands should be present between the buyer and supplier team members. Product development strategies require decisions

to be made by both sides. Participative decision making should be inherent throughout the strategy objectives and goals.

Supply chain strategies need to have a direction and a degree of integration to permit organizations to have ongoing conversations with suppliers. According to Moorman (1995) the overall success of NPD comes from the use of continuous information sharing to provide direction for supplier integration (p. 323). Companies should continue to enable suppliers to share information which may lead to the signing of a confidential information agreement but only so the supplier knows not to share proprietary information with anyone outside of the organization. Demonstrated leveraging of such valuable information sharing is also another great way for supplier integration to increase performance, timeliness, and creativity of the new products being developed. Along with information sharing, companies should also look into the use of CE.

Competition is motivating many companies to take a look at ways to reduce supply chain costs especially in the areas of order management, material acquisition, inventory carrying costs, planning and information systems. In the past companies were only focused on reviewing suppliers through the design processes being used in manufacturing, testing, assembly, and material costs on delivered products. However, many companies soon discovered the traditional manufacturing operations needed to be transformed to accommodate the concept of complete customer order fulfillment enterprises. Based on research from Balasubramanian (2001) successful product development can be achieved by integrated supply chain strategies using a concept called CE.

Companies use CE during new product development (NPD) because the goal of the concept is to eliminate or minimize supply chain risks while reducing direct and indirect costs.

CE is an essential predictive early integration process which is focused on design to delivery times plus reducing product costs. However, the only way for a CE implementation to be effective is through management support and integration of product management process (PMP). The PMP requires the use of highly aligned performance or cross-functional teams which are responsible for encompassing various deliverables of the CE concepts into NPD (Balasubramanian, 2001). Furthermore, using CE during NPD often results in higher product and development costs since the process adds complexity (Tracey, 2004).

Buyer quality, competitive pricing, supplier quality capabilities, and supplier cost capabilities play a major role in the supplier selection process. According to Kouferos et al. (2012) integrating suppliers into NPD should be done using the supplier selection process. Companies should keep a check list of must haves when selecting suppliers. Not all suppliers are created equal which means not every supplier is able to provide the benefits and services required for the new product being developed by a company. This also needs to be remembered when an evaluating an existing supplier. In the past the supplier may have been able to support the NPD process but if anything for the new product has changed such as a new engine emission system is required, the current engine supplier might not be able to provide this new engine. Another way to stay ahead of this issue is to discuss during current projects, future project ideas and ask whether the supplier would be able to support these projects as well.

Supplier selection criteria should be used to make critical strategic decisions. Organizations should require supplier competencies be tested with respect to two dimensions. The first is testing whether or not a supplier can master a new or complex technology. The second is whether the supplier has the ability to provide an outside perspective. These two

dimensions along with trust, reliability, openness, and mutual support ensure a good working relationship between the buyer and supplier (Wagner & Hoegl, 2006).

The supplier selection process also allows companies the chance to do a detailed assessment of a supplier. Most companies want a supplier to be involved especially with the design process of the products being supplied. During the detailed supplier selection process additional information is evaluated including past involvement, technology capabilities, company culture, and financial stability. It is critical that the supplier will be able to meet the volume obligations after the production of the product begins (Handfield & Lawson, 2007). However, Zsidisin and Smith (2005) found suppliers can fail to address quality problems, do not always meet production introductions, and not always great at addressing significant issues. This is just another reason why companies need to understand the importance of using ESI information during the supplier selection process. Furthermore, companies still need to remain cautious when selecting suppliers.

In addition to innovation, ESI, collaboration strategies, and the supplier selection process, the buyer-supplier relationship is also another area where an organization benefits during NPD. Based on research done by Handfield et al. (1999) the timing of new products, product quality, development cost, and overall product should be benefits for organizations who involve suppliers into the NPD process. However, the relationship between the buyer and supplier must be maintained with continuous support. Supplier contribution to the relationship is done best when expectations are given. The relationship is then able to grow since the supplier knows what the buyer is expecting. Along with expectations, proactive management of the buyer-supplier relationship will provide a dependency to grow between the two companies (Lakemond et al., 2006).

Developing new products can be challenging especially for small, new firms. Marion et al. (2012) found small, new firms have limited resources and risk a lot on NPD. Many small companies will often suffer from poor execution during the development process whereas large established firms can use cross-functional teams and up-front market planning. Small firms must develop or adapt methods through the use of resources (often limited) to find success.

