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**THE ROLE OF PRODUCT FEATURES ON BUYER-SUPPLIER
COLLABORATION IN PACKAGING INDUSTRY**


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<p>Title THE ROLE OF PRODUCT FEATURES ON BUYER-SUPPLIER COLLABORATION IN PACKAGING INDUSTRY</p>	
<p>Abstract</p> <p>The thesis presents the study relative to the collaboration between suppliers and buyers in packaging industry with the impact of product features. The main purpose of this study is to examine the importance of product characteristics on collaboration to develop better packaging and to figure out how buyer-supplier collaboration in the supply chain perspectives is conducted and managed in packaging industry.</p> <p>The theoretical part reviewed some basic frameworks of collaboration including the scopes and levels of collaboration, risks as well as powers of collaboration, relationship and some key factors for successful collaboration. Followed by the overviews of packaging industry with the main issues related to product characteristics in packaging.</p> <p>By using the qualitative method, secondary data consisting of articles, reports, websites and primary data through interviewing some well-known packaging companies and case companies are collected in the thesis.</p> <p>The empirical result emphasized the importance of product features' analysis in packaging industry since it plays a central role in the materials, design process, production and innovation with the role of collaboration. Collaboration in packaging is vital for packaging companies to survive and grow in the competitive environment. Finally, some key factors for effective collaboration were summarized based on the perspectives of packaging companies. It is highly recommend building a long-run collaboration with their customers due to undeniable benefits. With increasingly importance of collaboration in packaging industry, further studies may be conducted.</p>	
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1. INTRODUCTION

The importance of collaboration strategy in obtaining efficiency and effectiveness has been increasingly acknowledged worldwide. The packaging industry has strongly competed and cost restructured for recent decades. Many companies are turning to collaborative strategy so as to integrate and synchronize the supply chain for future growth and profitability. A number of studies have been concerned the buyer-supplier partnership and collaboration as well as the possibilities to improve strategies.

1.1 Background

In the supply chain point of view, collaboration has been noticeably presenting in the mid-1990s in the context of collaborative planning forecasting and replenishment (CPFR) but is still immature and attractive (Barratt, 2004). For most companies, buyer-supplier collaboration is also relatively in an early stage but this is a chance rather than a problem. Changing in technology, making supply base more flexible, and increasing awareness of the feasibly extended enterprise help buyers to get a much bigger profits from their partnering initiatives. Partnerships give procurement executives an opportunity to get lower costs, be more creative, and help their companies have better products and go to the market more rapidly. Companies have a chance to utilize their collaborative programs with suppliers to refresh themselves as an innovative enterprise and to create a model in which buyers' and suppliers' activities are easier to control. In theory, a company reached this ideal can become more effective and efficient, avoid some main supply-chain disruptions, and subtract overlapping expenses including in R&D. (Robert, Jonathan, Paul, Stefan, Peter & Andreas, 2013)

Collaboration is a very large and general term and it needs to clarify when it is concerned in the perspective of supply chain for example. There are a number of researches concentrating on collaboration regarding to its benefits, risks with the sharing of information (Stank *et al.*, 1999a; Barratt & Oliveria, 2001) and some

frameworks mention product natures and impacts on the relationships particularly in the supply chain. However, only few studies focus on the role of product characteristics on collaboration strategy. In order to examine the successful collaboration, it is necessary to understand some issues regarding to why buyers-suppliers should collaborate, where and which activities they should collaborate and which factors influence on their partnerships. This paper will go deeper on the role of predominantly physical characteristics on buyer-supplier partnership strategy in packaging industry as one typical case.

The study will start by reviewing the literature review of buyer-supplier collaboration. Then the packaging industry will be introduced focusing on describing product related collaborative strategy to develop better packaging. As can be seen (Figure 1) below, the focus of the study explore about how the product characteristics influence on the buyer-supplier collaboration and which role they has in collaborative strategy in packaging industry.

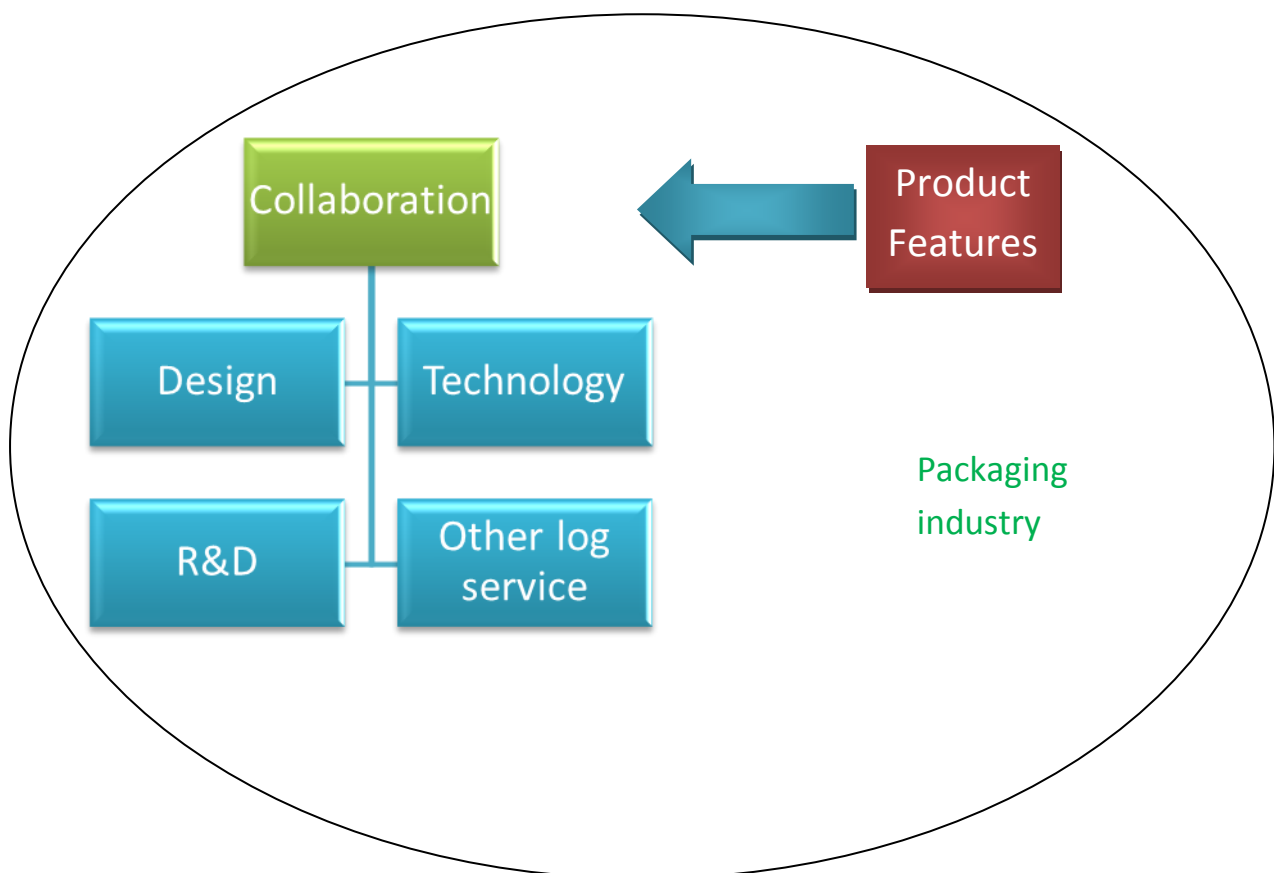


Figure 1: The thesis model (the author)

The scope of collaboration with buyer-supplier relationship and some key factors such as design, technology, R&D represent the cornerstones on collaboration. In literature review, collaboration and packaging industry with product features will present in more detail. In thesis model, the author simply makes the visual of the linkages among those. Specifically, the study has a look at the importance of physical product features on packaging material, technology and other services in which two parties involve in developing the best solutions in collaboration. Thereafter, the study will come up with the case company to go deeper in reality. Finally, the conclusion will summarize the findings of the study and probably give some discussin surrounding the results.

1.2 Thesis objectives and research questions

In this study, the main objective is to examine the importance of product characteristics on collaboration to develop better packaging by addressing the major issues of collaboration strategy. The thesis aims at figuring out buyer-supplier collaboration in the supply chain perspectives is conducted and managed based on specific physical product characteristics. The study would like to find how buyer-supplier partnership cooperates to build the value creation in packaging industry. The author is really interested in packaging industry with many buyers and suppliers surrounding due to its natures and importance on supply chain effectiveness.

The research questions and sub-questions in this thesis are then:

How does the collaboration between buyers and suppliers conduct based on product characteristics to develop better packaging and better solution in supply chain?

- What are the main physical features and corresponding packaging materials, designs?
- How do product features affect to collaborative technology, R&D and logistics services strategies?

- What would be factors that customers and suppliers can develop effective business relationships?

1.3 Thesis limitations

This study is conducted under the supply chain management's perspectives so the marketing literature is not included in this study. This study mainly focuses on the examination of products' natures on small parts of the whole supply chain in business to business environment. It cannot be adopted in all international projects since business context can be changing, complex and very dynamic.

In the thesis, the case companies are in use so the delivery times are often very tight because of the dependence of the company schedule. In the general, the plan may be conducted poorly or perfectly uncompleted.

1.4 Definitions of key terms

- **Product features:** in general business, product features refer to physical and chemical elements of a product which is investigated by the company. They can be all characteristics such as its size, shape, substance and its functionalities. A product feature seems a piece of functionality in business which brings a corresponding benefits for that product's end consumers. (Aha, 2015)
- **Buyer-supplier relationships:** refer to the way in which organizations of suppliers and buyers is connected for purchasing and supplying of goods and services. (Bresnen, 2008)
- **Collaboration:** is defined as "at least two organizations operate together to gain a competitive edge by jointing an alliance, interchanging information and sharing profitability which originates from satisfying end customer needs. By working together, they both can gain greater benefits than operating alone" (Togar & Sridharan, 2002). It can be identified as "a number of entities cooperate, work in the same processes, share know-how and information to create more value for their customer and themselves (Foster & Sanjay, 2005). In another word, "Collaboration means information is shared among partners, strategic plans are developed together and activities are synchronized in order to achieve the

vertical integration's advantages instead of acquiring businesses" (Daugherty *et al.*, 2006)

- Packaging: can be described as the embosoming technology to protect products for distributing, warehousing, sale, and consuming. Packaging also consists of the design, assesment of protection and packages's production. Packaging can be seen as an automatedly harmonized system of wrapping products, preparing outlines for storage, distribution and other logistics services. (Soroka, 2002)

1.5 Thesis outline

The thesis includes two main parts which are theoretical study and empirical study.

The thesis's structure is visualized as the figure 2 below

Chapter 1: Introduction	<ul style="list-style-type: none"> • Background • Objective • Research questions <ul style="list-style-type: none"> * Limitation * Key terms * Outline
Chapter 2: Collaboration	<ul style="list-style-type: none"> • Collaboration • Power and risks of collaboration • Buyer-supplier relationship • Key factors for effective collaboration
Chapter 3: Packaging industry	<ul style="list-style-type: none"> • Overview of packaging industry • Product features and materials • Technology and R&D collaboration • Other logistics services collaboration
Chapter 4: Research method	<ul style="list-style-type: none"> • Method • Data collection and analysis • Validity and reliability
Chapter 5: Empirical results	<ul style="list-style-type: none"> • Interviewed case companies • Analyzed information
Chapter 6: Conclusion	Summaries and discussion

Figure 2: Thesis outline (the author)

In theoretical part, sufficient framework of buyer-supplier collaboration is reviewed in chapter 2 and chapter 3 represent an overview of packaging industry with the focus of physical product characteristics with corresponding packaged materials as well as technology, R&D and other logistics services collaboration.

In the empirical part, the research methodology including research questions, research method and case company in chapter 4 whereas the data collected via interviews is analyzed and discussed in chapter 5 based on the literature review and facts. Chapter 6 concludes the thesis with summaries of the key findings and a discussion of the implication in this study as well as suggestion for further research.

2. BUYER-SUPPLIER COLLABORATION

2.1 Collaboration

Collaboration has a key responsibility in business strategies that has been exposed and discussed by many researchers. There is a number of studies presented collaboration in many business fields such as procurement, supply chain and logistics management, R&D and finance. According to Cooper et al (1997a), collaboration becomes promoted since each member involved in the chain endeavors to maximize its own outcomes instead co-ordinating its operations with others to get the overall success of the entire chain. Collaboration is increasingly important in SCM perspectives due to a bit “Silver Bullet” in some aspects (Kampstra, Ashayeri & Gattorna, 2006).

2.1.1 The scope of collaboration

The forms of collaboration in SC are viewed as two main scopes including vertical collaboration and horizontal collaboration (see Figure 3). Vertical collaboration refers to the internal cooperation with customers and with suppliers whereas horizontal includes collaboration with competitors as well as with non-competitors. (Simatupang & Sridharan, 2002)

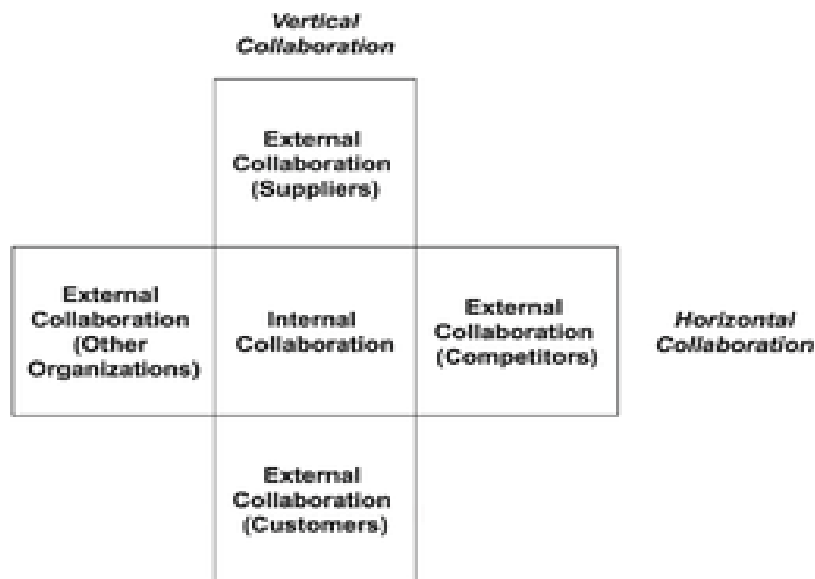


Figure 3: The scope of collaboration: generally (Simatupang & Sridharan, 2002)

Initially, many organizations often focused on the internal collaboration even though they may have considered the external collaboration. Nowadays, both internal and external collaboration have been seen as an importance of new enabling to grab opportunity for growth. Internal collaboration must come along with external collaboration regarding to closer relationship development, integration and information sharing between suppliers and customers. In another way, it means that external collaboration must go parallel with the drivers and restrictions of internal part during the whole supply processes. (Barratt, 2002)

As stated by the European Union (2001), horizontal collaboration of the value system is considered as a coordinated implication among companies performing at the same positions or levels. Cruijssen (2006) defines horizontal collaboration is one type of partnership with “two or more organizations energetically collaborate at the identical levels in the same chain with compatible logistics functions throughout the chain”. As a recap, those companies can be suppliers, buyers, wholesalers, retailers or other logistics service providers.

Horizontal collaboration has five different objectives for a company strategy which are reduction of cost, innovation, quick response, future growth and social relevance (Cruijssen, 2006). Basically, the main purpose of horizontal collaboration is to explore and purchase win-win situation among two or more companies running at the

same position in the value chain. Those companies support to each other regardless of competitors or not, similar or different size and market share. In other words, horizontal collaboration helps members involved to achieve upmost performances and benefit rather than they can reach their goals alone. In this respect, trust is obviously important to approach such an objective. (Wilhelm, 2011) Horizontal cooperation has been elaborated in individual industry with specific contexts. It is remarkable to say that the practice of horizontal notably in logistics can bring to different results within the industry. (Francesco, Luciano & Silvia, 2015) For example, according to Leitner *et al* (2011), Romanian automotive suppliers achieved 15 percent cost reduction including fuel cost reduction and 40 percent in CO2 decrement, however, their lead times increased doubled because of the need for consolidating loads. In contrast, competitors in Spain obtained 14 percent cost reduction and 17 percent CO2 decrease with no negative effect on their lead time.

