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Industrial Marketing

Master's thesis

Value creation in intelligent packaging value chains

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ABSTRACT

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The goal of this thesis is to look for and point out problems and bottlenecks related to value chains and networks in initiation and implementation of intelligent packaging. The research is based on interviews in different case companies and is qualitative by nature. The interview results are examined through a framework built upon relevant theory, with the aim to present a useful recommendation for a supplier company for advancing intelligent packaging business. The perspective that is attained through the research questions demonstrates the potential customer companies' views of possibilities and problems. The key results suggest that intellectual property of relevant products is in an important position from the customers' perspective. If the supplier does not own a product technology, a sufficiently large company can consider working as an integrator in a network where smaller companies make use of a compiled offering from other smaller actors. The foundation for these networks and company relationships is value creation, which has to be based on profound customer knowledge and research. The framework that is created for this study builds upon earlier research to provide a model that better serves intelligent packaging implementation and includes the notion of importance of value proposition and continuous value co-creation.

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Työn tavoitteena on etsiä ja osoittaa arvoketjuihin ja verkostoihin liittyviä ongelmia sekä pullonkauloja älypakkausten käyttöönotossa. Tutkimus perustuu haastatteluihin eri case-yrityksissä ja on luonteeltaan kvalitatiivinen. Haastatteluiden tuloksia tutkitaan oleellisen teorian pohjalta rakennetun viitekehysten kautta, jolla pyritään esittämään toimittajayritykselle hyödyllinen ehdotus älypakkausliiketoiminnan edistämiseksi. Tutkimuskysymysten kautta saatu näkökulma havainnollistaa potentiaalisten asiakkaiden näkemyksiä mahdollisuuksista ja ongelmista. Keskeiset tulokset esittävät, että immateriaalioikeus oleellisiin tuotteisiin on tärkeässä asemassa asiakkaiden näkökulmasta. Mikäli toimittajalla ei ole omaan teknologiaan perustuvaa tuotetta, riittävän suuri yritys voi harkita toimintaa integraattorina verkostossa, jossa pienemmät yritykset hyödyntävät sen yhteen tuomien yritysten koottua tarjoomaa. Pohjimmaisena tekijänä näissä verkostoissa ja yrityssuhteissa on arvonluonti, jonka on perustuttava perinpohjaiseen asiakastuntemukseen ja tutkimukseen. Työssä luotu viitekehys rakentaa aikaisemman tutkimuksen pohjalta älypakkausten implementointiin sopivamman mallin, joka sisältää huomion arvoehdotelman ja jatkuvan arvon yhteisluonnin tärkeydestä.

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TABLE OF CONTENTS

List of figures and tables.....	6
Abbreviations.....	7
1. Introduction.....	5
1.1. Defining intelligent packaging.....	5
1.2. Background.....	6
1.3. Goals and limitations.....	7
2. Applied theories.....	10
2.1. Value creation.....	10
2.2. Value assessment.....	14
2.3. Value propositions.....	19
2.4. Framework for analysis.....	21
3. Methodology.....	24
4. Value of intelligent packaging business.....	28
4.1. Public image of intelligent packaging.....	28
4.2. Supplier's perspective to implementation of intelligent packaging.....	29
4.2.1. General views of the current situation.....	29
4.2.2. Current strategy.....	30
4.2.3. Views from different chains.....	31
4.2.4. Acknowledged problems in implementing intelligent packaging.....	33
4.3. Customers' view on implementation of intelligent packaging.....	36
4.3.1. Knowledge about intelligent packaging.....	36

4.3.2.	Benefits	38
4.3.3.	Practical arrangements.....	41
4.3.4.	Challenges and obstacles	48
5.	Analysis: Implementation of intelligent packaging	52
5.1.	Drivers & barriers for intelligent packaging solutions in value chains.....	52
5.1.1.	Differences & similarities between supplier and customer perspectives about intelligent packaging solutions in value chains.....	52
5.1.2.	Drivers for intelligent packaging implementation.....	54
5.1.3.	Barriers & concerns about intelligent packaging implementation	56
5.2.	Strategies for implementing intelligent packaging solutions in value chains 57	
5.3.	Outcomes of implementing intelligent packaging solutions in value chains	62
6.	Summary and conclusions	66
	References.....	68

LIST OF FIGURES AND TABLES

Figure 1. Three strategies for customer value assessment.

Figure 2. Framework for analyzing the case interviews.

Figure 3. Phases of the research project.

Table 1. Alternative ways of conveying value to customers.

Table 2. Supplier interview information.

Table 3. Customer interview details.

Table 4. Obstacles with implementation

Table 5. Knowledge about intelligent packaging

Table 6. Co-creation

Table 7. Expectations

Table 8. IT solutions

Table 9. Structure of supply chains

Table 10. Convincing stakeholders in the networks

Table 11. Participating in development

Table 12. What would make intelligent packaging viable?