Successful companies also understand the buyer-supplier relationship depends on different theoretical perspectives. Research done by Petersen et al. (2003) explained how the transaction cost economics theory drives trust and may affect the perceived risk within the partnership however the relationship does not improve due to increased purchases alone. According to Wagner (2012) the relational theory expands on the previous theory by stating the relationship depends on the establishment of joint efforts to communicate, share knowledge, and build resource investments. The third theory is organizational design. This theory proposes companies place resource concerns before economic concerns when building or selecting to continue a buyer-seller relationship. The final theory is called network and is based on open-ended contracts which allow for guarded exchanges and environmental contingencies. These four theories are recommended and used by companies for alignment of the buyer-seller relationship (Petersen et al., 2003, p. 285).

Finally, organizations can see the speed and proficiency which occurs when integrating suppliers. Many times, new products are being demanded by customers. Integrated suppliers especially those integrated in past projects should be able to deliver more quickly than suppliers who are not integrated into the organization. Research results suggest there is a proficiency in the tasks performed by group members and speed is important to the introduction of a product into the market place (Millson & Wilemon, 2010). The market demand for new technology

keeps companies striving to do more with less. When suppliers fill the gap with speed and proficiency this allows a company the chance to focus on other potential issues.

Speed and proficiency in NPD is a learning process. Team efforts are best practiced when organizations come together and share lessons learned. When cross-functional teams discuss previous issues and success stories, the NPD process will be able to move forward quickly. Along with the speed gained during these discussions also comes the ability to be proficient with innovation. Functional groups willing to share lessons learned from past mistakes are usually the most successful. Faster cycle-time is achieved through organizational learning. Cross-functional teams also have the ability to continue to make adjustments through learning and allow companies to learn from past experiences (Lynn et al., 1999).

### **Case Studies**

Companies are constantly subject to pressure to deliver new products to the market. The majority of the existing research found the key success factors of new product development include innovation, ESI, collaboration strategies and approaches, CE, supplier selection, buyer-supplier relationship, speed and proficiency. However, measuring some success factors is easier than others. Measuring the success of innovation is difficult yet many companies around the world today have been successful during the new product development process.

A great example of a company which has been successful at using innovation and supplier integration during NPD has been Sony Corporation or commonly referred to as Sony. The company is a well-known manufacturer of electronics in the consumer and professional markets. In 1996, the company began the Vaio project to create a good looking and portable laptop. Later the laptop would be named the Vaio 505. As the project progressed, Sony began to

collaborate with its suppliers on the development of the components needed for the new laptop design. During the collaboration process, the integrated suppliers told the Vaio engineers the standard space between components was not entirely necessary. After the prototype was built, the Vaio team continued to work with its suppliers to procure specialized parts for production. The innovation process along with the integration of suppliers allowed Sony to produce and implement a new laptop which in Japan was able to capture 10 percent of the market within two months after being released. Furthermore, this laptop created such a buzz that other firms developed laptops with similar designs (Motoyama, 2011).

John Deere is also another great example of how a company has been successful at integrating suppliers into NPD along with other areas. In 1997, John Deere decided to implement supply management best practices in order to change the company's future growth. The areas the company focused on included strategic sourcing, supplier development, cost management, supplier integration, e-procurement, and logistics. Goals were established for each area along with implementation plans to improve the overall numbers. In the supplier integration portion, the focus was on selecting the right suppliers, closing performance gaps, and managing costs. The optimal solution found was using people power in the supply chain. For example, before the H-Series Crawler was introduced to the market, the company was able to use early involvement of suppliers to reduce design waste. The early design stages involved collaboration with the top 16 suppliers along with engineering, quality, and manufacturing to reduce the overall costs per unit (Nelson, 2002).

Another interesting case study which reflects the importance of using the success factors of NPD was used at Eileen Fisher (EF), a women's apparel manufacturer, during the inception of fully fashioned knit sweaters known as the Peru Project. The company faced five challenges but

soon discovered the design process could be improved by the integration of suppliers into their processes (Curwen et al., 2013). This manufacturer decided to use ESI to enable knowledge sharing with suppliers to create successful products (Parker et al., 2008). EF engaged a supplier called Design Inheritance (DI), which also contracted Knit Peru (KP), making this a unique sweater line. Throughout the NPD process, the designers worked with suppliers to find solutions for the numerous challenges which emerged. For example, the yarn used to make the sweaters created a liability for EF so the fabric team had to work with the supply chain to find a suitable replacement. As the Peru Project progressed, EF found the following principles were important: a strong company mandate, core values match, gather and diffuse information, cross-functional organization, and significance of the supply chain. In this case, innovation, ESI, buyer-supplier relationship, collaboration strategies, and speed played a critical role for EF. In conclusion, not only was the supply chain relationship strengthened but the product quality improved and pricing remained competitive. The company was able to make the new sweater line while gaining knowledge and experience working with supplier integration (Curwen et al., 2013).