Collaboration gives vertical supply chain collaboration a number of opportunities on both the downstream and the upstream. Figure 4 below specifically presents those possible opportunities. On the down perspective, it consists of customer relationship management, collaborative planning, forecasting and replishment with distribution. The other side of the chain includes relationship management with suppliers, supplier-buyer planning with production timetables, joint format, and collective transportation. (Barratt, 2004)

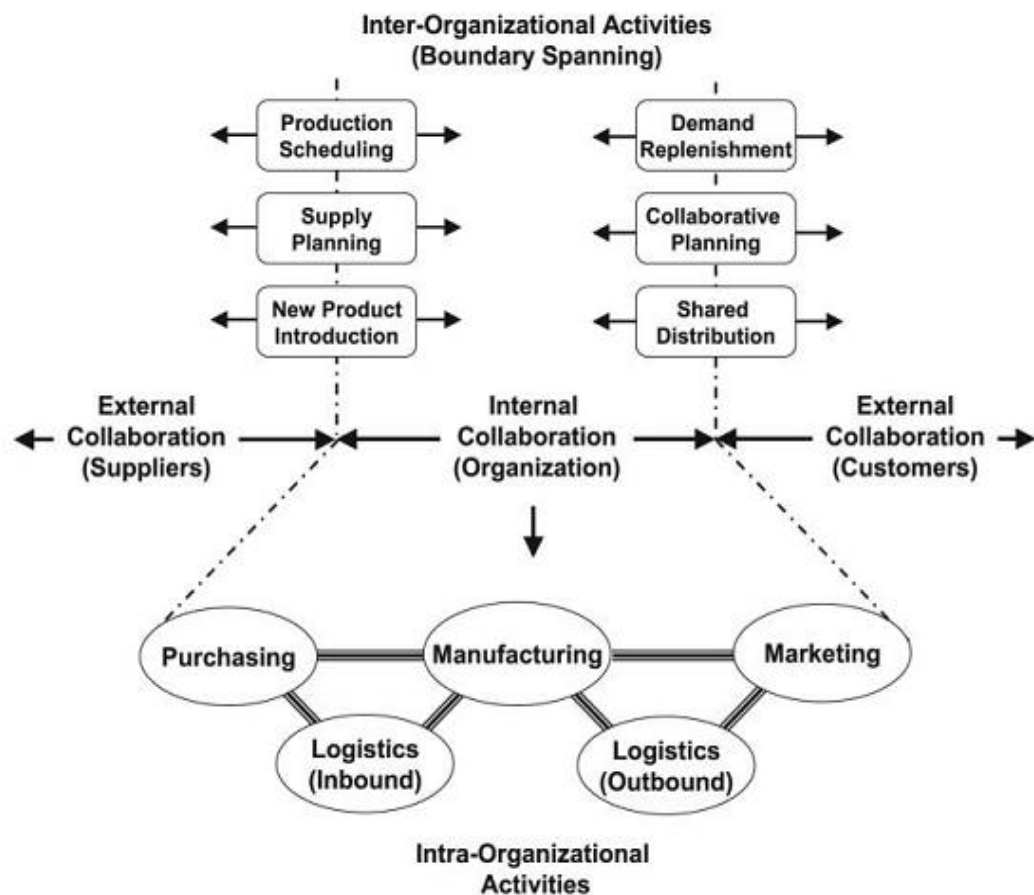


Figure 4: The scope of vertical collaboration (Barratt, 2004)

It is undeniable to state that vertical collaboration is more popular in implementing than horizontal collaboration because it is the collaboration between supplier and customers based on mutual benefits. The main objective of customers is to make their end consumers satisfy and to better perform rather than its rivals can do. So as to reach this goal, customers have attempted to classify the right places for their products at the proper time with the lowest costs (Kotler & Kevin Lane, 2006). Each supplier has their own capabilities and abilities that customers can choose the most suitable and profitable one based on supplier's offered package.

2.1.2 Levels of Collaboration

According to Moutaoukil *et al* (2012), three levels involved in collaboration are strategic, tactical and operational collaborations. In this case, those three levels relate

to the sequence of activities which play a vital part in overall success of design as well as application of collaboration between suppliers and buyers.

Firstly, strategic level belongs to the engagement process which includes from the identification of assorted partners until the accumulative network design. Secondly, tactical level is interdependently managed by both partners from the localization of cooperated warehousing to information sharing. The third one is operational level related to effectively conducted operations from performance of specific operation to the definition of protocols for controversial resolutions. (Moutaoukil *et al*, 2012)

Moreover, collaboration is not only developing interchanged information relied on close correlations of an operational level's operations, but it also requires partners to simultaneously conduct at tactical level and strategic level within the whole supply processes as well (Barratt, 2004) (see Figure 5).

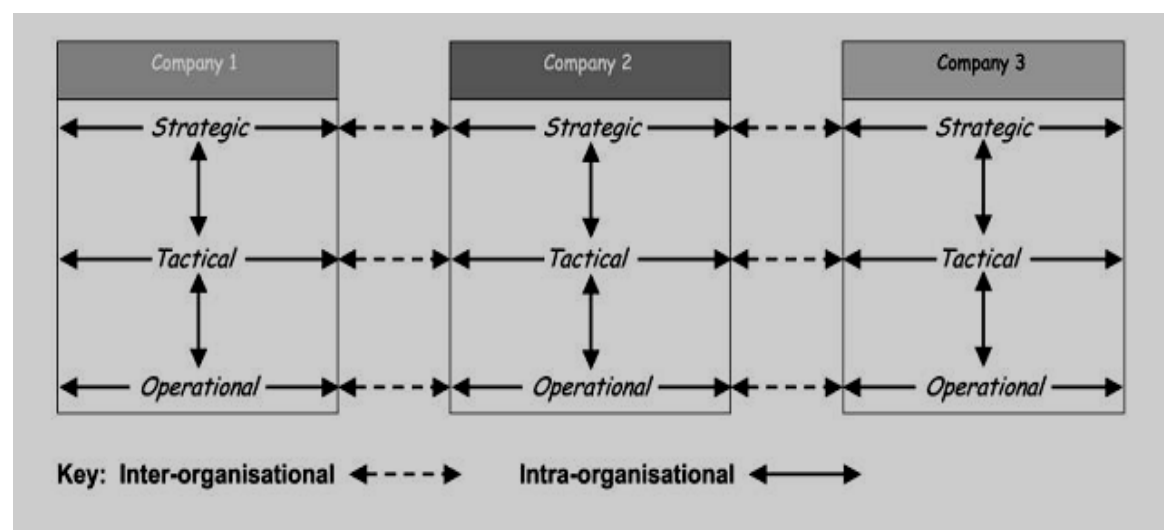


Figure 5: Levels of inter-intra-organizational integration (Moutaoukil *et al*, 2012)

In an operational level, companies can consolidate their processes and perform their benefits but if processes are not integrated at tactical and strategic levels, the benefits of achievement will be restricted (Barratt, 2004). In short, three levels must come a long with each other to bring the most beneficial for both suppliers and buyers in the same chain.

According to Cruijssen (2006), it is remarkable to say that suggested elements such as decision level, competition among partners, common assets and goals are utilized just for assorting the different substitutes, not for designing and implementing.

Furthermore, associated couples of aims and assets can be explored along with the evolution of the collaboration (see Table 1). (Francesco, Luciano & Silvia, 2015).

Element of the pair	Stage 1 Operational collaboration	Stage 2 Tactical collaboration	Stage 3 Strategic collaboration
Shared assets	Data Information Fleet/carrier	Logistic facilities Warehouses Supporting processes	Order Market power Expertise Knowledge
Aims	Cost reduction Quicker response Purchasing and tendering groups Joint distribution & flows consolidation Improved productivity	Multimodal collaboration Better resource management Reduced supply risk	Innovation Value creation Joint investments Growth Improved market positio Social relevance Networking

Table 1: Coherent pairs of aims and shared assets for levels of collaboration (Francesco, Luciano & Silvia, 2015)

Additionally, the development of the collaboration between buyers and suppliers can be identified into three levels. The first one is initial level of collaboration in which chain partners interchange information mainly based on day-to-day transactions. The second level is cooperative collaboration in which members in the supply chain have an allowance to access the needed information at the same time. The cognitive collaboration is the last one where partners share information in order to gain knowledge and joint in decision making. (Sanda, 2011)

2.1.3 Collaboration Processes

Basically, collaboration is considered as sharing information directly related to sharing information of production and storage, purchasing in the markets and production scheduling within the supply chain (Ayers & Odegaard, 2008). Three stage processes of collaboration are taken into consideration in which a simpler type of interchanged information is started and easily automated, then decision of jointing is made and finish with win-win partnership across network (Lapide *et al.*, 2002). Gray (1989) states that there are three phases including problem scheme, direction

planning and implementation. The collaboration process is described as a continuum of stages regarding to strategies from better making the community to transforming it into “empower collaboration” (Himmelman, 1996).

According to Ring and Van de Ven (1994), the process of collaboration is built relied on the framework involving negotiation; commitment and implementation (see Figure 6)

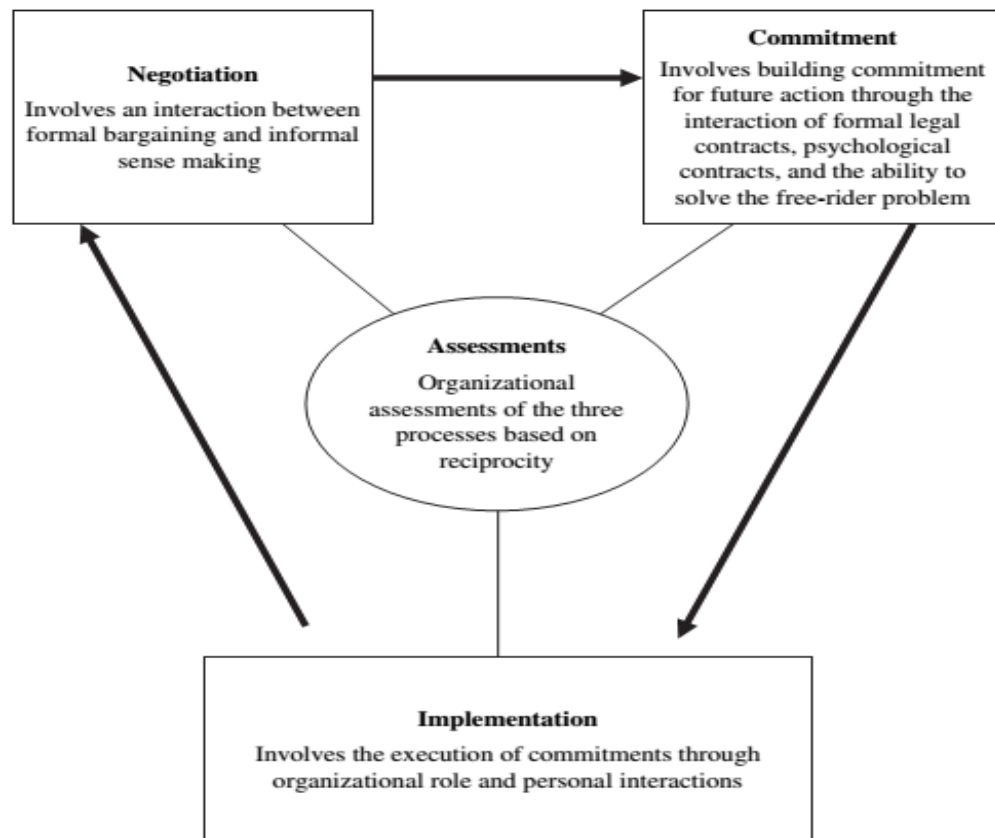


Figure 6: A collaborative process framework (Ring and Van de Ven, 1994)

Ring and Van de Ven depict the process of collaboration as iterative and cyclical process with interconnected elements. By following this framework, for example, companies are joined in collaboration, they are able to expect and negotiate at least based on their appropriately cooperative actions, and further they are able to dedicate to an initial contract. When chosen activities are managed in a mutual way, jointing companies will carry on or enlarge their reciprocal commitments. Otherwise, participating companies must create measures to correct through negotiation or

reducing their commitments. To what extent of companies' actions used, it often bases on the scale of what they have a collective and integrative views on collaboration. (Ring and Van de Ven, 1994).

Ring and Van de Ven's process framework is also applied into collaboration process to promote collaborative strategies develop. The integrative factors indicate in personal relationships, official contract and even informal acknowledgement. It is highly time for commitments to displace the collective elements presenting as institutional parts and official contracts. Exploring the true balance between integration and aggregation instead of depending on conventionally organizational structures like typical operating process can be the central aspect for sustainable lasting collaboration over time. (Thomson & Perry, 2006). In addition, Gray (1989) figures out that cooperation and coordination appear as important parts at the beginning of collaboration process, however, collaboration still integrates throughout the whole long-term process "by which parties point out various outlooks of one issue, encouragingly elaborate their differences then investigate in the ways taking under their own restricted vision of possibilities and carry out those solutions".

Returning into previous view, collaboration is mentioned in term of Collaborative Forecasting Planning and Replenishment (CPFR). CPFR also defines key actions by its name to be handled during the formulation of collaboration initially. It apprehends operational advantages of all chain and supplements collaborative systems so as to promote sharing information in the whole chain. CPFR is divided into three stages: planning, forecasting and replenishment (see Figure 7). (Luc, 2006)

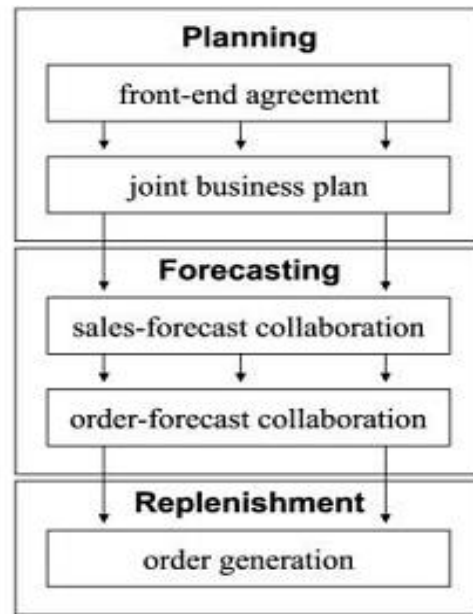


Figure 7: CPFR process model (Luc, 2006)

Planning is the first stage including two analytical steps which are front-end agreement and joint business plan. The planning stage is very important since both suppliers and buyers create collaborative initiatives and terms. The second stage consists of two forecast steps: sales-forecast collaboration and order-forecast collaboration. The third and final stage is replenishment involving order generation. Those two phases can be considered as operational stages which must come back on the principles of the first stage when obstacles and risks increase. (Luc, 2006)

The first two phases in the CPFR model are significant to plan supply chain collaboration. In evolving a front-end agreement in the first stage, all members must clarify their own requirements and goals, and then agree on a collaborative program. This agreement ensures completed commitment to collaboration of all partners involved. Creating a joint business plan makes partners in the collaboration process to deeper approach to product information which is exchanged. It aims at exchanging strategies and business plan among members in alliances on developing a joint business plan. Companies interchange their information related to business strategies and simultaneously transfer the specific joint business plan into their own systems. (Luc, 2006). Importantly, adopting the CPFR process in a supply chain brings a lot of

benefits such as increasing in sales, reducing inventory and improving customer services (Aviv, 2001; Esper & Williams, 2003).

2.2 Power and Risks of Collaboration

Collaboration is increasingly important due to globally competitive business environment and requirement of synchronization in the supply chain for surviving and growth. Collaboration can upgrade organizations to higher level; however, it may also ruin organizations themselves. Therefore, collaboration need to be identified benefits in specific cases and paid much more attention at any potential risks. Many researchers set mutual benefits, rewards and risk sharing and the information exchanging as the cornerstone of the collaboration (Barratt, 2004). It is critical to deeply understand both of potential advantages and pitfalls when collaborative working so as to optimize the positive outcomes of such collaboration.

2.2.1 Power of Collaboration

According to supply chain management perspectives, a lot of advantages are generated by a cooperative relationship among partners. Collaboration in supply chain management consists of co-activities regarding to process integration, shared information technology and consequently resulting to the customer satisfaction. (Paiva, Patricia and D'Avila, 2008). Undeniably, collaboration is a fierce weapon which can be used to improve business performance. It helps companies to build up strategic partnerships with suppliers and buyers so that mutually beneficial goals are set up, business processes and information are shared among them. (SAP, 2007)

Firstly, cost benefit is seen as the key power of collaboration that can often be evolved by combining volumes from parallel supply chains and obtaining size economies from collaboration. Collaboration also allows companies use more assets regarding to trucks or warehouse. (Cruijssen, et al., 2007). For instance, the trailer cube can be maximize their efficiency by using high volume, less dense shipments, lower volume product simultaneously. Empty cargos on return, thus, can also be reduced or even eliminated. By collaboration, organization can also share operational support, consumable and non-core costs such as training, fuelling arrangements, vehicles and

so on. More frequent deliveries can lead to lower inventory as well. (Vasco *et al.*, 2015)

According to many researchers and consultants, collaboration among supply chain players can have massive reduction of costs and improve services (Sandberg, 2005). Barratt (2004) reckons that collaboration in supply chain brings some common benefits such as cost saving, efficiency inventory, timely replenishment and accurate forecast. More potential benefits of increased collaboration comprehends more proper utilization of recourses, upgraded flexibility, shortened delays, better control, higher quality and improvement of competence that bring to lower costs and higher profits. Collaboration can help companies drive market share, sales and product adoption by optimizing companies' return on assets and returns on investment (SAP, 2007).

Secondly, increasing efficiency and effectiveness is another important power that collaboration provides to chain members. Since the mid 1990's, the collaboration has been significantly justified in terms of some concepts such as Vendor Managed Inventory (VMI), Collaborative Forecasting Planning and Replenishment (CPFR) and Continuous Replenishment (CR) according to supply chain perspectives. It is undeniable to state that generating a smooth, interlocked system in the same chain increases positive responsiveness, efficiency. (Matthias, Stephen, Jan and Johanna, 2003). There is a number of evidence that effective collaboration can increase efficiency and effectiveness. For instance, some case studies of high profile companies are close trading partners such as HP (Lee & Billington, 1995), Dell (Magretta & Dell, 1998) and Wal-Mart (Landry, 2003). Negative impacts of the 'bullwhip effect' might be controled and handled by decreasing wild warehousing fluctuations and increasing rapid response to the markets' variability and turbulence. Moreover, many researches reckon that collaboration brings a positive influence on the performances in finance of organizations. They also represent that collaboration highly performed by companies in the supply chain provides better competitive edge rather the others in les collaborative supply chains. (Myhr & Spekman, 2005).

Furthermore, collaboration gives more accurate forecast which influences on the effectiveness and performance in the whole chain and it presents effective utilization in capacity (Zhao *et al.*, 2002). For instance, collaborative planning, forecasting and replenishment collaboration of Wal-Mart with their suppliers is a typically successful case. In SCM review, Wal-Mart is often represented as the pioneer in collaboration

which gives positively beneficial for all parties involved. (Sandberg, 2007). Collaborative planning and forecasting are standards for suppliers and customers especially in packaging industry because suppliers are forced to achieve the benefits of lower inventory and more efficient use of processing capacity and resources to support collaborative activities (Andrew *et al.*, 2006). The collaboration is useful in promoting better planning in sales and encouraging environmental management in manufacturing as well (Vachon & Klassen, 2008).

The last but not least, collaboration improves satisfaction and loyalty. Successful collaboration can lead to not only sales growth and market share but also satisfaction of supply chain partners (Mishra & Shah, 2009). The success of collaborative partnership basically encourages the organizations to carry on in the future projects (Ramanathan *et al.*, 2011). Members in the supply chain attempts to retain the fruitful partnership to engage in future businesses and build closer relationships (Nyaga *et al.*, 2010). Based on the mutual trust growth among suppliers and partners with the extent of sharing information, successful collaboration can bring advantages to all partners in collaborative relationships. The objective is to serve all suppliers, customers, service providers and other partners as an extension of organizations. (SAP, 2007). Therefore, collaborative partnerships often present interest in long-term relationships.