Table 13. Arranging co-creation

Table 14. Challenges

Table 15. Need for proof

Table 16. Observed findings.

ABBREVIATIONS

AIPIA	Active & Intelligent Packaging Industry Association
B2B	Business to business
IP	Intellectual property
FMCG	Fast moving consumer goods
NFC	Near field communication
OLED	Organic light-emitting diode
RFID	Radio frequency identification
ROI	Return on investment
UHF	Ultra high frequency

1. INTRODUCTION

The purpose of this section is to give an insight into the backgrounds and motivations of the thesis. Goals and limitations of the work are specified and justified in order to make delivery of content more efficient and focused. Also the methodology is described for providing clarity into the extent of practical sources of the research and what phases there have been in making this thesis. The role of academic literature and publicly available information on intelligent packaging is also portrayed. The thesis examines the position and applicability of intelligent packaging and networks surrounding it, in an established industrial B2B environment, in order to provide a useful portrayal of said business with possible paths for implementation.

1.1. Defining intelligent packaging

Intelligent packaging constitutes a component that can be added to a normal package, or be the whole package itself, that works as more advanced system, providing intelligence into the product through packaging. There are different types of intelligence in packaging, between which a separation needs to be made: Active and intelligent packaging are both quality improving solutions for packaging. Intelligent packaging consists of electronic components and solutions, which include logistics solutions such as RFID (radio frequency identification) tags like UHF (ultrahigh frequency) chips and NFC (near field communication) information stickers and other quality improving solutions like environmental sensors, lights and sound. Active packaging represents chemical solutions such as visible temperature, oxygen or pH indicators, gas scavengers and moisture absorbers, which are mostly used in food and other perishable product packaging (Realini C.E & Marcos B. 2014). The thesis will focus exclusively on intelligent packaging. All of the sensor based components can potentially be connected to an interface, database or an internet service where the involved packages can provide additional value to the supplier and their customers. This can occur for example as more accurate consumer purchase behavior data or by pointing out bottlenecks or inefficiencies within supply chains.

1.2. Background

Intelligent packaging is a developing, yet not widely refined industry which can potentially be implemented into any value chain that involves tangible products. My interest in both high technology and paper or packaging industry motivated me to seek out a way to research and improve said products' implementation. The wide implementation possibilities of intelligent packaging make their commercialization a managerially interesting topic. It is likely that intelligent packaging would be useful for most stakeholders in value networks and provide convenience to consumers alike.

Managerial importance of this work is based on the case that intelligent packaging is not prevalent in networks of multiple companies, but used by single companies as a goods-dominant way for enhancing their fully self-controlled value chain. While the benefits of intelligent packaging can be quantified from ROI calculations, efficiency metrics etc. and by examining logistics solutions in single company chains, the implementation of such solutions in larger scale has not been widely successful or even tested (Research specialist interview). This thesis is aiming to uncover reasons and justifications for withholding from large scale application of intelligent packaging and to find ways of implementing them better. The acquired data is observed and evaluated from the perspective of successful value assessment models and compared to the views of related stakeholders.

Current state of intelligent packaging solutions raises concerns for suppliers that are not owners of the technology, but would prefer to work as an integrator or a manager within their networks. The supplier interviews present the situation as uncertain, since there has not been a confident way of going forward in terms of who to contact and how. Instead of having a plan for reaching out to certain customers, intelligent packaging has merely been promoted in events and conventions until recently. The latest development has initiated customer contacting through back and forth visits for customers however (Research specialist interview).

Both value assessment and creation have gathered growing attention in the recent years and are researched actively. There are sound theories and models for value co-creation and assessing different types of perceived values, namely monetary and intangible assets. Why this topic is important in the case of intelligent packaging, is that value needs to be quantified and communicated to potential customers along value chains. Currently intelligent packaging is mostly used by companies that manage the whole supply chain and therefore do not need to convince other companies to use these offerings (Research specialist interview).

This thesis explores the methods or possibilities of value assessment in networks of several stakeholders. An important issue is that the sold products would change traditional functions within the supply chains and probably require change within the customer organizations. Therefore good reasoning is required in business transactions, which in turn necessitates properly gathered knowledge of customer needs. Effectiveness of this research is made possible by both supplier and customer interviews and comparisons between them and academic views of value creation.