Organizations demand innovation, collaboration, and planning when creating new products. Toyota is one of those organizations. Consistently, the company has depended on highly skilled engineers, designers, and suppliers during the innovation, design, and production of every product it has introduced into the market. The company prides itself on deep expertise in engineering specialties vital to the product-development system. Toyota's suppliers know the vehicle development process rather well since there is consistency model to model. The key to the company's success has also been the use of standards and integration aspects for every project (Sobek et al., 1998). Product development has allowed Toyota the ability to leverage suppliers and technologies into a lean strategy. The Toyota Product System (TPS) opened the

door for the company to create new guidelines or the Toyota Product Development System. Moreover, these new guidelines further embrace full integration of suppliers into their processes. Furthermore, the biggest advantage has been on the central focus of waste reduction (Teresko, 2007).

Minimizing risks and integrating suppliers is not always easy. Samsung Electronics and Apple, Inc. may be at the top of the market today but the success of these companies will only continue to grow if new products continue to enter the market. Integrated solutions have allowed Samsung to become the top television manufacturer along with introducing smartphones and tablets. On the other hand, Apple Inc. is actually four companies in one (hardware, software, services, and retail). Apple controls the design and development of products but does not manufacture or assemble its products. Samsung is actually Apple's most important supplier. The collaboration and buyer-supplier relationship is a little bit different than the other examples but without this relationship these two companies would not be as successful (Vergara, 2012).

## CHAPTER IV

### CONCLUSIONS AND RECOMMENDATIONS

Developing new products involves various risks but most companies are dedicated to making those ideas a reality. After reviewing the literature, sharing best practices, and highlighting a variety of company case studies, it is clear there are several success factors involved in the NPD process. Competition continues to grow around the world and companies are ready to use innovation, ESI, collaboration strategies and approaches, CE, supplier selection, buyer-supplier relationship, speed and proficiency to development new products. The effort put forth by each company varies from project to project but the research has shown the main goal is success.

The research proved supplier integration enables success especially when executed early in the NPD process. Organizations want to establish and maintain trust, openness, and goal alignment with their suppliers because performance is enhanced when the entire supply chain is integrated. Supplier integration also gives organizations the ability to minimize risk and develop long term supplier relationships. Further facilitation and continuous information sharing will continue to influence supplier behavior while promoting positive results. Communication and involvement between purchasing professionals and suppliers will help to maintain an organization now and into the future.

Supplier contribution to the relationship is done best when expectations are given. The relationship is then able to grow since the supplier knows what the buyer is expecting. These expectations are usually given to suppliers as goals. In order for these goals to be achieved proactive management is required from the buyer-supplier relationship. Suppliers and buyers form dependencies which if done correctly allow product development activities a chance to

form coordination and balance the numerous activities within the process to be completed. Suppliers are able to be involved while carrying out close cooperation with the company developing the product. The relationship between the buyer and supplier became the basis for project integration coordination and enabled the company the chance to further develop a common understanding along with mutual expectations for the supplier.

Selecting and working with the right suppliers will always be an important aspect of the integration process into NPD. The current research found supports developing solid information exchanges between the company and its suppliers. Knowledge sharing and communication whether face-to-face or electronically will become a high priority. NPD success depends on a number of factors not just the supplier and how it is integrated but also the purchasing department, engineering, manufacturing, and other cross-functional team members. Furthermore, companies should not be resting on achievements alone because innovation is a challenge but sooner or later another organization will see the benefits and profit from this discovery.

## **Recommendations**

Many research studies have been completed on various levels around the term NPD but more studies should be conducted on the success factors of integrating suppliers into NPD. Competition will continue to push organizations to do more with fewer resources while demanding new and even unique products. Customer demands and continuous changes with technology will require future studies. Supplier selection decisions and design performance may also need more analysis on how these efforts impact the overall NPD team goals.

The available research was also able to highlight many important areas but considerable attention should be given to NPD projects and how to identify innovative suppliers including going a step further how to find continuous collaboration from the same suppliers. Some issues need more clarification especially on the areas both suppliers and buyers should focus on during the entire length of the project. Depending on the product's lifecycle, demands will vary, so benchmarking could be used to better define the viewpoint of both a business and the supplier. Furthermore, the current strategies being used by supply chain management are too often focused on the operations side and not on product development. However, CE is another great example of where continued efforts should be focused moving forward.

Another important area which deserves more research is the necessary degree of supplier coordination. Companies should not involve suppliers as a relief effort since NPD still requires involvement from an internal project management standpoint. However, the size and scope of the project may dictate the supplier involvement required. The buyer-supplier relationship should involve continuous communication and requires more research in this area as well. Additional contributions and future technology efforts may change how success is measured during future NPD projects. As mentioned, further studies should be conducted as the current market demands change and grow.

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