Moreover, the accuracy of forecast in collaboration has a widely positive affect on the entire supply chain in which increases benevolence of customers as well (Zhao *et al.*, 2002). Collaboration also shows better customer services due to shorter lead times and more rapid deliveries. The improvement in customer services provides benefits to those customers jointed in the collaborative chain. (Kaipia *et al.*, 2002) Sequently, it results to the customer satisfaction and loyalty. In addition, collaboration has power in improving communication, limiting or even eliminating activities that waste time or non-added value. It can help organization react more rapid to complexly changing condition in the competitive business environment. (Sanda, 2011)

2.2.2 Risks of Collaboration

However, in several studies, the authors have identified the problems or risks related to collaboration since there are a lot of barriers existing in the whole chain. Many problems occur because of the practical obstacles relative with fulfillment (Handfield

et al., 2000). Normally companies have strains in some issues regarding to what the appropriate type of collaboration they should apply (Rudberg & Olhager, 2003; Walter, 2004) and how they can avoid or refuse some over-managed manners of collaborative partners (Watson, 2004). Furthermore, a number of potential barriers that enable to make uncertainties and thus lead to ultimate causes of failure in collaboration also presented in some studies.

First of all, uneven gain-share benefits and problems are considered as the key barriers in collaboration. Cruijssen *et al.*, (2007) identifies a number of obstacles and categorizes in terms of “selective partner problems, determined gains with dividends, the unequal negotiating partners’ levels and the uneven adoption of information communication technology solutions among logistics providers”. The question of how inputs and outputs can be divided fairly among partners is problematic in collaboration. The issues of the adoption of ICT in collaborative arrangements in terms of uneven standards and protocols utilized result to incompatibility difficulties. (Krajewska, 2008). Those pitfalls are also related to customer relationship management (CRM). There is a list of major barriers that can lead to uneven share of benefits and problems in collaboration such as poor leadership, insufficient contribution, large capital investment requirement and meeting customer expectation (Nguyen *et al.*, 2007).

Secondly, complex infrastructure is another key barrier in collaborative partnership. Collaborating in supply chain means one organization may link with a wide range of partners including their supplier, their customers and other service providers. In this case, different technical functionalities and IT infrastructures can be used. Managing those complexities may be costly and time consuming. In global supply chain, besides the majority use of phone, fax and email, the other tools and services are wide spreading such as electronic data interchange, some kinds of data inventory software with different language for e-business transactions and for integrating collaboration processes among partners. Those tools can handle with many connectivity and data problems among chain members; however they are complicated and costly. It also requires significant commitments of IT personnel as well as software. Nowadays, back-end systems allow organization within the supply chain to integrate directly networks with solution but some firms still put their index forward software of warehouse or partially merge their information into a business process only.

Therefore, other partners are able to access only limited information which is not really effective in interconnecting business processes and decreasing decision cycle times in the supply chain. (SAP, 2007)

Thirdly, business environment is inconsistent and dynamic so it is highly challenging for organization jointing in the collaborative partnership or maintaining a successful collaboration. Fine (1998) concerns the very rapid changes in terms of structures in the industrial environment. It requires agility and adaptability for organization to enable to survive. It also has a big impact on collaboration because all partners involved in the changing cannot remain stable and pay-back time must be shorter for new investment. Moreover, suppliers and customers often have their own objectives and expectations in some key supply chain issues. Suppliers must address about handling demand variability, inventory, safety stock and reasonable lead-time while customers concern about the forecast, quality, prices, and capability and so on. They may change their strategies to be able to adapt the changing of business environments and to reach their own goals. Therefore, the context of competition may arise regarding to those issues such as inventory costs, prices of production, distribution costs and so forth. (SAP, 2007)

The last but not least, lack of effective performance measurements is one important barrier that may lead organization in failed collaboration. Metrics to measure preformation for all partners in the supply chain are necessary. Members of adaptive supply chain often concentrate on optimizing their own operations instead of collaboratively co-operating to ensure mutual benefits and profits. It means that members do not evaluate their activities or performances which are not under their direct control. It is becoming obviously difficult and complicated to fix problems or improve the performances in the supply chain later on. (SAP, 2007). Critical aspects needed to take into account for collaborative success are accepted joint goals, performance indicators and management. Collaboration needs members involved to be adaptable to change when necessary in the operational level as well. In long-run alliances, the externally surroundings required to be controlled every now and then also since every changes of those indirect effects can have an impact on common goals and achievements of members. (Wagner *et al*, 2002)

2.3 Buyer-Supplier Relationship

Regarding to buyer-supplier relationship, a numerous researchers are interested toward power and dependence between supplier and buyers since 1950s. Researchers focused mainly on power uses and sources and on dependencies in dyadic buyer-supplier relationships (Kahkonen, Lintukangas & Hallikas, 2015). Some researches found that power and dependence highly impact the characteristics of the buyer-supplier relationship (Nyaga *et al.*, 2013; Kahkonen, 2014). The mutual dependence and power are highly connected to each other, in which the dependence of the buyer on the supplier is a source of supplier's power and inversely the dependence of the suppliers on the buyer is a source of buyer's power (Caniel & Gelderman, 2005). The Figure 8 below (Andrew Cox, 2000) shows the relative utility and scarcity of buyer's resources for suppliers and suppliers for buyers in returns.

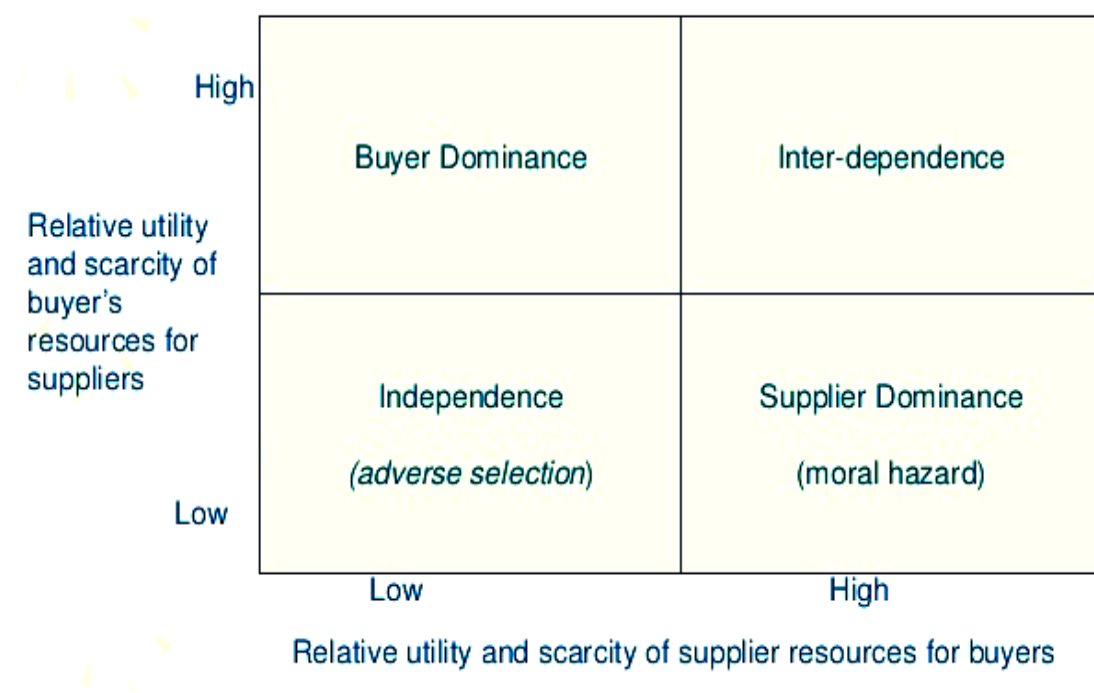


Figure 8: The power matrix of supplier-buyer relationship (Andrew Cox, 2000)

Alliance usually gets failed because of a shortage in the power positions' understanding of the members in the chain (Van Weele and Rozemeijer, 1999).

2.3.1 The types of buyer-supplier relationship

Buyer-supplier relationship is established based on mutual benefits which is reflected by cooperation for certain purchases rather than competition. Many previous literatures and researches has paid much attention at the context of buyer-supplier relationships. Many researchers state that alliance is not a uni-dimensional structure. There are four kinds of relationship which are self- centered, personal loyalty, mutual investment and political control. The self-centered focused on the demands of a firm, the personal loyalty bases on common responsibility and agreed contracts, the mutual investment is characterized by long- run liability related to strategic plan and mutual benefits, and the political control depends on interconnection and high levels of associations. (Campbell, 1997). O'Toole and Donaldson (2000) identify relationships as parallel, recurrent and discrete or hierarchical where bilateral relationship is recognized by mutual co-working, recurrent relationship is linked to bilateral but lack of closeness of its while discrete relationship has minimal integration or hierarchical relationship represents one partner is dominant.

In supply chain perspectives, buyer-supplier relationship can be defined as two main types which are adversarial competitive and collaborative partnership. The main purpose of adversarial relationship is to minimize expenses of production resulting to lower prices of sold products and services. In this approach, the buyers make only short-term contract relationships with multiple suppliers to gain a higher bargaining position compared with other suppliers. In this case, buyers use only few total resources of suppliers and suppliers, therefore, provide less value-added services, have fewer possibilities to access technology or other strategies in gaining competitive advantage from the buyers. Hence, it is not likely to bring long-term relationship in this approach. (Marquardt, 1988). Collaborative relationship looks for lower acquisition as well as lower operating costs through co-ordinated efforts of both buyers and suppliers. The collaborative approach emphasizes cooperative movements that have been emerged in many industries in terms of efficient consumer response, just-in-time, lean production (Cespedes, 1995; Tosh, 1993). Evidence from the literature, collaborative alliance proposes customers to reach tighter correlation if they desire to manage the supply dependence or impact on product quality and distribution

(Ellram, 1995). The differences between two types of relationships are shortly elaborated by Lamming (1993) (see Table 2)

Relationship factor	Adversarial competitive	Collaborative partnership
1. Nature of competition in supply market	Price based; competitive	Collaborative; technology-based
2. Basis for sourcing decision	Competitive bidding (price-based)	Long-term performance history
3. Role of information transfer and its management	One-way; closed	Transparency of costs in each direction
4. Attitude to capacity planning	Independent	Shared problem which is strategically planned
5. Delivery practices	Erratic	JIT, small quantities on an agreed based
6. Dealing with price changes	Traditional price negotiation; win-lose	Collaboration on cost reduction programmes; win-win
7. Product quality	Aggressive goods inward inspection	Joint efforts with aim of zero defects
8. Role of R & D	Assembler designs and supplier makes to specification	Supplier involved early in R & D process
9. Level of pressure	Low – purchaser will go elsewhere if dissatisfied	High – continuous improvement to identify better methods and materials leading to lower costs

Table 2: Comparison of adversarial and collaborative relationships (Lamming, 1993)

Additionally, buyer-supplier relationships can be put in a continuous sequence with two types of approaches: transactional relationship and partnership relationship. Buyers still want to remain their autonomy but they also move their business to ‘partnership’ since they prefer to developing closer relationships with their suppliers. (Varley, 2003) The transactional versus partnership approach characteristics are compared in detail (see table 3)

Transactional approach	Partnership approach
<ul style="list-style-type: none"> • Short term or occurring once only • Many suppliers and buyers • Lack of commitment and loyalty 	<ul style="list-style-type: none"> • Long term and on-going • Few suppliers and buyers • Loyalty and commitment

<ul style="list-style-type: none"> • Low switching costs, little investment • Made in relationships • Release or no process • Exchange centered on single firm • Changes in customer/ supplier affect little 	<ul style="list-style-type: none"> • High switching costs, big investment • Many people and department involved in exchange • Change in customer/supplier causes disturbance
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Table 3: Transactional vs. Partnership approaches (Varley, 2003)

2.3.2 Relationship and business performance

Many recent literatures represent that relationship and performance are interconnected. The buyer can gain a lot of advantages due to successful relationships regarding to financial performance and lead time performance (Martin & Grbac, 2003). Kraljic (1983) builds some matrix or model that helps buyers in developing a suitable purchasing strategy. The Kraljic Matrix (see Figure 9) maps the financial impact of a product on one axis and the vulnerability to supply risks on the other. It is able to help companies to visually capture the importance as well as the relationships of two examined elements. It also contributes in the first step of supplier management to identify the interconnecting between relationship and performance.

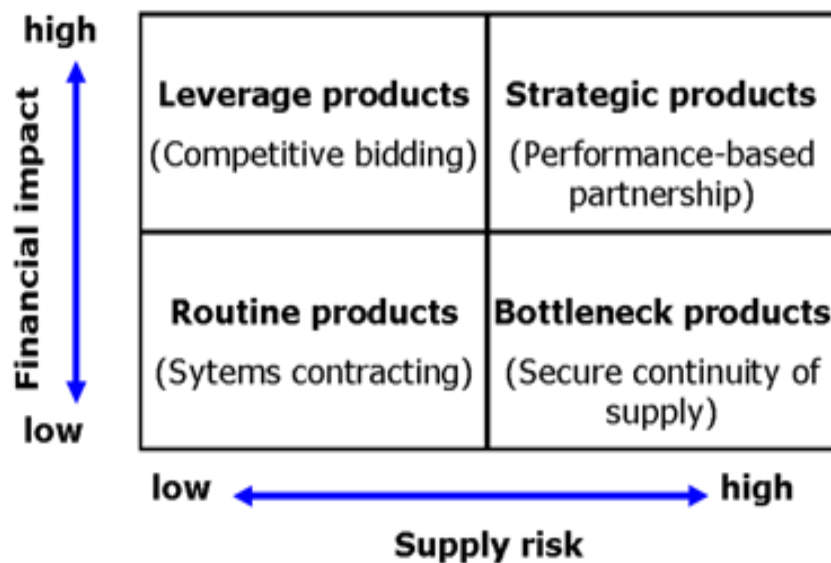


Figure 9: Kraljic portfolio matrix (Kraljic, 1983)

Furthermore, the alliance can result to improve responsiveness and customer satisfaction and creativeness (Johnston *et al.*, 2004). In the opinion of suppliers, successful relationship can bring benefits in cost reductions and lead time (Kalwani & Narayandas, 1995). Also, some attributes of supplier costs is identified in the buyer-supplier alliance. Some researchers state that suppliers obtain lower inventory and selling expenses, eventually give companies higher profitability in the long-term relationship. It not only improves product or process design, quality but also supply chain performance (Benton & Maloni, 2005). Importantly, closer future relationship prospects is generated by successful relationships (Duffy & Fearn, 2004). Some actual evidences of relationship' benefits are approved in some other literatures where relationships give the power in recycle and new product development, delivery performan, flexibility and customer satisfaction (Scannel *et al*, 2000) . Furthermore, close relationships also lead to reductions in transaction costs, possibilities in information sharing and technology transfer or improvements (Singh, 1997).

A model of performance in relationship is built with the five main theoretical explanations of relationship-based pros. They are the commitment-trust perspective, the dependence perspective, the transaction cost economics perspective, the relational norms perspective and the resource-based perspective. In their research, they analyze main elements that have influences on inter-firm relationships and performance

results. In the conclusion, they state that the resource-based approach interpret the performance effects on internal correlation within a firm better than other approaches. (Daniel, 2012). In the model of Reddy and Czepiel (1999), the impacts of acknowledgement, expenditure with revenue and performance on relationship longevity and perceived performance are compared respectively. Some other perspective also compares different factors of the similar structure on recognized performance results. (Daniel, 2012).

In addition, increasing supply management orientation by buyers including long-term alliances, supplier jointing in product development, quality focus in supplier selection and other reduction programs with supplier involvement upgrades the performance of both buyers and suppliers in terms of quality, delivery and expenses (Shin *et al.*, 2000.) figure out that companies co-operated with both supplier and customer sides are likely to boost market share, productivity and non-productivity performance (Frolich & Westbrook, 2001) . Companies conducting supply chain management implication such as strategic supplier partnership, customer relationships, information exchange and so on can approach higher levels of firm's performance (Li *et al.*, 2006).

Importantly, innovation is one key outcome of relationships between buyers and suppliers. Particularly, close relationships between buyers and suppliers can help new products launch successfully. Close relationships promote the new product development related to ideas and processes. This also can improve commercialization because of reducing barriers in terms of communication, information sharing and technical access. Close relationships arise the probability of proper systems and processes integrated between buyers and suppliers as well. (Daniel, 2012)

It is undeniable to say that the measurement of how performance can attribute to specific activities or ideas is very hard. Recent literatures on relations between buyer-supplier relationships and performance have paid attention on own firms' assesment rather than alliance performance. The impacts of relationship continuity, assets specificity and unpredictable volume and unpredictable buying of a supplier and alliance span are examined by Heide and Stump (1995). The effect of correlated power with the absence of a relationship on supply chain performance, relationship strength and particularly on buyers and supplier is investigated (Benton & Maloni,

2005). They find out that the influence of central aspects of relationships on relationship performance itself.

2.4 Key factors for successful collaboration

There are some key factors influencing collaboration strategy. Trust and commitment are key elements in succeeding the collaborative relationship (Morgan & Hunt, 1994). Efficiency, productivity and effectiveness can be improved if both trust and commitment are achieved. Moreover, commitment and trust result directly to cooperation behavior, consequently leading to relationship continuity. The relationship between buyer and supplier is analyzed based on three aspects: commitment, cooperation and operational linking (Prahinski & Benton, 2001). Some critical features of an alliance consisting of behavior and operational elements are also indicated by those three aspects. Likely, relationships are depended on trust, commitment of cooperative chain members. Business partners of the supply chain must count on and collaborate with each other so that the efficiency of an alliance is increased and costs are reduced. The quality and delivery are paid first attention by both buyers and suppliers, and the flexible management of strategic plans as well as cultural differences are followed. Suppliers are highly recommended to acknowledge the buyers' goals and strategies. They are likely to take part in its operation with correlative factors regarding to trust, commitment, communication (Cambra & Polo, 2008). In this study, the author reviews three key factors that have a big effect on effective collaboration between buyers and suppliers.