1.3. Goals and limitations

The goal of this work is to pinpoint bottlenecks and obstacles in the implementation processes of intelligent packaging and discover possible solutions for their commercialization. The scope of interview data collection is limited to a supplier company and its potential and current customers and partners. Interviews are conducted from varying value chains and different sizes of companies, while literature examination involves value assessment models and considers value networks in general. The interviews are structured to discover the interviewee's perspectives on intelligent packaging and its relevance and prevalence in their field and company. Finally, their views and ideas on pilot project investments and value network structure are explored in order to determine the presence of key stakeholders along the value chain and possibilities of cooperation with them. This perspective can be expected to provide useful insight into certain business cases, but will unavoidably be based on a

number of subjective views. For the purpose of this work, intelligent packaging is defined as indicator, sensor, monitoring and interaction technologies that can be printed or added into packaging, as described by Danielli D., Gontard N., Spyropoulos D., van den Beuken E.Z., Tobback P. (2008). This is to separate the focus of this thesis from active packaging which is different technology in itself. It should also be noted that all of the involved interviews are done in Europe, so some caution should be had before generalizing the preferences of the interviewed parties to other market areas.

Three research questions can be derived from the focus of this thesis:

RQ1: Why have intelligent packaging solutions not been widely implemented in networks?

RQ2: Where is the perceivable value in intelligent packaging networks?

RQ3: How should intelligent packaging business be initiated in networks?

These questions require investigation of views from different sides of supply chains or networks, in terms of preferences and needs. While the questions focus on initiating business, a framework for continuous intelligent packaging operations is necessary for justifying the initial contact. The first question is crucial in order to understand the starting point and the dynamics between potential customers and the supplier. Second consideration is necessary in order to establish the points of focus for development of the said framework. Lastly, the managerial importance of this thesis is emphasized through finding a suggestion for future action in terms of value delivery to potential customers within intelligent packaging networks. This information is useful due to the data's basis on cases of relevant actors in a connected network of companies. Although such approach leads to fairly specific description and suggestions, the results should be generalizable within certain constraints.

The research presents its usefulness through first-hand accounts from people that interact in their respective networks on a daily basis and the results are adapted to the presented framework. The second and first questions are answered mainly through

interview analysis. Regardless of the specificity of the industry, common views and points of interest about business interactions can be found.

2. APPLIED THEORIES

This section opens the theories that make up the framework for analysis. As one of the main goals or benefits of intelligent packaging is the creation of additional value through specialized functionality, value creation is a central topic in this thesis. Therefore value assessment is also one of the main justifications for the conclusions, so it will have the most attention in this theory section. Partner selection is an important point of consideration, since there are major differences between different types of companies' views of value co-creation. Due to the wide span of intelligent packaging's effects over the whole supply chain, implementation for a single company would be difficult and therefore a wider, business network perspective needs to be used. Lastly the significance of loyalty consolidation in partnerships is worth discussing. These topics together make a basis for better understanding how value can be determined and what could be done in terms of future co-creation with customers.

2.1. Value creation

The concept of value creation should be introduced through solution business model by Storbacka (2012). Although the thesis builds upon a framework by Keränen J. and Jalkala A. (2014), going through Storbacka's model for solution business is useful, as it is a basis for the model of Keränen & Jalkala as well. It is useful to emphasize Storbacka's points that were not in the focus in the said framework.

Storbacka's study suggests that when reaching past conventional product sales, as is the case in the focus of this thesis, companies should focus on delivering more than mere ad-hoc solution. This should be achieved through both commercialization and industrialization. These two are further divided into components as displayed in figure 2.

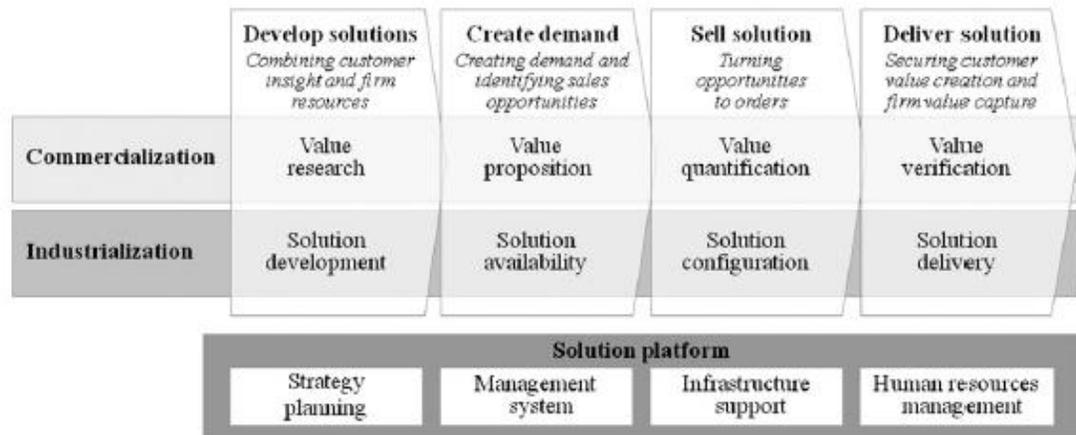


Figure 2. The solution business model framework. (Storbacka 2012 p.703)

The main idea behind this model is the simultaneous nature of both processes, which leads us back to the necessity of a functioning business organization (Storbacka K. 2012). The supplier case company of the thesis could be classified to the *develop solutions* phase of this model, and thus the produced information in this thesis can help the company to contemplate if demand exists and how to create it.