2.4.1 Mutual Trust

Trust can be defined as the reliance and reliability of one company on another partner to carry on its core competences, to well behave and perform whenever the goodwill exists. It is essential to say that trust is returned, thus, it must be addressed as mutual trust. Admittedly, the mutual trust growth among partners with the readiness to exchange information that is beneficial for all involved ones are cornerstone for a successful collaboration in the supply chain. This mutual level of trust is obtained by right place putting of service-level agreements and corresponding measurements that provides all partners accurate feedback of collaborative actions. (SAP,2007)

Trust in collaboration is defined in numerous ways which are likely to consider a assailable position with the positive expectations of partners' responses (Rousseau *et al.*, 1998). Trust is defined as confidence of counting on an exchange partners. Morgan and Hunt (1994) recognize the trust based on a certain trustworthiness and integrity among members of the chain. Credibility, responsibility, sincerity and ability are interconnected to integrity. (Morgan & Hunt, 1994). Companies often test their partners before trusting them at the beginning of a relationship. After that, it is highly time to establish an active collaboration in order to obtain their execution objectives. (Prahinski & Benton, 2004). Trust, which presents levels a company believe in its relationship partner, is honest and reliable. Moorman *et al.*, (1992) similarly as Ganesan (1994), trust reflects credibility and benevolence in a simple meaning of understanding. Credibility, which refers to levels a firm believes in its partner, has competence as well as expertise to perform tasks effectively as it expects. Benevolence refers to the extent to which a firm believes that other partners' intentions and reasons will bring benefits to the relationship. (Ganesan, 1994).

Uzzi (1996) show that trust is "a unique governance mechanism in that it promotes voluntary, no obligating exchanges". Many previous studies find the strong linkage between trust and relationship success, trust and satisfaction with profitability (Mohr & Spekman, 1994; Whipple & Frankel, 2000). Crorstena and Kumar (2005) reckon that trust can lead to greater openness between buyers and suppliers, consequently greater acknowledgement and appreciation of contributions of each member in the relationship. Ganesan (1994) also point out that successful long-run relationship between suppliers and buyers can occur as a supplier or customer trust the channel partners. Hence, buyers and suppliers who trust mutually will reach satisfaction easier and will put more efforts to maintain its continuity.

However, trust and risks are highly connected to each other (Laequddin *et al.*, 2012). Trust occurs when one party is willing to fullfil the commitment based on agreements and expectations. Risks happen when the party has not enough competence to perform or the party does not choose to act. Trust exist there must be a place for risk also unless the outcome is predictable or there is no uncertainty for outcomes. Moreover, if parties are not dependent to each other, there will be no requirement for trust. (Spekman & Carraway, 2006). Nevertheless, trust is not a long-run complicated reinforcement process. In Laeequddin *et al* (2012) model, they argue that "trust

establishment may be imminent stage when the extent of risks can be assessed". Similarly, Heide and John (1990) also believe that trust can greatly support for long-run consistency of a firm. Lee and Billington (1995) suggest that effective coordination of partners is established by the cornerstone of trust and commitment.

Trust is a key factor that is generated from both sides. Trust helps both partners to control the business's negative movement or even financial crisis, uncertainty situations and many aspects of business issues. Literatures give many evidences that trust can decrease in production costs, risks and build long-run alliances; create more investment chances and enlargement of business relationship further. (Mohanty & Gahan, 2012). In supply chain perspectives, three ways of trust have a big impact on relationship. Firstly, trust contributes as a system of control in coexistence of a contract and agreement. Secondly, trust is a reason itself that encourages both parties involve. A firm can estimate the net outcome of an interaction relied on the perceived benefits and profitability that other partners bring to it. Thirdly, trust is built all the time throughout the repeated actions. Each of these ways can offer both opportunities and risks for buyers and suppliers. It is still controversial a lot that buyers can sellers can highly and effectively cooperate in the manner of trust. (Spekman & Carraway, 2006). However, it is undeniable to state that trust plays a vital role in the overall success of collaboration

2.4.2 Commitment

Second important element of the collaborative relationship is commitment. In any supply chain network, the commitment is dependent on its commitment acknowledgement related to the other partners. In this case, the commitment of buyers can have positive effect on the commitment of suppliers. (Anderson and Weitz, 1991) Trust and commitment can increase satisfaction in general and thus lead to relationship success (Mohr & Spekman, 1994; Benton & Maloni, 2005). Resources dependency influences on commitment, trust and satisfaction and the perception of collaborative power and actions are connected to commitment, trust and consequently relationship success. Some researches point out that firms decide to specific investments based on commitment and satisfaction. (Mohr & Spekman, 1994; Anderson & Weitz, 1992).

The construction of commitment is conceptualized as the trusting of a partner. A carrying-on relationship is crucial and essential to maintain and warranty it by maximizing effort. Commitment means a wish to build and enlarge a steady relation and strong bonds among members. Commitment is willing to sacrifice in the short-term to retain the bond and to confidently stabilize the relationship (Anderson & Weitz, 1992). Like the trust, commitment originates from economic and behavioral constituents which arise with positive responses. (Bharat *et al.*, 2006). According to Anderson (1994), commitment attempts to reach the continuous perception and growing in the relationship between two firms. There are a lot of researches related to the ways of increasing commitment in partnerships. They believe that commitment can prompt innovation investments among partners leading to obtain core competences (Cullen *et al.*, 2000). One of common ways to manifest commitment is reducing the number of suppliers in the supply chain. As the result, it will intensify the suppliers' ex post bargaining power and then increase their ex ante motivations to create more investment opportunities in relationships. (Kanter, 1994).

Commitment are identified in three different facets which are affective commitment, instrumental commitment and temporal commitment. Affective commitment indicates a positive behavior towards the existence of the relationship in the future. Instrumental commitment occurs when some forms of investment regarding to time, other issues in the relationship are also conducted. The last aspect is temporal commitment describes the relationship is alive all the time. (Gundlach *et al.*, 1995). Three elements for commitment are investments in the business partner, affective commitment and long-term relationship expectation (Kumar, 1995). In other studies, commitment is also clarified with three dimensions: instrumental commitment, normative commitment and affective commitment. Gilliland and Bello (1992) indicates that instrumental commitment occurs where a partner is restricted by the costs and difficulties in getting rid of the existing collaboration. In Brown *et al.* (1995), they show normative commitment is depended on the worth of partners in the alliance. Affective commitment connects an involved partner's identification with other members of the collaboration (Brown *et al.*, 1995).

In some other researches, commitment is conceptualized as a sustained aspiration to retain a worthwhile relationship (Moorman *et al.*, 1992) and considered as unattachment from its attributions (Morgan & Hunt, 1994). Those approaches are able

to examine the independence and earlier influences of emotional dimensions of ties on the wish to last the successful relationship in the near future. However, their studies do not investigate in economic sides such as profits or benefits in their approaches to commitment in the business relationship. (Jamila & Abdellatif, 2013). Notwithstanding, it is admitted that commitment and trust can improve efficiency, effectiveness, productivity and capability if they both simultaneously perform

2.4.3 Communication

Communication is one of the central factors in the buyer-supplier collaboration. Communication is closely linked to the necessity of precisely communicative tools throughout the whole network (Morh & Spekman, 1994). It will support to quicker information exchange and to create shared understanding among supply chain partners (Stank *et al.*, 1999). Communication is not only the point of contact, but it is also a necessity of developing comprehensive interfaces among companies, hopefully surpassing the shortage of internal communication. It supports and encourages creating a place for creative ideas as well. (Barratt & Green, 2001). It enables to prevent from occurring the negative issues if one contact leaves and can make the entire collaboration be endangered (Frankel *et al.*, 2002).

Communication is categorized into four components: content, way, feedback and frequency. Those factors will form the communication power and coordination among suppliers and buyers. (Morh & Nevin, 1990). Speaking a bit about feedback, customer feedback plays an important element of communication. Particularly, feedback can be used to improve customer relations and customer services. Companies who take feedback seriously will build strong customer relationships. With the strong customer relationship, companies can have systematic processes for dealing with complaints in returns which would effectively reduce customer service problems and make customer satisfaction in the values of the organizations (Prakash *et al.*, 2009). It is admissible that communication bring more operational efficiency by utilizing tools such as fax and other electronic instruments. Electronic communication tools help many buyer-seller relations run fluently and transparently. Braldi and Waluszewski state that information technology and business application like technical systems allow companies to handle with the resolution of most problems. Moreover, Cassivi

(2006) also suggests that despite of the fact that communication tools are getting increasingly complex with vast flowing data in every second, the system is more relevant, the forecast is more accuracy. However, it will require the higher levels of education and organizations' structures and planning may be reformed.

Communication between partners can lead to increase the trust and commitment (Anderson & Weitz, 1992). Some studies also find that increasing communication results directly to increasing performance and satisfaction (Sriram & Stump, 2004). Communication can be linked to product price, contract agreements, technical systems, business strategies and also know-how market. Communication can express its effectiveness only if both involved members apprehend the objectives and mutual demands at the similar level. (Mohanty & Gahan, 2012).

Furthermore, the communication is very critical in merging with distribution channel since communication helps vendors to upgrade their achievement relative to their customers' requirements. In supply chain perspective, communication provides sources of essential and worthwhile information. Types of information accepted by different communication tools will be significantly intense comparing to the one come directly from the market. (Gulati & Gargiulo, 1999). In vertical collaboration, the access of information and supply run throughout both formal and informal hierarchical structure. Relationship among parties will generate a vast amount of dissemination channel with huge information data. Hence, the information value is based on its content, reliability and validity rather than the structure. (Paiva *et al*, 2008)

3. PACKAGING INDUSTRY

3.1 Overview of packaging industry

3.1.1 Features

Packaging industry play a vital part in the industrialized sector of the whole world. It is surprising to say that packaging is one of the ten biggest industries in each country more or less. There is no official figure for the packaging business. The total value of packaging share over the world is approximately EUR 429 billion in 2003 and EUR 22 billion in Europe market (SCA, 2002). The global consumer packaging market is estimated at roughly EUR 329 billion in 2012 (EY, 2013). The overview of packaging industry is visually depicted in the Figure 10 below. (Packforsk, 2011)

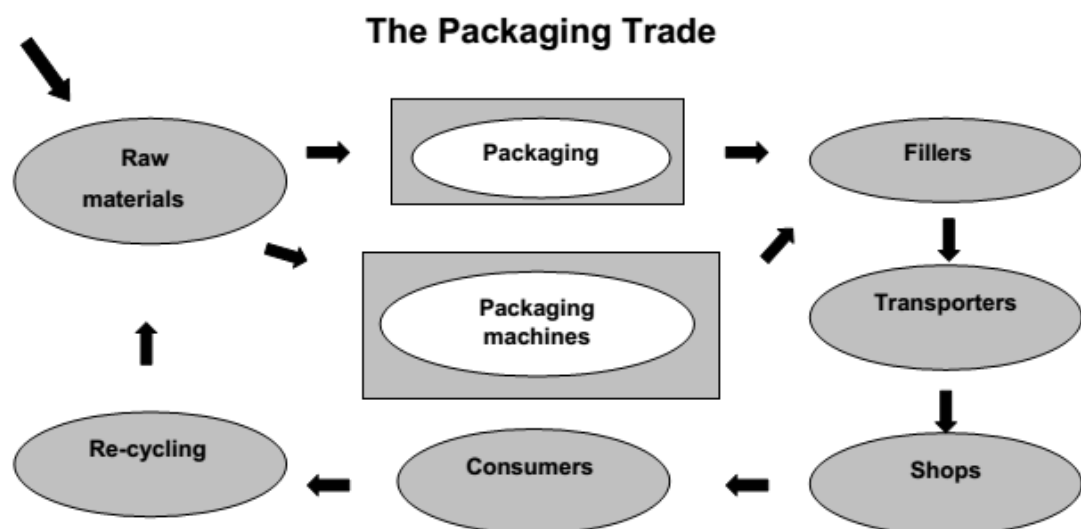


Figure 10: Packaging industry (Packforsk, 2011)

Packaging industry has been going under challenging competition and cost restructuring recent years, given pressures to rapid movement for producers of goods.

Due to the Eurozone's economic downsize, prices of raw materials as well as energy uncertainty also have a negative effect on packaging industry. Fierce growth in emerging markets like Asia brings both opportunity and thread for packaging industry. (EY, 2012). The environmental aspects of packaging are increasingly addressed since they shape an essential role in packaging development process. The comprehension of markets, new materials and technical tools must be taken into consideration in the packaging industry as it relates to environmental issues and product development processes. (Ikonen, 2001).

Packaging can be categorized into three levels including primary, secondary or tertiary and reflecting packaging (see Figure 11). Those three level system is used together as a hierarchical uniform. The procedure emphasizes the basic interaction among distinhgished levels of packaging then makes their interdependence easier to understand. (Jonson, 2000)

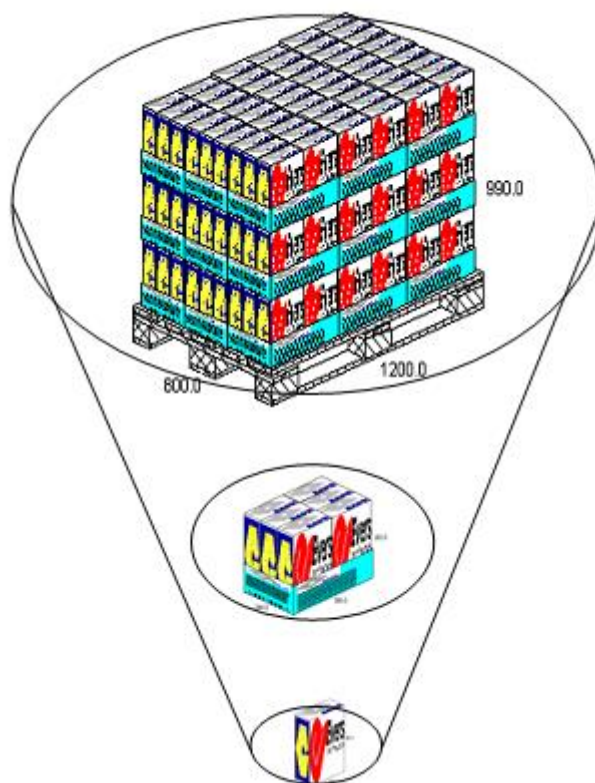


Figure 11: The levels of the packaging system (Jonson, 2000)

According to Smithers Pira (2013), packaging sales accounted for 36% of the total value are paid attention in Asia in 2012. 23% and 22% are the shares for North America and Western Europe respectively whereas Eastern Europe is accounted for 6% global share with the fourth largest position. South and Central America has 5% and The Middle East shows 3% for packaging demand of the total value, while each of 2% is shared for Africa and Australia. (see Chart 1)

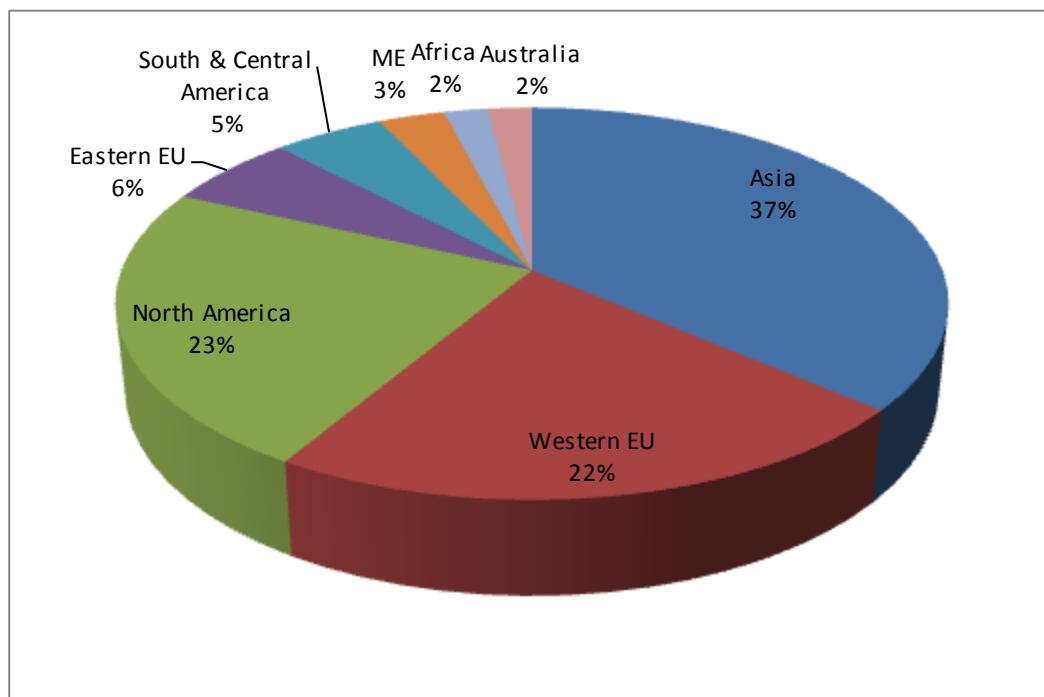


Chart 1: Total market size of global packaging by geography (Smithers Pira, 2013)

According also to the study, they predict that the segmentation will be significantly changed by 2018 in where Asia is foreseen to count over 40% of demand in packaging while North America and Western Europe may decrease their share noticeably. The Brazil, Russia, India and China markers account for roughly 30% of world requirement due to their economies' development. Packaging trades in the emerging countries are continuously desired to grow due to a growing middle class. According to EY analysis (2012), packaging of food is accounted for a half of total consumed packaging with 51% in 2012. Beverage packaging is the second largest consumed packaging with total shares of 18%. In 2012, Pharmacy is the third one which account for 6% of total consumed packaging, closely followed by Cosmetics

with 6%. Other consumer is grouped in one segment with 20% of global packaging share. (see Chart 2)