The commercialization process involves constant presence of value assessment, which has its functionality separated into four parts. This structure supports suggestions presented by Davies A, Brady T. and Hobday M. (2007), that also stress the importance of in-depth analysis of a customer's business. This analysis is expected to yield results that help in designing offerings based on perceived customers' problems and experiences from past interactions.

Kotler P., Keller K.L., Brady M., Goodman M. and Hansen T. (2009) (p.409) present a list of key steps in the co-creation process:

1. Define clear objectives for the project.
2. Discover who are the right customers to involve in the process.
3. Work with customers to discover what they really want to include in a marketing offering.
4. Design market offerings-systems jointly to meet those customers' needs. This includes selecting the partners to be included in a company's network.
5. Decide how to share the customer-perceived value.
6. Overcome internal resistance to change - with seller, buyer and partner organisations.

Several of these models highlight importance of working together with the customers, which leads to numerous contacts over different customer relationships. Therefore a short description of networks is in order. Håkansson H. and Ford D. (2002) provide a clear explanation for the concept of networks: They consist of nodes with their own specific capacities and are connected to each other with threads of relationships. These nodes are business units of different types of companies, which have come together to form a "quasi-organization" which should benefit each through the members' unique resources and capabilities. Håkansson & Ford also discuss a factor that plays into the significance of partner selection. The aforementioned threads eventually pose limitations, as the business relationships strengthen over time through investment and collaboration. The strength of these bonds restricts the flexibility of the involved companies. Due to the long term nature of life-cycle business partnerships and potential lock-in, mitigating the negative effects of these limitations would be eased by carefully selecting the right partners. (Håkansson & Ford 2002 p.133)

Creating value in industrial setting is examined by Pekkarinen O., Piironen M. and Salminen R.T. (2012) who present a BOOT-model that describes transformation to solution business and value creation on a global scale, which would give insight into

what arranging intelligent packaging operations with multinational customers could entail. It is also a useful insight of larger scale operations after when the initial operations have been consolidated. Although the focus of this thesis is on commercializing intelligent packaging in value networks, it is worth mentioning how a successful network could develop further.

BOOT represents build-own-operate-transfer which describes a business model that tasks companies with the responsibility to fully manage an entity, such as an industrial process, which will be part of a larger network of companies in a similar position. In the center of this network, a company works as an integrator which manages the different components of this consortium. Benefit of this system is that a single company only has to take care of their designated tasks while other partners are focusing on the rest of the required operations. Such setting is brought to use as a consequence of resource shortage where companies prefer to focus on their core competencies while customers demand more complete solutions. A question also arises: Who will own the equipment/installation, if the customers cannot afford to own them. Options may also be loaning or leasing, which then requires close cooperation. (Pekkarinen et al. 2012)

When examining long term value creation such as described by Pekkarinen et al. (2012), loyalty becomes an important topic. Kotler et al. (2009) elaborate the dimensions of customer and supplier loyalty. They suggest that loyalty is a two way street, so rather than asking *“How can we radically increase customer loyalty?”* the supplier should ask *“How can we radically increase our own loyalty to customers?”* (Kotler et al. 2009 p.387). A reason to make customer loyalty a part of an organization’s attention is the stability that can be achieved through mutual respect and security of cooperation. This is especially important when there are only a few customers on the market, as would be the case in the cigarette packaging and pharmaceutical segments for example.

After considering the market settings with several small actors and a few large ones, the significance of networked product development perspective should be highlighted. In intelligent packaging solutions, understanding supplier's own company is just one part of numerous points of consideration. Customers', component, software and material suppliers' and sales and logistics companies' situations need to be appreciated so that all of the actors can implement and develop intelligent packaging together. Company interviews will deliver a description of whether these different actors advance or obstruct the implementation. Davis J.M., Keys L.K., Petersen P.L. & Chen I.J (2004) and Browning T.R. & Ramasesh R.V. (2007) have examined this setting from different industries and concluded that collaborative product development is necessary in the current business environment. Their justification for this is the use of cross-disciplinary expertise that can be accessed in a functioning business network (Davis et al. 2004; Browning & Ramasesh 2007).

2.2. Value assessment

Value assessment is generally divided into two areas. The more traditional way of looking at value is through monetary metrics. Recent literature has increasingly emphasized intangible values which should be taken into account when creating customer relations. These assets include shared skills, knowledge and improved reputation. (Keränen & Jalkala 2014)

Uлага W. (p.678) (2003) recognizes that general understanding of value is varied and product centered:

“Most research on customer value adopts a transactional approach focusing on product-related issues, neglecting relational dimensions of customer-perceived value.”

This thesis considers value assessment as a continuous process where value is expected to be created over the use of supplier's products and services in the case of intelligent

packaging solutions, unless explicitly mentioned otherwise. Such perspective suits the examination of intangible value assets and their creation over time (Kraaijenbrink 2011). This outline does not exclude translation of value from intangible assets to monetary metrics, since ultimately business relationships are about creating revenue. To support this perspective, a model for the analysis will be necessary.

Three strategies for customer value assessment in business markets by Joonas Keränen and Anne Jalkala (2014) presents a model of best practice companies' strategies being used for value assessment in customer relationships. Keränen and Jalkala present the traditional value assessment of customer satisfaction and performance through calculators or metrics, and argue that they have at least three significant drawbacks. The focus on physical products, their singular use in time and the tactical scope in business relationships are the voiced problems. These drawbacks pose a lack of long term value-in-use assessment and therefore can lead to the inefficient use of the available knowledge for the supplier. (Keränen & Jalkala 2014)

Findings by Keränen and Jalkala illustrate a model of three different strategies for value assessment. The first of these is *emergent value sales strategy*, in which value is not a constantly followed metric depicting business success, but wholly managed by sales and used for occasional evaluation for sales and marketing purposes for example. It is likely that the learning from these interactions with customers may stay at the sales people and will not be utilized any further in the rest of the company. (Keränen & Jalkala 2014)

The second approach is *life-cycle value management strategy* which involves a larger part of the supplier organization. These parties are sales, delivery and service. Focus of the sales department is on value potential identification while delivery and service both can conduct baseline assessment. Finally the service department should take responsibility of long-term value realization. Another major difference to the emergent value sales strategy is data management. When the project is handed from a department

to another, it is vital that all the necessary information is transferred and the process does not stop. Therefore there is a need for consistent data management. This strategy is the only one where studied companies had implemented an incentive system to promote data management. (Keränen & Jalkala 2014)

In addition to the aforementioned strategies, Keränen and Jalkala suggest a *dedicated value specialist strategy* where a specific organization or a group of specialists is appointed for managing customer value operations. The involved responsibility of specifically managing value operations also makes additional monetary incentivizing less necessary, as data management is a duty instead of extra work. Figure 1 presents this model's depicted strategies and their responsible units over time.

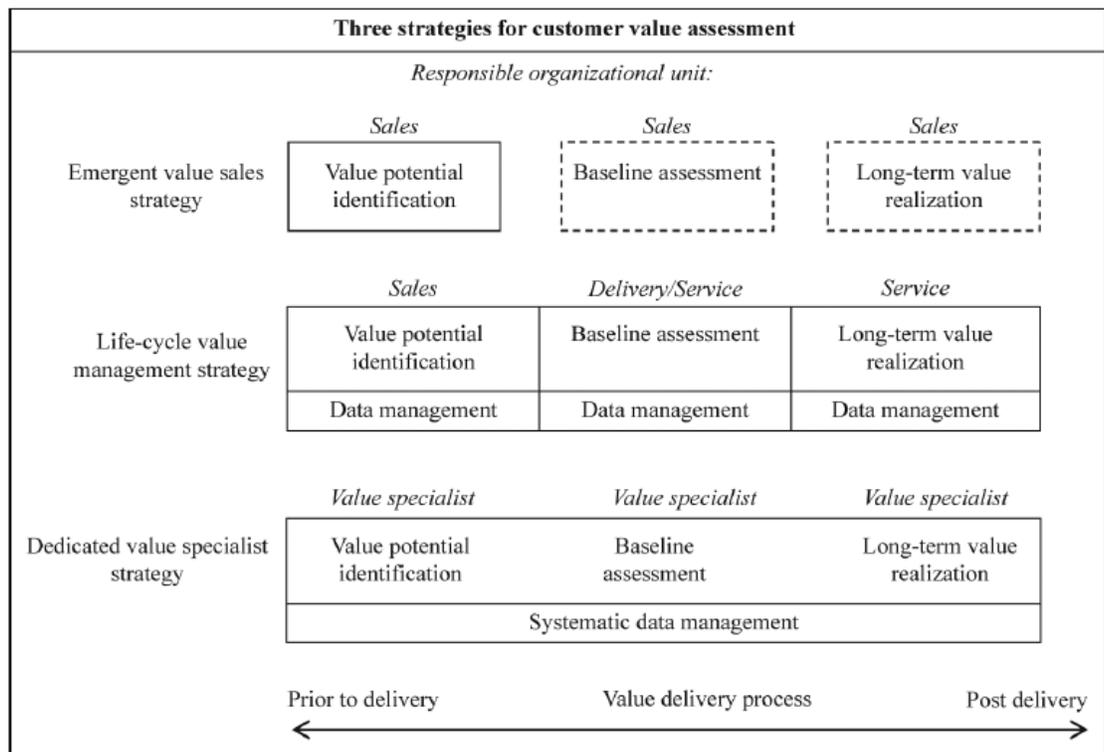


Figure 1. Three strategies for customer value assessment (Keränen & Jalkala 2014, p .87)

The underlying resource to this organizational structure is its systematic data management. This enables customization of the offering as it is possible to use modules of previous customer interactions for new business cases, including old relationships to initially introduce intelligent packaging as an extension of old offerings. As Keränen and Jalkala present (p. 94):

“The dedicated value specialist strategy is particularly suitable for customized offerings in markets where the customers’ purchase process is non-routine, complex and characterized with high need and market uncertainty.”