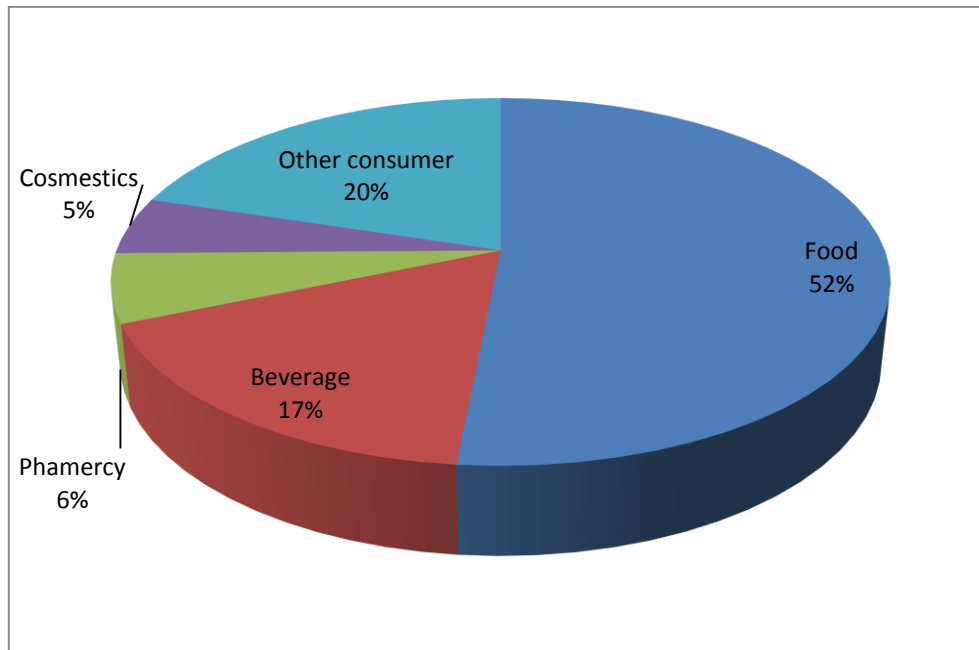


Chart 2: Total market size of global packaging by end markets (EY, 2012)

3.1.2 Packaging types and roles

There are many concepts and terms of packaging used in reality. Some terms are described the same type of packaging but can be in different aspects. Jonson (2000) summarizes some common terms with definitions as Table 4 below

Packaging types	Definitions
Primary packaging or consumer packaging	Packaging directly cover the product and the end consumer often can take to home
Secondary packaging	Packaging is designed to carry one or more primary packages
Tertiary packaging	Packaging is used to cover the assembled packages of a number of primary or secondary packages on a pallet or lava or container
Group packaging	Packaging is formulated to make protection,

	display, handling and transporting a number of primary packages easier.
Transport packaging or distribution packaging	Packaging is designed for easily handling, transporting and storage a number of primary packages to improve production efficiency and distribution and to prevent physical damage during the ways
Display packaging	It is similar with group packaging, yet it often focuses more on display features
Retail packaging	It is also similar with group packaging with a special highlight on the design to be suitable in retails
Used packaging	Packaging materials are remaining to reuse after the removal of the product it covered.

Table 4: Different packaging types with definitions (Jonson, 2000)

The European Organization for Packaging and the Environment has identified some main roles of packaging on their webpages. They are protection, promotion, information, convenience, and utilization, handling and waste reduction. Brody (2000) adds some more function including dispersing, dispensing, tampering and pilferage deterrence. It is undeniable to say that packaging is considered as a vital role in preserving and protecting consumed products. There are four common and important roles of packaging discussed which are containment, protection, convenience and communication. (Robertson, 2009)

- Containment: the products must be packed in order to transfer from one place to another or to easily carry without touching on the surface of products. The package is designed based on product physical features.

- Protection: it is one of the most important functions of packaging. Packages must cope with a lot of impact and damages during distribution to end users. It is necessary to understand all mechanical, chemical and thermal factors to protect products. It also include preservation functions which means preventing chemical activities from biochemical changes and microbial attack (Brown, 2008)
- Convenience: users find packaged products easier to uniform dispense and utilize. Packaging also help distributors or consumers tightly take to different places.
- Communication and information: package is one of important linkages between consumers and manufacturers. The package contains regulations and marketing features for brand owners and marketers. It is a mean of advertising and marketing that can influence on customers' decision making.
- Environmental issues: the package needs to be as secure and environmentally friendly as possible. Manufacturers would like to produce qualified products to satisfy their customers. Customers nowadays require to entail the environmental orientation packages in terms of manufacturing, recycling, re-utilization and final disposal (McDowell & Kirwan, 2003)

3.2 Product features and packaging material

3.2.1 Product features vs. packaging design

A product is not only the amount of its completed propotion but it can be also a separated item, a spare component, a piece of an assortment (Friso, 2012). Basically, constitutes of a product's characteristics often refers to name, size, shape, color, weight and price (see Figure 12). Product features are physical characteristics and elements that make a product different from other. Each product has its own tangible and intangible properties that can specify the goods by its usage and benefit.

Diversification of product features can make product become unique in the market and effectively appeal to consumers. Product profile is created by the combination of characteristics and each product has its unique product profile with being more importance of some characters than others. Different products own different

characteristics with various ‘strengths’ such as weights, colors, tastes which require categorical types of packaging. (NZIFST, 2014).



Figure 12: Product characteristics (NZIFST, 2014).

Due to differences in the competences, product characteristics are needed to manufacture, distribute products regarding to products; intrinsic structure and nature. Since consumers are demanding on product variety, thus materials, design and functional innovation have been emerged as vital aspects of a single product. (Bruce *et al.*, 2004). An abundance of characteristics is very important in designing packaging to match the requirement and condition of products. Companies have to take packaging unit, packaging dimensions, packaging weight and packaging materials into account when they enclose a product.

Packaging design is identified as a string of activities including forming, structuring materials, setting up color, images, and labelling information with ancillary design elements to make a product proper and eye-catching in sales. Its primary purpose is about generating a box or container to contain, protect, store, transport and identify a product in the marketplace (Rosner & Krasovec, 2010). The type of packaging is usually chosen by product features and further considerations of cost reduction. Therefore, packaging design has an effect on costs in terms of purchasing costs and management waste, packing costa, handling, inventory, transport. It is obviously difficult to clearly understand the results of specific determination in formatting the

the packages for products. (Garcia-Arca & Prado-Prado, 2008). Although an “economic” packaging is formulated by a standard format with a proper logistic efficiency, cost reduction approach can be risky without collaborative manner (Garcia *et al.*, 2012). In recent decades, the combination of packaging and logistics has been defined as the phase “packaging logistics” (Hellstrom & Saghir, 2006). According to Shagir (2002), packaging logistics is considered as a range line of scheduling, conducting and monitoring the coordinated packaging mechanism to prepare products for safety, effective handling, efficient inventory, usage and recycle with relative information corresponding to optimization of purchaser value and eventually gain.

Garcia-Arca and Prado-Prado (2008) state that the initiative and packaging design development can be formed based on three main foundations. Firstly, the definition of the model requirement is depended on packaging function and product characteristics. Secondly, the concept of an organizational formation involves all divisions or unit internally within the company and externally within the supply chain. Eventually, some kind of aspects like palletization, formular, format or quality standardization, re-use, recycling, etc are called as the application of “best practices”. In order for packaging to match the companies’ requirement, it is necessary to combine the packaging structure including primary packaging, secondary packaging and tertiary packaging with the four basic decisions regarding to design consisting of selection of used materials, dimensions, groupings the number of packs and “graphic artwork” of the packaging (Garcia *et al.*, 2012).

3.2.2 Packaging material

The industry consists of five main types of packaging which are paper and board, rigid plastic, glass, flexible plastic and others. The largest consumer packaging sector is paper and board group involving paper bags and cartons with about 34% of total value. Rigid plastic consisting of tubs, pots, jars is the second biggest packaging group with a 27 % of the total packaging market. This type is estimated to become one of the fastest growing categories by 2015. Glass is the third largest consumer of packaging with 11% of market share, close followed by flexible plastic with 10 % of total value. Other types of packaging categories account for 18% share of the total packaging market. (EY, 2012) (see Chart 3). All of packaging materials are developed

to meet different requirements of manufacturers, consumers, products and specific usage. The most common trade of material for packaging is used to provide products from the producers to the retailers (Europen, 2003). Packaging material has a great impact on recoverability of products. In addition to the consumed packaging material, the packaging wastes regarding to economical issues and probability are also taken into consideration. (Twede & Goddard, 1998)

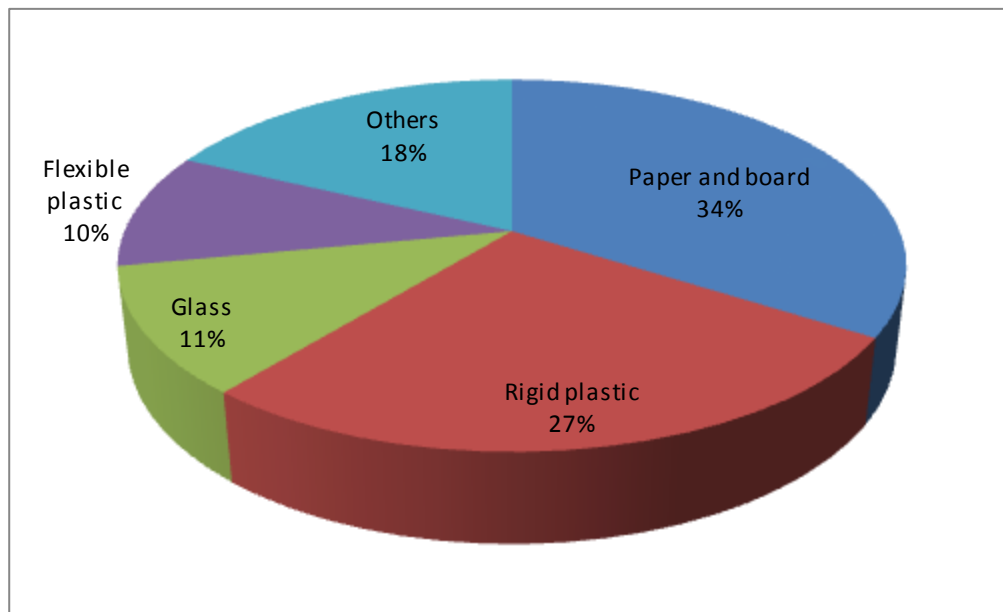


Chart 3: Total market size of global packaging by types (EY, 2012)

Paper is the largest materials used in packaging because of its nature such as low cost performance, moderate weight, stiffness, easiness for printing and other versatile functions (Twede & Goddard, 1998). Firstly, paperboard gives not only multi-faceted functions but also cost-saving in packaging. Paperboards present predominant materials for packaging food products. These materials are always developed to make material perform better. For instance, liquid board often uses two PE layers to prevent the paperboard from getting wet. Paperboard also may have aluminum foil lamination to embargo exhaust gas or absort light. (Twede and Goddard, 1998). For distribution, cardboard material is basically the most popular container to protect products. In most logistical systems, cardboard container is considered as a standard attribution since roughly 95% share in the total world's products using cardboard in shipping. (Tan & Khoo, 2005). Both paperboard and cardboard have advantages in recycling. Paper

used in cardboard is economical to gather a vast amount and to reuse (Twede & Goddard, 1998).

Plastic is the second largest material used for packaging. Plastic is one of the most immature packaging materials applied new technologies and utilized in mass production since the 1950s. It has been emerging as the most common materials in the recent decades. In plastic materials, PE, PP, PVC, PS, PEN and polyamide (nylon) are often used. They can offer durability, clarity, lightweight, flexibility and easiness in processing. Plastic materials also diversify in terms of types and constituents presenting a variety of design opportunities. One main limitation of plastics is heat tolerance. Plastics can be mixed with different types of other materials due to its diversity and durability. Plastics have competitive edge in low costs, light weight which are usually consumed to produce flexible packages and liquid board (Soroka, 1999). It is easy in melting but difficult in recycling because of its multi-material structures. They must be sorted by types, composites before recycling. (Pira International 1993). Recently, people innovate and encourage using one new type of plastic materials called biodegradable plastics. They are basically produced by natural renewable raw material like leaf or wheat's starch, corns and so on. Biodegradable plastics, which can support for environment as well as waste disposal, are used in many supermarkets in EU. (Anon, 2005).

The third popular packaging material is glass with strong, durable, transparent and healthy functions. Glass materials enable to hinder chemical reaction so products especially food products are highly recommended to use glass to contain. It is also a barrier of moisture and gas. However, the disadvantages of glass are weight and breakable that make people prefer plastics and other aluminum substitutes recently. Nevertheless, the recyclability of glass is very high with a little impact on its performance. For example, glass packages like jam bottles can be reused many times as it can be sanitized and ensured in high processing temperatures. It is very healthy for food containing and food processing. (Twede & Goddard, 1998).

3.3 Packaging technology and R&D collaboration

Nowadays, technology plays a central role in determining the quality and quantity of productions. Many companies recognize that they have enhance more competitive

advantages and profitable in investing collaborative R&D rather than their own R&D. In response to global competitive challenges, collaboration is important to maintain expertise, to establish new technology-based, fast-growth entrepreneurial firm and to create high value. (David & Everett, 1990).

Collaboration in manufacturing with the latest technology helps not only suppliers to develop application for products but also customers across the value chain. Both parties can improve safety, convenience, comfort and other qualities that make the whole chain move smoothly. Due to the challenges of future in the packaging industry, it is critical to address in direct collaboration between suppliers and customers in terms of materials, components, modules and equipment. Electronic data of information technology is interchanged that make more flexible packaging, automated warehousing and quick logistics. Applying collaborative technology improve performances in terms of rapid response, efficient consumer feedback, faithful response, mass customization, lean manufacturing and so on. (Fisher, 1995)

For instance, the National Center for Advanced Packaging Co., Ltd dedicates to develop and commercialize advanced system and technologies in packaging. Their R&D collaboration works together to create evolutive mechanism for packaging solutions for instance high performance flip-chip ball grid array (FCBGA) and high-density 3D packaging using through-silicon for fullfil the high performance products. Two parties believe that their collaboration can optimize best packaging solutions to match and satisfy the end consumers' requirement nowadays. (NCAP China, 2015). Another example, G.WIN Company also recognizes that there was a huge chance to better connect with their existing suppliers at the front end of innovation. They focus on externally-enabled innovation; they collaborate more deeply with their suppliers even in testing phase. They admit that closer connection helps their team to tap into specific expertise of based suppliers and simultaneously supports their supplier better understand to produce superior products. (Jeff, 2012)

It is undeniable to state that through collaborative technology and R&D, new collaboration tools and regional innovation centers will create, fabricate and validate solutions for better packaging. However, there are a number of arguments that buyer-supplier collaboration does not really need to depend on technology and technology collaboration seems to be an obsession or one big obstacle for collaboration (see Figure 13).

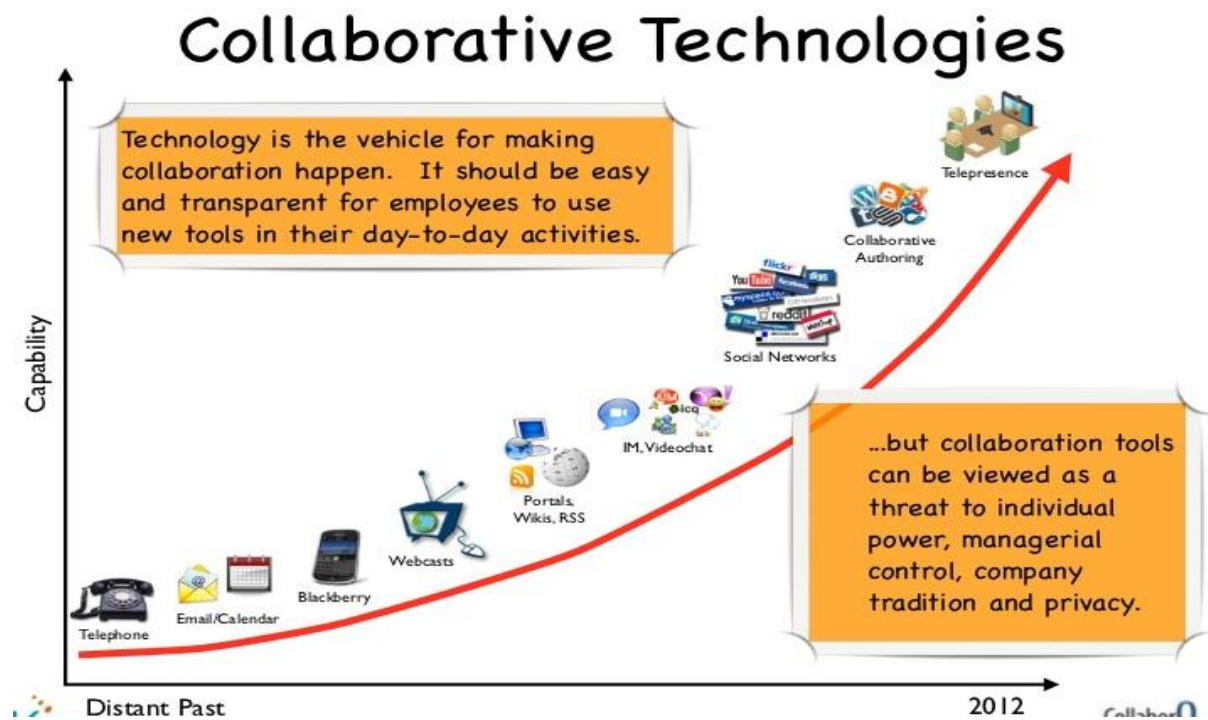


Figure 13: Collaborative technology (Barratt, 2014)

At the beginning of collaboration, the use of simple technology like email tends to be less expensive, yet more effective rather than the modern mass of collaboration tools using software vendors. The vital way for collaboration success is mutually understanding important things such as what partners are cooperating over, the assigned processes and required information of the processes. Technology has responsibility only to shift collaboration closely to real-time practice for interchanging and using share know-how regarding to vast amount volumes of information. (Barratt, 2004)

3.4 Packaging logistics collaboration

Although the packaging industry is increasingly confident by improved economic conditions, increased demand from manufactures, packaging companies are still looking for effective means to manage their supply chain. Collaboration in logistics is

one way of effectively controlling packaging supply chain. Collaboration is a powerful strategy in reducing carbon footprint and costs without negatively affecting on customer services (Tim, 2014).

Despite of the fact that packaging has a great influence on the effectiveness and efficiency of logistical procedures and other operations all over the whole chain. A lot of packaging costs are often neglected by packaging design unit in the system. Packaging specifications have a straight way impact on the time needed to finish packaging actions. Consequently, this also influences the product lead time and time to delivery to the customers. (Twede, 1992). Twede & Parson (1997) point out logistics packaging have a big impact on the cost of each activity, and on the productivity throughout systems. The size and density of packaging boxes are closely linkages to transport and inventory costs while handling costs base on loading and unloading units. To manage the inventory effectively, the property of manual workforce or automatic machines is required. The product quality and safety rely on the protection of product whereas the cost for unpacking or discarding packages has an impact on customer services somehow.

Lambert et al., 1998 gives examples of the linkages between packaging and logistical systems (see Table 4)

Logistics activities	Packaging cost trade-offs
Transportation	
Increased packaging information	Decreases shipment delays; increased package information, decreased tracking of lost shipments
Increased package protection	Decreases damage and theft in transit, but increases package weight and transport costs.
Increased standardization	Decreases handling costs, vehicle waiting time for loading and unloading; increased standardization; increases modal choices for shipper and decreases need for specialized

		transport equipment
Inventory		
Increased protection	product	Decreased theft, damage, insurance; increases product availability; increases product value and carrying costs
Warehousing		
Increased information	package	Decreases order filling time, labor cost
Increased protection	product	Increases cube utilization, but decreases cube utilization by increasing the size of the product dimensions
Increases standardization		Decreases material handling equipment costs
Communications		
Increased information	packaging	Decreases other communications about the product such as telephone calls to track down lost shipments

Table 5: Packaging cost Trade-offs with other logistics activities (Lambert et al., 1998)

4. RESEARCH METHODOLOGY

4.1 Methods

The theoretical part of the thesis is based on existing literatures on collaboration, buyer-supplier relationship, packaging industry and packaging partnerships. These literature are collected from articles, journals, academic books, dissertations.

The empirical part of the study applies qualitative research with the multiple-case study approach. Interviews with departments or people of packaging companies, who are experts in packaging fields and probably the companies' customers to have more precise perspectives about the collaboration as well, are conducted. The case studies described the packaging industry with their collaboration strategies are explained in detail in chapter 5 and refer the depth analysis of how suppliers and customers can collaborate based on physical product characteristics regarding to material design collaboration, technology collaboration, R&D collaboration and other logistics services. However, names of interviewees are not mentioned in the report in order to keep confidential and diminish interview bias (Saunders, Lewis & Thornhill, 2009)

In-depth interviews with multiple case companies is chosen in this study as it provides the possibility to deeper understand and acknowledge the research problems and answer research questions. Multiple-case study approach can bring more data to the research; researchers find it more robust and attractive. On the other hand, multiple-case study is difficult to conduct and time-consuming compared to single case study. Moreover recommends that multiple-case study can be concerned as multiple experiments. (Yin, 2009). In another word, it means that the result of one case can be replicated in another case which seems unimportant in certain conditions.

In this study, exploratory descriptions are adopted in which unstructured problems are best described with flexibility. There exists two common research approaches called inductive and deductive. This study mainly uses the deductive approach as it refers to the examining of existing theory. This approach can take the form of qualitative research in searching deep answers for open-ended questions. It enables to generalize

the found results. (Sauders, Lewis & Thornhill, 2009). The method of this thesis can be visualized through the research onion modified from Sauders, Lewis & Thornhill (2009) (see Figure 14)

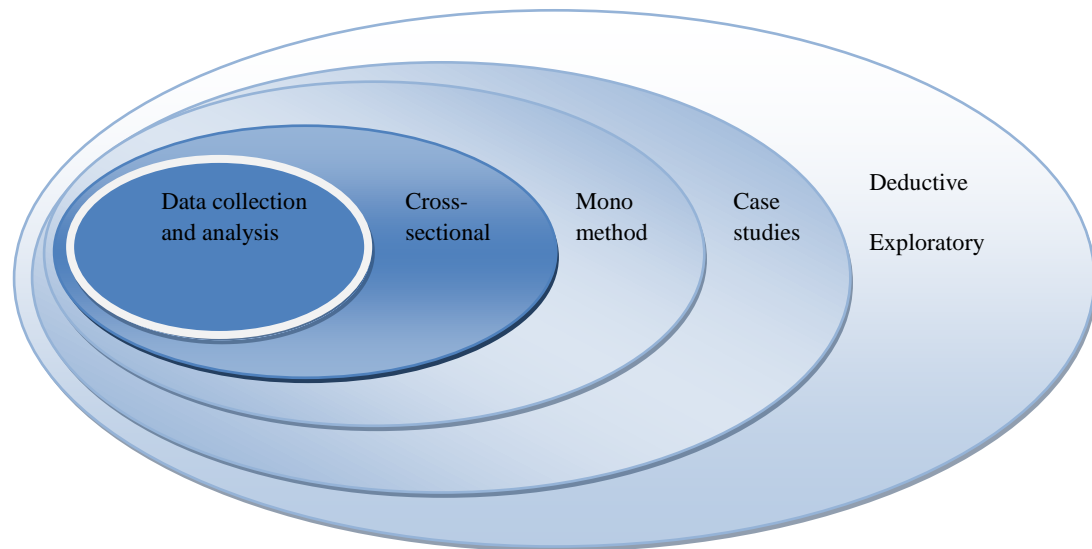


Figure 14: The reseach onion (Sauders, Lewis & Thornhill, 2009)

As a recap, the study applied deductive and exploratory approaches and multiple-case study with in-depth interviews. The study then adopts a mono method where a single data is collected and an analysis procedure is used. The thesis goes along with cross-sectional in time horizon since it presents specific moments in stead of long-terms vision. (Sauders, Lewis & Thornhill, 2009). At the heart of the research onion, data collection and data analysis are conducted and depicted in more detail in the following chapter.

4.2 Data collection

Data is collected by applying the in-depth interviews with three case companies who have great experiences in packaging collaboration. In this case, there are two companies in Finland which are predominant in the packaging sector, one companies in Vietnam including one supplier company and one customer company. The structure

of interview questions is shown in Appendix 1 for supplier side and Appendix 2 for buyer side. The questions for the interviews are designed based on the manner of sub-questions.

In-depth interview in qualitative research is the most suitable method for this study because it gives deeper perspectives through the answers of expertise interviewees. This type of research also gives the chance to explore more issues related to collaborative partnerships. Although the interview questions are designed based on the research questions with a precise structure, the discussion is not restricted and it is possible to discover new perspectives and dimensions.

All interviews are implemented through online including email interviews and Skype interview due to different distances and time zones. The time of interviews are determined by the interviewees because of their busy schedules. The author has contacted with the targeted companies in June and made all four interviews within the month of November, 2015. All interviews are noted with the permission of the interviewees.

4.3 Data analysis

Data analysis in qualitative method involves a lot of processes which collected data regarding to investigating issues or situations are shifted to the form of elaboration and interpretation. In order to analyze qualitative data, researchers should draw out pattern from concepts and look insight the big picture, then figuring out the similarities and differences among those responses. This helps to express illustrative explanations and individual responses. In general, this study follows the same procedure of the qualitative research with six main steps (see Figure 15). (Creswell, 2009)

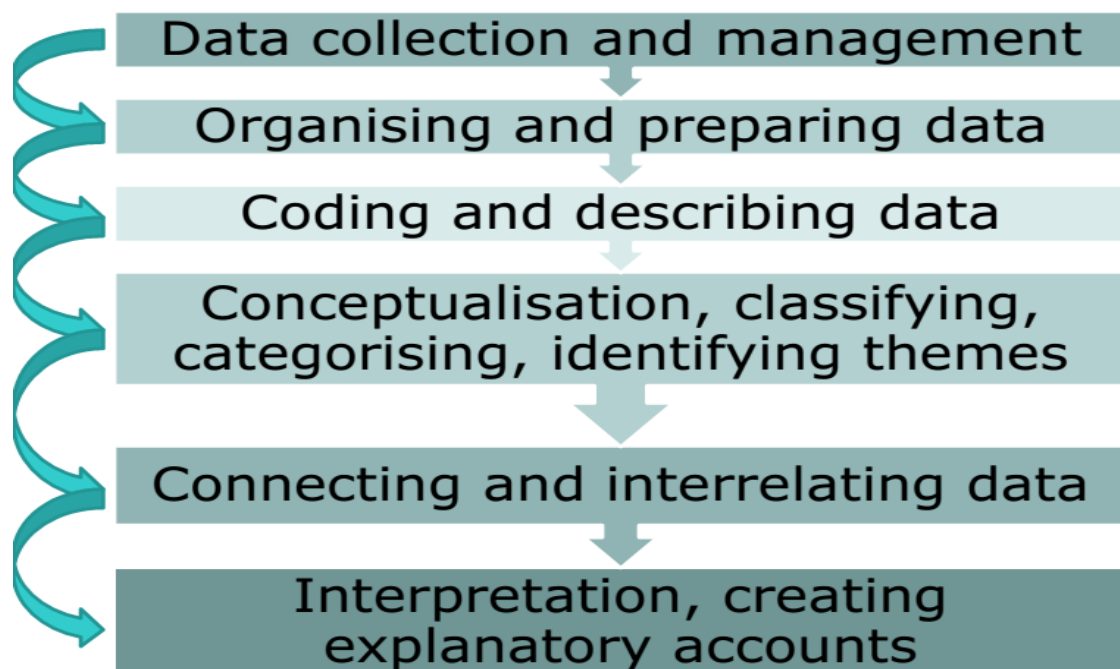


Figure 15: Qualitative data analysis (Creswell, 2009)

In this study, all interview questions are recorded and transcribed on Microsoft Word and the data is classified into different categories. Before elaborating into each question, the author identifies the framework and then sort out data as the framework. Using the framework at the beginning is helpful for descriptive analysis. The collected data from the interviews are grouped and assigned with the codes and sub-codes based on the key concepts and research questions. There are three types of codes including descriptive, interpretive and pattern codes. Descriptive codes illustrate information in general with a little bit help of interpretive codes whereas pattern codes require more explanatory and more contextual meaning for the data. The codes must come along with the theoretical concepts of the study and the research questions. (Miles & Huberman, 1994). The thesis is coding based on the model below (see Figure 16) (Creswell, 2009).

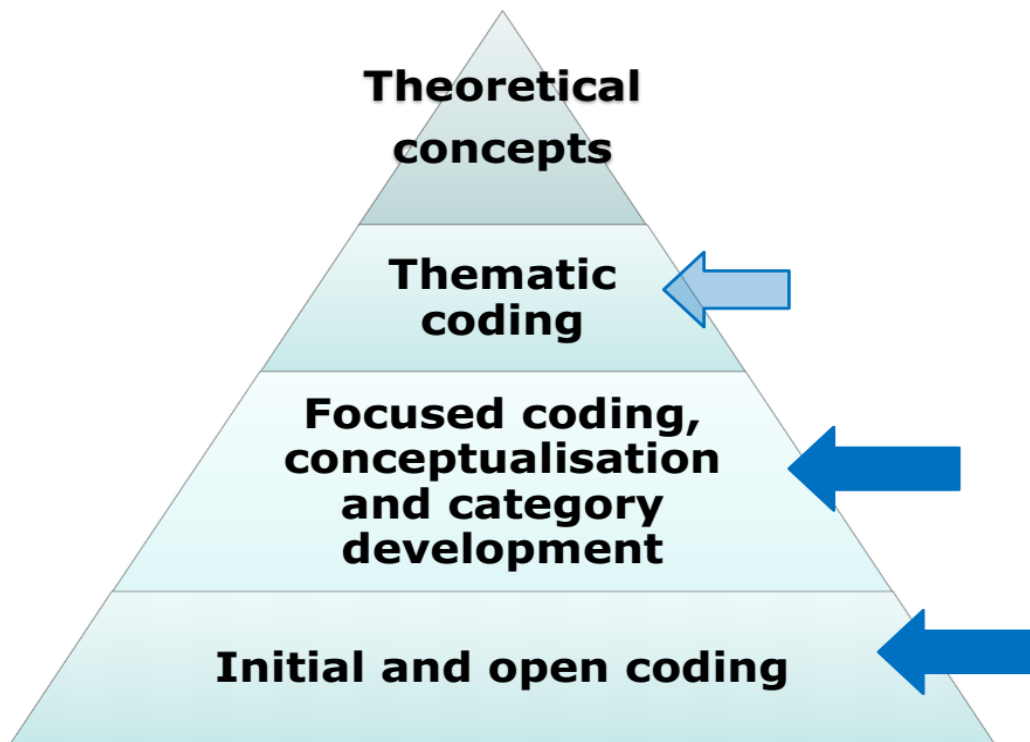


Figure 16: Retracted data analysis (Creswell, 2009)

More specifically, the data of this study is analyzed step by step based on the conceptual model below (see Figure 17).

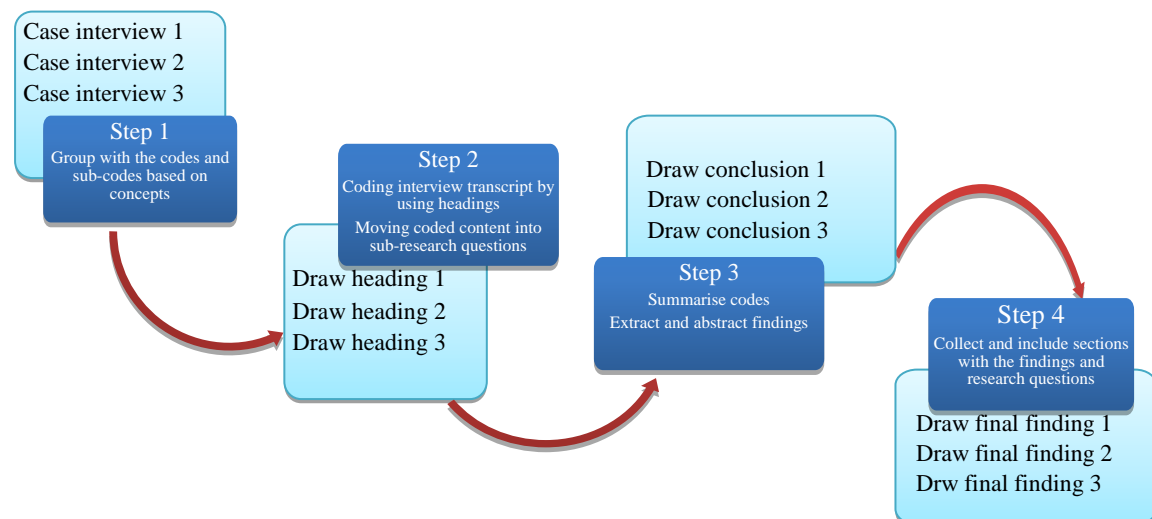


Figure 17: Data analysis steps (the author)

The author identifies different case study interviews to draw the findings. Firstly, the codes and sub-codes based on concepts and research questions are grouped. Secondly, the author uses heading to transcript the codes and move coded content into sub-research questions. Thirdly, those codes are summarized and the findings are extracted and abstracted. Finally, the findings are drawn by collecting sections with research questions.

4.4 Validity and Reliability

Validity and reliability play an essential role in researching because they give possibility to measure the study results accurately. These interconnected measurements can make readers reliant and also find the practical issues and a precise overview of the research. The study is unable to achieve internal validity without reliability, and higher internal validity can result to stronger reliability (Yin, 2009).

Both internal validity and external validity can shift the theory into the practices. Internal validity figure out an aspect where the results are appropriate with the reality. Hence, the more the internal validity is reached, the higher accurate conclusions and clear recommendation of the study can be achieved. For this study, the author uses mainly academic articles, journals to find the common attributes for notified data on the written protocol. External validity generalizes from a serious research to other people and organizations. It measures whether the findings of the specific research can be applied to other cases. For this thesis, the interview questions are supported and commented by academic supervisors at LUT, thus any redundancies and misunderstandings are limited. Additionally, the interviews are absolutely conducted in English; therefore, no language problems and misunderstanding of transferring into report exist.

Reliability is critical to measure the truth and value of data. Yin (2009) states that reliability enables to help a researcher to avoid the errors and biases. One best possibility to examine the reliability of one study is to implementing several studies with the similar results. In the thesis, the qualitative research method can be difficult to assess the reliability because of unanswered open- questions. Nevertheless, the

study has conducted a number of cases and case interviews. Results of the interviews do not vary from one to another much. Moreover, as mentioned above, the questions which are consulted by the supervisors and high reputed companies of Finland with detail information about the company and the interviews, can increase the reliability in this study

5. EMPIRICAL RESULTS

5.1 Case descriptions

The individual case studies which are gained throughout the in-depth interviews are briefly described here. Those case companies are typical and well-known in packaging sectors and their experts have shared their experiences during the conducted interviews. Some information is restricted due to limited time and confidential issues such as their clients and some detail strategies. Two interviewees desire not to be named in the research so the author respects to not mention all interviewees' names in this study. As mentioned earlier, three companies give me great contribution in helping me conduct the interviews. Three case companies are Finnish companies and two companies operate in Finland and one company is in Vietnam.

The first case company is Amersplast, a well-known manufacturer of high performance film, laminates and bags for food and non-food categories. It was founded in 1952 with 420 employees all around the world and was a leader in developing innovative packaging solution from the beginning. It is one of the biggest plastic packaging and bread bad manufacturers in Europe. It has been continuously developing in order to become the largest flexible packaging provider in packaging sector with the recent acquisition of Suominen's flexible packaging business. Its headquarters is located in Finland with two production plants in Finland and Poland, many operations in Nordic region, Germany and Russia. The flexible packaging solutions are offered to customers in over 20 countries. Amerplast's main products are hygiene and consumer tissues packaging, food and beverage packaging, and various types of bags for food and hygiene's. It ensures that its products are controlled under hygienic environment and met product safety all the way from production to delivery. Its R&D and production are comprehensively linked to its quality system. Importantly, Amerplast closely cooperate with its customers as well as supplier to provide optimal packaging solutions to meet customers' requirements. The author has

an in-depth interview with one expert of R&D and production departments. He shares his precious experiences and knowledge by answering opened interview questions through email.