Such system could be expected to provide long term efficiency benefits as well, since customer value can have different meanings to different customers. Perception of value can even change over time. The model involves a consideration of this changing perception (Keränen & Jalkala 2014 p.94):

“To develop more sophisticated value assessment strategies, firms need to become aware of the variety of meanings that customers attach to value propositions. Value assessment requires the combination of “hard” and “soft” approaches.”

Successfully evaluating other than accounting-based values would require combination of subjective data from several different customers. This in turn would demand proper designated group of people for collecting and analyzing the data. Baseline assessment is an integral part of realizing and analyzing customer value, as there needs to be information about current and previous performance if the future effects of business interactions are to be evaluated. (Keränen & Jalkala 2014)

If the supplier intends to provide solutions which include both product and service offerings, there needs to be constant analysis of perceived customer value. Continuous evaluation in all parts of the value creation process should produce deep understanding of the customers’ operations in the long run, which in turn improves the possibilities

of providing unique value to the customer. Eggert A, Ulaga W. and Schultz F. (2006) (p.25) support this notion as their research suggests:

“Offering superior value through personal interaction and service, access to know-how, and increased time-to-market, appear as promising avenues for differentiation in today’s highly competitive business markets.”

These aspects are also found to show more variance over the life-cycle of the relationship, which calls for continuous customer research by the supplier. Eggert et al. (2006) also propose that companies should work with their customers through a proactive attitude in order to meet their needs with as little dissatisfaction as possible. A point to add to this is a well thought out value proposition. (Eggert et al. 2006)

While the transactional value of an offering is an important aspect of value assessment, Corsaro D. & Snehota I. (2010) suggest that relation specific value is becoming increasingly important in business marketing. This relevance is accompanied with two questions (Corsaro & Snehota 2010 p.2): “What makes business relationships valuable? and How can the value of a relationship be assessed?” Their study found that views of value are especially subjective. The main reasons for this subjectivity are the limitations set by available resources and the relativity of priorities between interacting companies. We should understand that the number of value dimensions in an intercompany relationship is so large that there will unavoidably be simplification which may lead to lack of depth in value analysis. Such limitation leads to the need of constant relationship analysis and research instead of finding the right approach just once and settling to it. (Corsaro & Snehota 2010)

Uncertainty in value creation is not a detriment however. The relativity and context dependency provide a chance for case specific pricing instead of static or quantity based cost management, provided enough research is conducted to justify this offering. Corsaro & Snehota (2010) also emphasize the significance of change in value

perception, which in turn causes evolution within a business relationship. This evolution is yet another justification for ongoing evaluation.

When the fundamentals of value creation in intelligent packaging industry are understood, the most important points of interest can be compiled for simple reference. For a company that is planning provide intelligent packaging solutions, information or data management, customer understanding, relationship cultivation, definition of value offerings and their own capabilities and limitations need to be addressed and defined. This need leads to the topic of value propositions which should be the starting point of customer interaction.

2.3. Value propositions

When initiating contact with a customer, an awareness of their unique requirements should be achieved. Anderson J.C., Narus J.A. and van Rossum W. (2006) suggest that being able to start with a proper value proposition persuades the potential customer to listen to what the entire sales pitch has to offer. As costs are a persistent worry for businesses, a clear and understandable case has to be presented for the benefits of selecting the supplier over their competitors. (Anderson et al. 2006)

In the case of intelligent packaging, the obstacles are not presented just by competition, but other issues such as already established practices within customer companies, competing solutions like QR-codes and a general unawareness about intelligent packaging. This needs to be counteracted with the right approach. Table 1 depicts alternative ways of conveying value to customers by dividing value propositions into three types (Anderson et al. 2006 p.5).

Table 1. Alternative ways of conveying value to customers (Anderson et al. 2006 p.5).

VALUE PROPOSITION:	ALL BENEFITS	FAVORABLE POINTS OF DIFFERENCE	RESONATING FOCUS
Consists of:	All benefits customers receive from a market offering	All favorable points of difference a market offering has relative to the next best alternative	The one or two points of difference (and, perhaps, a point of parity) whose improvement will deliver the greatest value to the customer for the foreseeable future
Answers the customer question:	“Why should our firm purchase your offering?”	“Why should our firm purchase your offering instead of your competitor’s?”	“What is <i>most</i> worthwhile for our firm to keep in mind about your offering?”
Requires:	Knowledge of own market offering	Knowledge of own market offering and next best alternative	Knowledge of how own market offering delivers superior value to customers, compared with next best alternative
Has the potential pitfall:	Benefit assertion	Value presumption	Requires customer value research

In addition to classifying value propositions, Anderson et al. (2006) present three building blocks of a successful customer value proposition: Points of parity, points of difference and points of contention. Simply put, *parity* covers the similarities of the competing offerings, *differences* consider both superiorities and inferiorities of said offerings while *contention* refers to disagreements between customer’s and supplier’s understanding of comparison to the next best alternative. (Anderson et al. 2006 p.6)

Being able to construct a competent value proposition based on the aforementioned building blocks benefits a lot from systematic data management. The importance of research for future and recording of ongoing and past customer interactions cannot be downplayed as accurate information of customer savings and benefits needs to be

available. The research also observed that a proper value assessment model promoted innovation when the value propositions were quantifiable (Anderson et al. 2006).

The most important note for value propositions in this case is that effective delivery requires knowledge, which in turn necessitates more than just knowing one's own offerings. Insight into the customers' motivations and current needs is imperative for producing a satisfying and worthwhile value proposition.

2.4. Framework for analysis

Using these theories we can explore views of the different sides of the value network and evaluate the companies' roles and possibilities within it. By examining opinions from both the potential customers and the supplier's side will help pointing out differences and similarities in views through these theories, which in turn depict the reality of the selected cases. Being able to discern the gaps between customers' and supplier's needs and wants should enhance the image of the current status of intelligent packaging markets.

All in all, current academic research provides a basis which suggests that when attempting to commercialize an offering that includes a complicated product or a variety of products and service components, a network approach would be beneficial. Through applying the strategy model by Keränen and Jalkala (2014), a framework for implementing intelligent packaging can be devised. Components of this framework are focused on relationships and value creation within networks. As presented by this strategy model, a major factor for a functional network in the long run, is profound and systematic data management. A company that works as an integrator in a solution business network requires tools for managing customer information and making use of this data in later interactions. When a system for managing the information about successes and failures through customer interaction is in use, learning through past business cases would be enabled.

The most important use of the collected data is the possibility to provide solutions to new and existing customers. The understanding that can be derived from systematically formulated data should prove as one of the key resources in providing intelligent packaging solutions all the way from the first interaction. This function would also serve both the sales force and underlying organizational structures as well, since realized customer benefits could be used for internal training purposes in addition to marketing and developing new solutions for customers. Analysis of customer retention and reasons for failure should be readily available and utilized for further improvement.

As intelligent packaging generally consists of infrastructure-heavy products, this support system development is necessary for effective management. A robust support for both managing the surrounding supply network and customer contacts is something to be cherished. Selecting the right partner for initial commercialization is important for long term development, as customer loyalty can save a lot of time and resources. When understanding the limitations and strengths of both parties in a relationship is merely a point of discussion instead of causing friction, common and shared development becomes easier. For example in uncertainty through power disparity should be alleviated through loyalty and understanding. These factors can be considered as part of the drivers leading to strategy formulation.

In close and long term relationships, it should be possible to utilize continuous value assessment in the way presented by Keränen & Jalkala (2014) and Storbacka (2012) which would both improve customer relationship and profitability of the overall network. A baseline analysis built upon the drivers is a necessary part of this analysis, right before the initial contact and over the length of the relationship. After establishing the baseline, effective value propositions can be brought to the customer which can lead to value co-creation in time. Having a specialized organization for managing these operations would make it easier as there would not be a need for separate information transfer between different units within the supplier's organization. Through understanding these requirements for business relationship management and active

value co-creation, a framework for assessing perceptions and opinions of the interviewees can be constructed.