The second case company is Stora Enso which was founded in 1998 by the acquisition between the Finnish company Enso and the Swedish company Stora. Its headquarter is situated in Finland and operations on all continents of the world with about 27000 employees. Stora Enso is predominant in producing pulp, paper, packaging boards and wood products. In this study, the author focuses only on the packaging division of the company. Stora Enso is considered as one of the leading manufactures of sustainable packaging board and solutions in the world. Due to its outstanding technology and experience, the company operates in a wide range of production chain from cutting forest to the end consumers. The company also has its own R&D department with large scale of work. The packaging division provides materials for packing and many packaging solutions by using renewable raw materials. The main products include food, beverage packaging, confectionary packaging, pharmaceutical packaging, elegance care, electronic packaging and graphical applications. Stora Enso has designers and packaging experts all around the world to figure out the best solutions for customers' products. The company pays much attention at paperboard with superb features such as durability, lightweight, flexibility and cost-effectiveness. Paperboard packages are ideal not only for information carrying and brand building but also for environmental issues. The author has a honor to make online interviews with a managing director of Formeca, one branch company of Stora Enso and receipting answered questions by HR manager who spent time to ask some experts in Stora Enso' s headquarter.

The last company who is willing to conduct the interview is Huhtamaki Vietnam, Ltd, one branch company of Huhtamaki Group in Finland. Huhtamaki Group fully started its packaging business in the 1960s in Finland. Its main product segments consist of food, drink packaging, personal care & household packaging, pet food packaging, medical packaging, tube laminates, labels and other specialties. The Group supplies to customers around the world and has many company branches in four continents. The company was established in Vietnam since 2004 specialized in flexible packaging for a series of goods such as seafood, coffee, tea, beverage, home personal care, ready meals, snack and other processing foods. The production plant in Vietnam also

masters in Tandem Extrusion, Blown Film, Adhesive Lamination, Shrink Sleeve and pouches. The key customers in Vietnam involve Nestle, P&G, Colgate, Unilever, Bayer, Ajinomoto, Vedan, Miwon, Vina-Acecook, Vinamilk, Trung Nguyen, GoldRoast. Moreover, the company also exports high quality flexible packaging in both roll and pouch forms to foreign markets such as the US, Australia, New Zealand, South Africa, ASEAN and so on. The company has packaging expertise and offers best-in-class solutions for customers. Remarkably, the company closely collaborates with customers to develop innovative packaging solutions to satisfy end-consumers. Thanks to supply chain director of Vietnam unit for spending precious time on answering the online interview regardless of time zone differences and businesses.

5.2 Findings

5.2.1 The importance of product features' analysis in packaging

Customers very often require specific demands based on single product's features and process design of suppliers. Therefore, elaborating and investigating in product's characteristics are very important in packaging sectors. Different kinds of products have their own physical elements and individual requirements on basis of packaged surfaces and preservation during distribution process. Goods may be durable goods or fragile goods or goods for single consumption. Investigating in specific demands of single products help packaging companies serve their needs satisfaction and figure out the optimal solutions for their whole supply chain.

According to the thinking and experiences of interviewed experts from three packaging companies, product features have a central affect on the materials, design process, production and innovation in packaging industry. In another word, product features decides the materials and design process, especially in case of building case packaging machines product features and production capacity are in deciding role in designing and machine designing. Packaging companies customize packages according to product's individual characteristics to contain, protect products and make them safe and easy to use. Their customers can cooperate with them to choose suitable packaging materials, sizes. Based on product characteristics, they can make design packages regarding to substance, density, weight, shapes and some additional features such as reclosability, perforation, durable and so on. Different types of

product features develop different solutions to efficiently support their customers. Innovation is created to improve functionality of individual products such as ease in use, thinner films, to develop more sustainable solutions. Big size packaging companies like StoraEnso and Amerplast have testing and measuring processes to make sure all chosen material, design and other standards are proper to product features.

Capacity, reliability and adjustability are in the first place of the customers demand on product characteristics. Change-over time, component specifications, complete documentation are also important elements in customers' requirements in detail. Normally, customers provides specific information about products in terms of drawings, material specification, product conditions so packaging companies enable to make deeper product analyses for designing packages or boxes and developing best solutions. Product development goes along with the client orders. Three interviewed companies have their own R&D department with high skilled personnel and expertise. They are also continuously developing their innovation process and getting more knowledge to be able to meet customer satisfaction and future expectations. New product development is usually driven by their R&D in our laboratory with the coordination of their customers. Their customers usually wish to affect in outcomes.

Packaging design can be seen as the process in which product characteristics are classified and considered. Packaging design has to contribute product manufacturability. Packaging design represents some main features such as materials, substances, dimensions and performance standards. On the other hand, the characteristics of the product, which are affecting the packaging design as well as the whole handling packaging system most, are the substance, the size, the weight, the dimension and other special characteristics such as sensitivity of the surface, contamination of the surface, sensitivity of the product, preservation conditions of the product, customer requirements and so forth. The category of various product features versus some specifications in packaging presenting different packaging companies are shown in the Table 4 below

Product features	Specifics
<ul style="list-style-type: none"> • Substance: rigid, liquid, food products, non-food categories • The weight: lightweight (<10 kg), medium-weight (>10kg and < 20kg), heavyweight (>20kg) • The size: small goods, medium-sized goods and large goods • The dimension: one or two directions, medium-sized in all dimensions (<30 degree) and large sized in all dimensions (>30 degree) • Other specific characteristics: sensitivity of product itself, sensitivity of surface, contamination of products, perseveration, standards, customer requirements 	<ul style="list-style-type: none"> • Variation of materials options for single products to protect, contain and preserve them • Distinguishing moderate and severe to very heavy products • Optimal adjustment of the structure of the control panel and frame surrounding products • Wide adjustment and competence to cover parts of different size and dimensions • High reliability combined with easy distribution and service in terms of tolerance, sterilization, long shelf life, moisture conditions and so on • Prevention of surface damage, deformation of the object during producing and distributing processes

Table 6: Product features vs. packaging design

With small and lightweight products or those products which require precise and skilled packaging, the human's cleverness is necessary in packaging processes. With the packaging of heavy and big-sized goods, packaging companies indeed need the help of robot and packaging machines to support their works and improves efficiencies and productivity. Moreover, in order to reduce the solution space, the packaged products are categorized according to different characteristics of products such as the weight, the size and other criteria. The different characteristics lead to

various demands on designs, materials, manufacturing and other logistics services. Hence, precisely understanding about product features is critical in packaging.

There is a close linkage between product features and packaging design with the influence on the supply chain. Figuring out the best material and solutions in packaging a product mainly bases on the product's physical characteristics. One example of choosing the most common packaging materials with the corresponding supply chain influences for fruit juice is shown in the Table 5 below

Product features	Packaging design with the impact on supply chain		
	Glass(Excellent protection, limitation oxidation, ≥ 12 month shelf life, good for health, environment)	Carton(Good protection, gas barriers, ≤ 12 month shelf life, easy recycle)	Plastics(Good protection, light, good oxygen barriers, recyclable, ≤ 12 month shelf life)
<ul style="list-style-type: none"> • Liquid extract of fruit • 1 liter format • High degree of clarity and viscosity • Physical-chemical characteristics (relative density, pH, refraction, sugar content) • Sensitivity to oxidation, light 	<ul style="list-style-type: none"> • Material meets all requirements → improve of quality, lifespan • It is heavy and fragile → limitation in distribution • Flexible for different type of base in bottles → improve in numbers of bottles per pallet • 100% recyclable → reduction of CO₂, saving materials 	<ul style="list-style-type: none"> • Material meets requirements but lower limitation of oxidation than glass • It is lighter and easier in forming shape for juice → improve in numbers of bottles per pallet, in distribution • Recyclable → reduction of CO₂, 80% of saving in volume of empty boxes in return 	<ul style="list-style-type: none"> • Material meets standard requirements but for some sensitive juice, its insufficient • It is also light, unbreakable → improve in format, palletizing and distribution • Recyclable → reduction of CO₂, saving materials.

Table 7: Examples of product feature on packaging materials with impact on supply chain

Each material has its own advantages and disadvantages and there are increasingly different choices of packaging formats and designs for single product. In order to make the optimal and most appropriate packaging solution, packaging companies must have not only deep knowledge of product characteristics but a comprehensive understanding of packaging system as well. Hence, they can calculate on different types of pallets, containers and other criteria to support for whole supply chain.

Additionally, product features as well as customer requirements vary from one customer to another among many companies so the information about products and customer needs must be updated all the time. Packaging companies usually use a web-based service to share and gain information with their customers and suppliers. For example, Amerplast has a web-based service called Amerplast Prepress Pro designed for their customers to manage and share their materials and data. It also includes detailed material requirements and instructions on how to produce an ideal design for flex printing. They offer their customers variety of ways to transfer their printing materials and other need. Their customers can send through Amerplast Prepress Pro or email. They have customer's own file management systems so it makes our communication more convenient and efficient. Beside, packaging companies often get information through frequent project meetings, client's factory specification and standards directly.

5.2.2 The vital role of collaboration in packaging

Packaging companies closely work with their customers during the current product development as well as the whole project. They all believe that collaboration in packaging is very important for them to survive and grow in the competitive environment. There are varieties of clients with different sectors those packaging companies are collaborating with. Biggest customers are in dairy, food, beverages, hygiene segments in general, in consumer goods and in furniture industry all over the world. A number of motives for collaboration are represented by the packaging companies in terms of profits, quality, performance improvement, and networks and

so on. For example, the collaboration helps Amerplast achieve its goals of becoming a leading pan-European packaging company.

The packaging process can vary from one company to another but they have some common standards in packaging process. For example, consumer goods with heavy weight and big size are arranged by the top to pallets or in cartons. The worker in the packaging system always directly access to the packaging and to the packaged product to prepare the pallets or boxes besides design teams. In this process, the safety of the workers must take into account and the utilization of packaging machines or robots is controlled individually. In Stora Enso Packaging Solution unit, they can offer a covering solution from box designing, packaging material deliveries to building and ramping-up the complete packaging line. All packaging processes are monitored and co-ordinated by both suppliers and customers in whom suppliers directly control the whole process and customer wish affect the outcomes. They both focus on testing and qualifying top quality of raw materials, product function as well as chemical conditions. They have inspectors for product development and also finished products.

All packaging companies prefer to have the long-term collaboration with their customers (more than three years). In their customers' perspectives, it is important for clients that sensitive process is maintained well and supported in near. Moreover, sensitive process should be available in new product implementations and in other deviations or errors. For suppliers, longer collaborative alliance brings some real advantages. In design, implementation and supply chain process, customers and suppliers work together for mutual benefits and the benefits of their end consumers, therefore, fruitful factors used come first and then knowledge is gained by all, trust is built and communication is boosted.

Firstly, collaboration helps both partners to acquire know-how and extensible knowledge beyond their own assets. All interviewed packaging companies reckon that they often share technology, personnel and logistics services with their partners. They believe that if both sharing and learning new things is a tight tie among collaborative partnerships, the true alliance relationship can be obtained. Secondly, long-term collaboration refers to mutual trust which means the potential risks and opportunism

is diminished. Both suppliers and customers are willing to openly discuss mutual objectives so the high degree of commitment and actions are brought to the collaboration. Finally, strong communication linkages are built, otherwise it is difficult for all partners to achieve the success and then all collaborative efforts can be collapsed. Communication and information sharing are improving with the increasing effectiveness of collaborative tools and software such as Web-based sites, Web conferencing, project sites and so on). All packaging companies admit that they can gain new technology, new design ideas and new management skills as well mostly from all long-term loyal customers. New technology is one of benefit they get in collaboration. For example, the collaboration of Amerplast with PerfoTec in Netherlands allows them to measure the respiration rates of fresh produce by calculating the required film permeability to enable salads, fruits and vegetables to achieve optimal respiration inside the packaging, therefore guaranteeing a longer life cycle. By their current collaboration, R&D, personnel are also getting more experiences, skills as well as motivation in co-developing best solutions to serve customers. Sometimes, their experts are exchanging and inspecting the production process and design process.

In addition, effort in building close and loyal collaboration, which provides a customer's business pros, may be applied into practice for other customers in the same sectors, consequently, leading to more opportunities for growth and expanded networks for the whole alliance. Once again, all suppliers and buyers think that closer relationship is more beneficial for better packaging and their end customers. Suppliers attempt to be so close to their clients' needs as much as possible, to put their proposals forwards as early as possible. In that way, they endeavor to influence in best total outcome taking into account all process parameters. Besides, suppliers sometimes collaborate with other suppliers of close and well-know clients to serve their clients better and gain effectiveness and efficiency. Furthermore, they also cooperate with transport companies and distributions companies to effectively transfer raw materials or components to packaging plants and deliver packaged goods to customers. Collaboration with transport service providers like transport and distribution companies allows suppliers to reduce total transport costs leading to lower packaged product costs for customers. Moreover, the packaging manufacturers

located in different regions with their customers or sub-suppliers so collaborating with other distribution companies can help both partners come across delivery problems and other administration issues. Some companies have their own optimal transport and distribution solutions in their current activities; they still cooperate with a group of companies specializing in deliveries and distributions. It is not only the matter of reduction of total cost but expanding their network and market share as well.

The case studies are used to identify the main roles and activities of each member within the collaboration in packaging sectors and to see how they coordinate to control the whole supply chain effectively and efficiently. A summary of activities and parameters regarding to the cooperation among customers, packaging producers and distributors in the process of packaging solutions is presented in Table 6 below

Customers	Packaging producers	Distributors
<ul style="list-style-type: none"> • Provide product information and features • Coordinate in packaging design and tests • Cost analysis: supply costs, packaging costs, distribution costs and inventory costs 	<ul style="list-style-type: none"> • Product analysis and tests in laboratory • Material design and design process • Primary packaging tests: size, weight, usability, labels, • Secondary packaging • Cost analysis: material costs, production costs, distribution costs, storage costs • Capacity evaluations and practical transportation tests 	<ul style="list-style-type: none"> • Truck load activities • Maximize the size of shipment or delivered cargo • Delivery time commitment • Distribution cost analysis • Environment care

Table 8: A summary of activities in the collaboration

The case studies are also used to investigate the impact of collaboration on packaged product process and development. The Figure 18 below plots in order of the degree of statement with the positive and negative influences of collaboration in packaging. For

example, all companies agree that collaboration allows them to shorten time and act more effectively in design process and R&D. This point is plotted in the one-fourth angle of the axis.

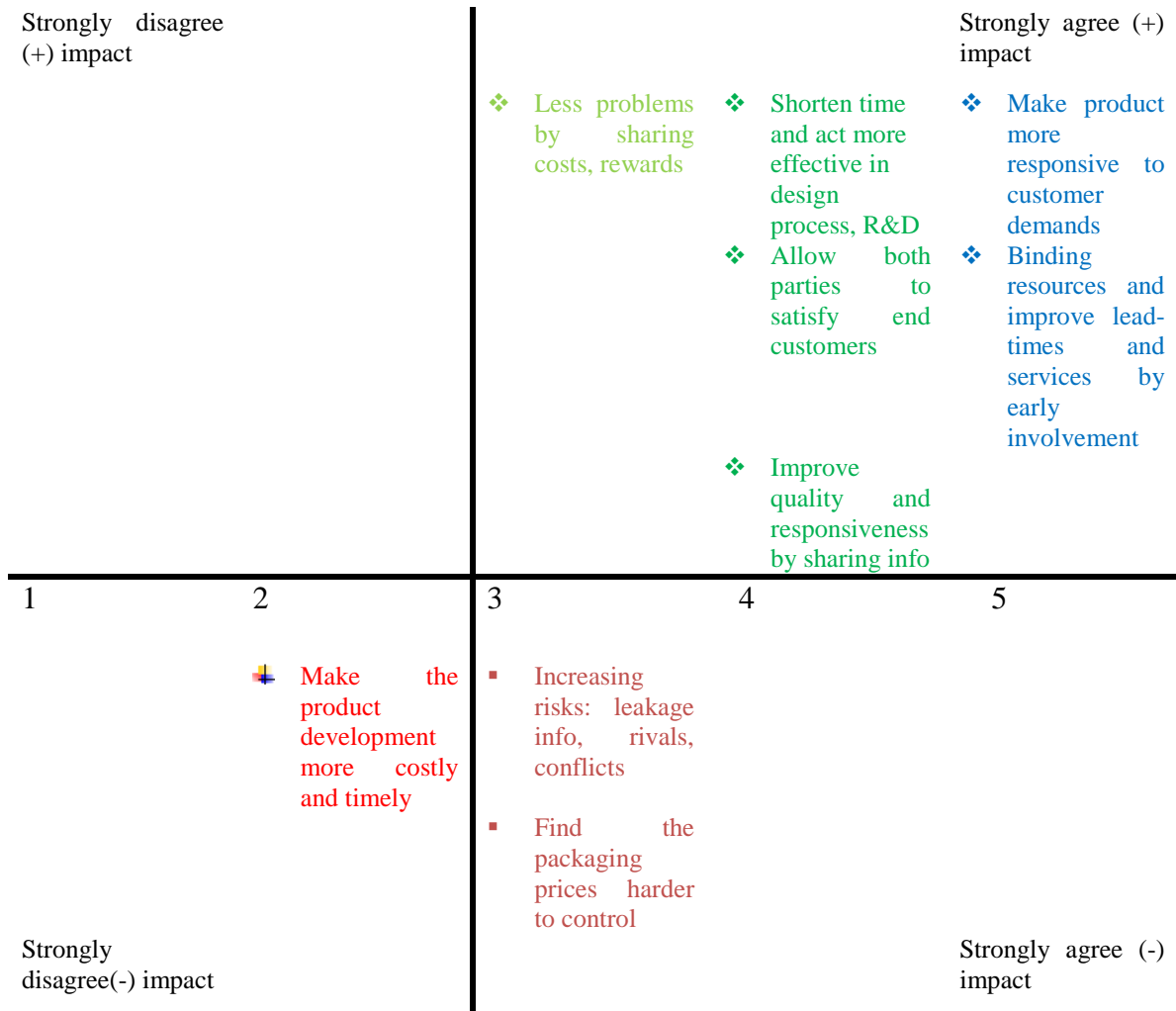


Figure 18: Degree of statements with the impact of collaboration (the author)

5.2.3 Identified key factors on collaboration

Collaboration will not occur if there is no cooperation and coordination between two parties, however, it is not only the story of alliance but also a number of elements affecting directly or indirectly in collaboration. Collaboration is never ever easily controlled due to its diversity and nature-based conflicts. Collaboration is considered as the two side sword. Effective collaboration can bring tremendous benefits to both

suppliers and customers, but it can also cost both a lot or even ruin the organizations if collaboration fails. Therefore, understanding key factors influencing to buyer-supplier collaboration is very critical in achieving the overall success of collaboration.

Through interviews, the author plots some identified key factors that packaging companies considers as the most important elements they must pay much attention to (see Figure 19). As can be seen in the figure, the degree of importance of each factor is calculated in five-point scale going along with the time of collaboration. For example, precisely understanding suppliers' capability and customers' objectives is concerned as the most important factor in collaboration and it appears at the early stage of collaboration.

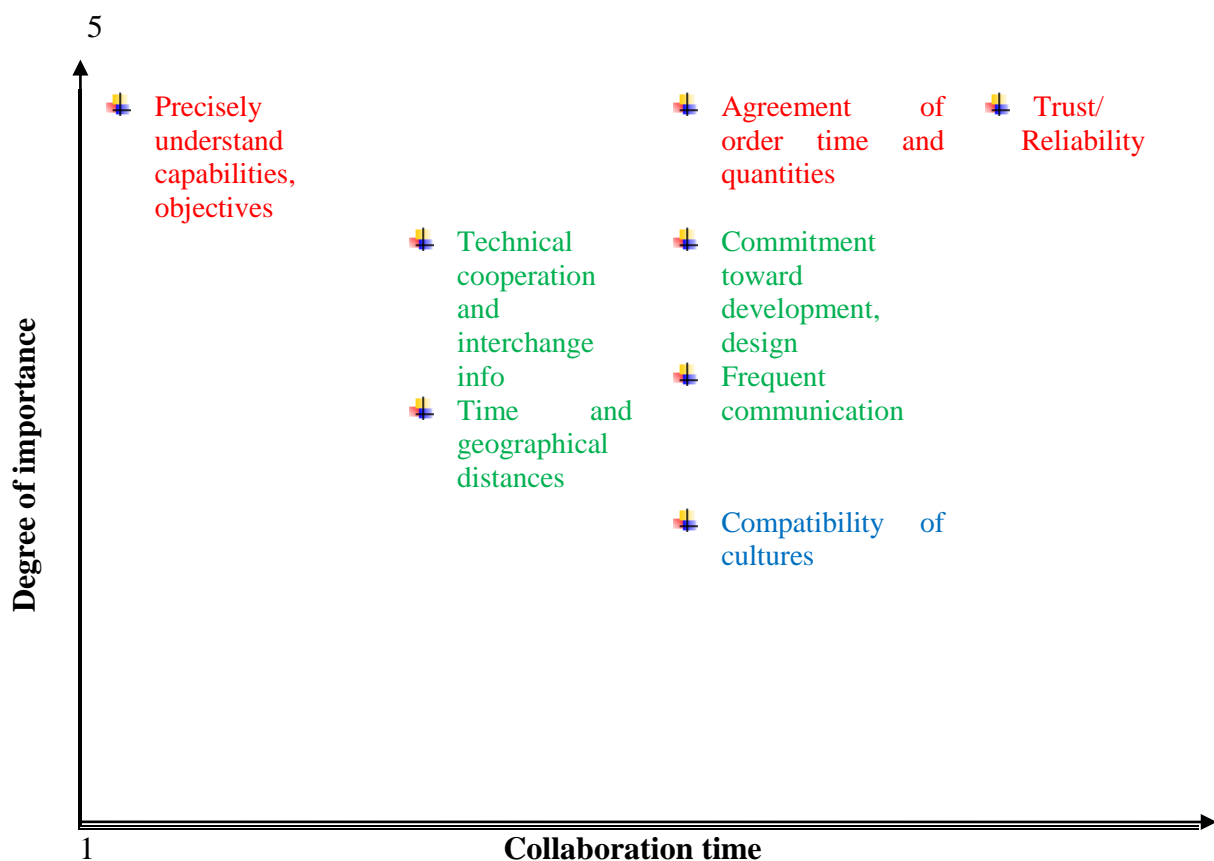


Figure 19: Degree of important factors on collaboration (the author)

Both suppliers and customers in packaging companies state that Trust/ Reliability play a very important role in deciding the success of collaboration. Mutual trust can bring a lot of benefits to all involved and with trust they are able to work with each other and deliver the same value to themselves and their end-customers without

pushing each other's business into risks. However, trust or reliability takes sometimes and refers to long-term loyal relationship. According to packaging producers, precise agreement of time order and quantity is also a key to build the relationship and maintain the loyalty. The approach of the size of order and when they want allow suppliers smooth out their volumes, increase supply chain visibility and reduce time and costs. Each customer has their own requirements and suppliers must meet those demands to make greater lead time and satisfy customers.

Commitment toward product development and product design and frequency communication are also significant to succeed in true collaboration. Commitment promises the mutual beneficial results for all involved. It is also seen to be the powerful tool in building the close relationship in the near future and create customer satisfaction and loyalty. The packaging recognizes the necessity for frequent communication to clearly understand the progress as well as to quickly react and handle occurring errors during the progress. By close keeping in touch with each other, they can solve the workload and obtain better outcomes.

Furthermore, technical cooperation and interchange information is important when suppliers and customers collaborate. Technology, which can be seen as the hero in packaging industry in reality, is however not comfortable with many companies due to differences in the way technology is used all over the world. It is undeniable to say that technology play an indispensable part in producing the vast amount of goods in short time but it is not easy to navigate, costly and risky to share. The information sharing is critical for effective collaboration and how to successfully build a system for interchange information is an issue many packaging companies have been solving. In addition, packaging companies take time and geographical distances with product natures into account. They believe that time and far distance can limit their offering and have a negative affect on their delivery times as well as the quality of product. They have to find the optimal solutions for delivery, storage and distribution based on time and geographical distances.

The culture has an significant impact on the business procedures and processes so all packaging companies must take culture into consideration before deciding the collaboration. Both suppliers and customers should concern and show respect to each

other to build the close and successful relationship. It is admitted to say that the compatibility of suppliers or customers' culture makes the collaboration easier to conduct and quicker to achieve the objectives. However, it is not so necessary to be compatible in cultures of suppliers and buyers, yet learning and respecting other cultures are critical for the successful collaboration. Speaking about the compatibility, packaging companies often pay much attention at the compatibility of the products themselves rather than the compatibility of the cultures. In reality, there are many incompatible issues and specifications which can hinder the collaboration.

6. CONCLUSION

Collaboration is not new, yet a difficult concept to grip in the business environment due to competition and risks. However, many companies find collaboration worthy seriously considering based on its great benefits. Collaboration is increasingly becoming the global nature of business that requires companies to optimize the effectiveness and efficiency of collaborative efforts to achieve the competitive advantage. Particularly, packaging industry also find that collaboration is one way in managing the packaging activities throughout the whole supply chain more effectively.

The main purpose of this study is to figure out some main concepts of collaboration especially in packaging sector and to inspect the importance of product physical characteristics on the way of collaboration in packaging companies. In the theoretical part, some basic framework of collaboration and buyer-supplier relationship including the scopes and levels of collaboration, collaboration processes, power and risks of collaboration and some key factors for effective collaboration are reviewed. With the increasing utilization of wide range products such as food, beverages, healthcare, cosmetics and other consumer's goods, packaging has significantly become an indispensable daily item. It is not surprising that packaging industry is broadly growing in the line with the global economy and the well-being of the packaging industry is closely related to the world economy in general. Remarkably, the rapid growths in packaging consumption in the emerging economies of Asia and also developed-economies of Eastern Europe have brought a lot of new opportunities for packaging suppliers. However, in parallel with the power and fast-growth of packaging usage, packaging companies have to deal with a number of fluctuation and risks in terms of raw materials, dependences of resources, competition and environment issues. Packaging suppliers have continuously attempted to investigate in R&D and technology to apply the best packaging materials to meet customer's demands. Furthermore, collaboration with their customers and other sub-suppliers in product development, R&D and other logistics services is one effective tool to create better packaging and gain effectiveness in the whole supply chain.

Product characteristics' analysis plays a very importance part in choosing the suitable materials, packaging design, packaging machinery and packaging logistics. Packaging products have been designed to be the part of the solution in the packaging sector. Packaging producers must categorize different characteristics of a single product and then customize packages to ensure that the package is able to contain, protect, preserve products and customers find it safe and easy to use. Moreover, base on individual characteristics of the product, packaging suppliers must enable to produce new shapes, use the most appropriate and economical materials, label in greater definition and deliver just-in-time to end-customers. In another word, packaging suppliers have to produce packages and packaging solutions from the most lightweight, safe and durable materials which are capable to not only meet the product' requirement but also the customers, end-consumers need.

Besides, packaging companies also need to contribute to protect the environment by choosing environmental-friendly and re-used or recycle materials since consumers particularly and the society at large really concern about the global warming issues recently. This can bring both advantages and disadvantages for packaging producers. It may encourage innovation of product development and facilitate initiatives that can reduce waste of new raw materials as well as unnecessary energy use in heavy metal processing packages for example. However, packaging companies may cope with issues of codes of conduct, reduction in packaging consumption. As this aspect is related forward environment and marketing strategy, thus this study does not pay much attention on it and the author may recommend for another further study. This thesis focuses on the importance of product characteristics on packaging design and packaging product developments in the collaborative relationship perspectives.

Regarding to innovation and product development, packaging suppliers have well developed collaboration with their customers and sub-suppliers, who are precisely understanding to the end consumers. The customers provide all product characteristics as well as their end-consumers requirements to packaging suppliers and they both cooperate and coordinate to delivery the best completed products to the markets. Practically, high-performance packaging has been created with special characteristics which can adapt to changes in pack requirements, expanding shelf life, support the environment and improve supply chain efficiencies. New developments in packaging

materials and designs are the big effort of R&D's suppliers and the cooperation of customers. The collaboration between suppliers and customers is also the relationship between the product development team and R&D departments. R&D is considered as one key indicators of the future growth for the packaging companies. The R&D's role is not only reply the quote from the suppliers on the packaging design, but it can also be an active collaborators in the development of new packaging product.

Besides the collaboration in technology, R&D among suppliers, customers and sub-suppliers, the collaboration in logistics services plays an important role in packaging industry particularly and many other industries as the whole. Logistics issues closely relate to production costs time delivery, transportation costs, inventory costs and customer services as well. If customers cannot find the optimal and profitable solutions for their logistics services, they will choose the closer packaging producers or centralize their production. Thus, suppliers from far distances will loose their chance to serve their customers and further negatively affect on their growth. Therefore, collaboration between suppliers and customers to find the best option for logistics services is very essential to establish the collaborative relationship in the barrier of geography. As analysis above, there is always trade-offs between production capacity, manufacturing, transport costs, inventory costs and other customer services. The main key to solve logistics issues is also based on the types of packaging regarding to flexible, paper, rigid, ect and the types of products such as food and beverage, cosmetics, healthcare products, ect.

All packaging companies wish to build a long-run collaboration with their customers due to undeniable benefits. However, maintaining and managing the collaboration effectively and successfully for a packaging business is complicated and it demands much effort from both sides. There are some key factors that packaging companies need to take into serious consideration such as trust, commitment to product development and process, frequency communication. Importantly, technology and R&D interchange is one great contribution for collaboration in packaging. In addition, some other factors such as time zone, geographical distance and cultures should be taken into account when the collaboration is made in different continents.

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APPENDIX 1

Interview questionnaire to Buyer and Supplier

Purpose: This survey is conducted for the academic study only.

Please answer the question based on the prevailing practices of your organization.

1. **General information** (Please give some background information of your company)
 - Company name:
 - Type of business:
 - Number of employees:
 - Position in market (market share/ yearly revenue):
2. **The Product (Supplier sides)**
 - What kind of product does you manufacture or package? Please describe dependency and complexity of main products.
 - Do customer demand specific requirements based on product features and process design?
 - How important do product features affect the materials, design process, packaging and innovation required by your customer in packaging industry?
 - How do you categorize the product features in packaging? Or what are the main features affecting your package design?
 - How detailed do the customers demand on product characteristics? (Drawings, material specification, techno...)
 - Do you have your own R&D department? How often your company develop new products? Is new product development driven by your R&D or customer?
 - Do you work with customer during the current product development? How often does production line change or update?
 - In what ways do you get information about customer needs? Do you share information technology with your customers?

- Can you give an example of product features affecting the packaging design development with the impact on supply chain?

3. The collaboration and Relationship (Supplier sides)

- How many customers do you have and what sectors do they present? and who are your main customers?
- What are motives for collaboration? Please describe a bit the process of packaging collaboration?
- How long does the collaboration last with customers? and why?

Long-term (more than 3 years) Short-term (Less than 3 years)

- Do you contribute on customer's new product development process, design process, dimension, and types of material, procedures...?
- Do you get feedback from your customers about compliments, shipments, detects? Does it work as you expected and then how you react?
- Do you collaborate on resources such as material resources, order systems, technology, personnel and logistics systems? Please describe the collaboration
- Do you know your customer's supply chain process? Do you also collaborate with other customers' suppliers?
- Is there any barrier make you ineffectively supply? Such as time limitation, distance, culture?
- Do you think closer relationship is more beneficial for better packaging? Why? Do you link your customer' needs with R&D department?
- What do you get from your current collaboration? Such as new technology, new design, new management skills?
- How is collaboration audited and affected by the changes of customer's product specification?
- The impact of collaboration on packaged product process and development. Please give a five-point scale (1= Strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly agree)

Shorten time and act more effective in design process, R&D	5	4	3	2	1
Make products more responsive to customer demands	5	4	3	2	1

Allow both buyers-suppliers to satisfy end-customers	5	4	3	2	1
Improve quality and responsiveness by sharing information	5	4	3	2	1
Binding buyer-supplier's resources and improve lead times and services by early involvement	5	4	3	2	1
Less problems by sharing costs and rewards	5	4	3	2	1
Increase risks: leakage of information, competitors, conflicts	5	4	3	2	1
Find the packaging process more difficult to control	5	4	3	2	1
Make the product development more costly and timely	5	4	3	2	1

- The important factors on buyer-supplier collaboration. Please give a five-point scale (1=Not important, 2= Fairly important, 3=Neutral, 4=Important, 5=Very important)

Trust/ Reliability	5	4	3	2	1
Commitment toward development, product design	5	4	3	2	1
Frequent communication in development, management	5	4	3	2	1
Technical cooperation and interchange information	5	4	3	2	1
Time and geographical distances with product natures	5	4	3	2	1
Compatibility of customer/supplier cultures	5	4	3	2	1
Agreement of order time and quantities	5	4	3	2	1
Precisely understand supplier's capabilities and objectives	5	4	3	2	1

Thank you for your contribution!

APPENDIX 2

Interview questionnaire to Buyer and Supplier

Purpose: This survey is conducted for the academic study only.

Please answer the question based on the prevailing practices of your organization.

4. **General information** (Please give some background information of your company)

- Company name:
- Type of business:
- Number of employees:
- Position in market (market share/ yearly revenue):

5. **The Product (Buyer sides)**

- What kind of product does you manufacture or package? Please describe dependency and complexity of main products.
- How important do product features affect the design process, innovation and required packaging for suppliers?
- Do you have your own R&D department? How often your company develop new products? Is new product development driven by your R&D or suppliers?
- Do you work with suppliers during the current product development? How often does production line change or update?
- In what ways do you get information about suppliers production lines? Do you share information technology with your suppliers?
- Can you give an example of successful or failed product package development project you have performed with one supplier?

6. **The collaboration and Relationship (Buyers sides)**

- How many suppliers do you have and what sectors do they present? and who are your main suppliers?
- What are motives for collaboration? Please describe a bit the process of packaging collaboration?

- What do you expect at the first collaboration with suppliers?
- How long does the collaboration last with suppliers? and why?
 Long-term (more than 3 years) Short-term (Less than 3 years)
- Do you contribute on supplier's design process, dimension, and types of material, procedures...?
- How often do you communicate with suppliers and in which way?
- Do you collaborate on resources such as material resources, order systems, technology, personnel and logistics systems? Please describe the collaboration
- Do you know your supplier's supply chain process? Do you also collaborate with other suppliers' suppliers?
- Is there any barrier make you ineffectively supply? Such as time limitation, distance, culture?
- Do you think closer relationship is more beneficial for better packaging? Why? Do you link your customer' technical capabilities with R&D department?
- What do you get from your current collaboration? Such as new technology, new design, new management skills?
- The impact of collaboration on packaged product process and development. Please give a five-point scale (1= Strongly disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly agree)

Shorten time and act more effective in design process, R&D	5	4	3	2	1
Make products more responsive to customer demands	5	4	3	2	1
Allow both buyers-suppliers to satisfy end-customers	5	4	3	2	1
Improve quality and responsiveness by sharing information	5	4	3	2	1
Binding buyer-supplier's resources and improve lead times and services by early involvement	5	4	3	2	1
Less problems by sharing costs and rewards	5	4	3	2	1
Increase risks: leakage of information, competitors, conflicts	5	4	3	2	1
Find the packaging process more difficult to control	5	4	3	2	1

Make the product development more costly and timely	5	4	3	2	1
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- The important factors on buyer-supplier collaboration. Please give a five-point scale (1=Not important, 2= Fairly important, 3=Neutral, 4=Important, 5=Very important)

Trust/ Reliability	5	4	3	2	1
Commitment toward development, product design	5	4	3	2	1
Frequent communication in development, management	5	4	3	2	1
Technical cooperation and interchange information	5	4	3	2	1
Time and geographical distances with product natures	5	4	3	2	1
Compatibility of customer/supplier cultures	5	4	3	2	1
Agreement of order time and quantities	5	4	3	2	1
Precisely understand supplier's capabilities and objectives	5	4	3	2	1

Thank you for your contribution