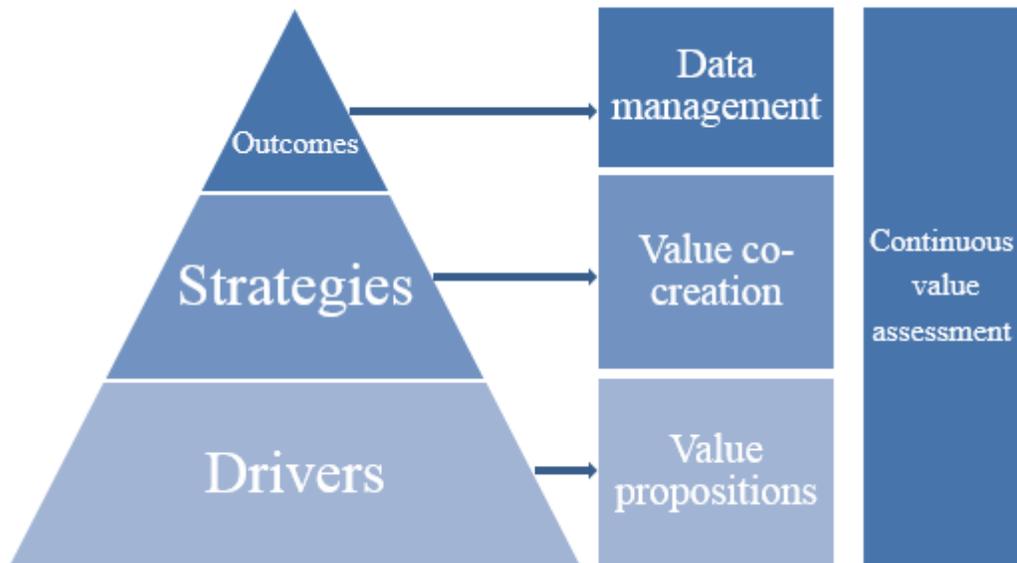


Figure 2. Framework for analyzing the case interviews.

When the data management and value assessment are consistent within the integrator company in a network, their personnel should be able to construct personalized value offerings to new and existing customers faster and more reliably. This effect would initially lead to efficient value propositions and to fruitful value co-creation in the long run. For the purpose of this thesis, the framework will be used to categorize the results from the interviews in order to understand drivers and barriers for implementation of intelligent packaging.

3. METHODOLOGY

The research method of this work is qualitative and mainly focused on case based interviews from companies that could benefit from intelligent packaging along different value chains. The basis of these interviews is founded on publicly available data of intelligent packaging and academic literature of value based business. An initial framework for handling the interview results was based on the strategy model by Keränen & Jalkala (2014), which was used in tandem with other literature to produce the analysis framework as depicted in figure 2.

Choosing personal interviews as the main source of case data for the thesis is natural, as the number of possible answers to prevailing questions is huge, and every company has their own motivations for particular actions. Being able to be in personal contact with the interviewee enables the possibility of directing the data collection during the interview itself and therefore increases the accuracy and collection of relevant information. The low number of interviews presents the problem of statistical unreliability however, which could have been alleviated with a questionnaire addition by sending a list of opinion questions to more companies than the ones interviewed. A questionnaire would have increased the sample size well above the six companies, but the personal interviews made it possible to collect subjective views and personal experiences which are invaluable for this thesis. (Hirsjärvi, S., Remes, P. & Sajavaara, P., 2009. pp.204-205)

Initial interviews were conducted at different departments of a forest industry company, to form an image of the supplier's perspective. On the supplier side, grocery, tobacco, pharmaceutical and cardboard packaging value chains are examined along with interviews of key people from the general intelligent packaging research and development operations.

Due to the interviews being personal, it is possible that some potential customer companies have declined the interview under the fear of not being able to stay

anonymous (Frankfort-Nachmias, C. & Nachmias D., 1996). Several did indeed claim that they do not give interviews to people outside their own organization. In order to mitigate this, the interviewed companies were selected from varied industries, instead of just focusing on ones that were expected to yield immediate benefit through intelligent packaging business opportunities.

While several companies are examined, the supplier is in the focus as the case company. This study focuses on providing answers to prevailing questions on the specific area of industry. The case company is a globally operating forest industry company with a revenue around 10 billion euros and staff of over 20000. Their business areas are different types of papers as well as packaging and wood products. Also development in the recent years has steered the company towards focusing their efforts on specific, narrower areas and into innovating, as indicated by intelligent packaging operations as well.

The purpose of these interviews is to help establishing an image of the supplier's views on intelligent packaging business and to compare it with the current public view. These interviews are then analyzed and used to help focus on the relevant questions in customer and partner interviews. This data is subsequently used for finding trends, problems and opportunities in application and commercialization of intelligent packaging. The resulting information provides a foundation for combining academic knowledge with the discovered results from the conducted interviews. The interviews were semi-structured from a general list of questions which was then personally modified to better collect information from specific people, based on their expertise. Some questions were adapted based on previous answers over the interviews, in order to extract more profound data.

The interviews were conducted either in English (#3, #5, #7, #8, #9, #11, #12,) or Finnish (#1, #2, #4, #6, #10). Quoted parts were self-translated from Finnish to English. Of the English interviewees, #7 is from United Kingdom, #8 from Germany, #9 from

Belgium, #11 from Germany, #12 from United Kingdom, #3 from Sweden and #5 from Germany as well. The different environments present a curious case as non-Finnish interviewees were generally more welcoming towards ideas of close co-operation while the Finnish were more reserved and presented needs for more consideration. Tables 1. and 2. Provide details about the interviewed participants.

Table 2. Supplier interview information.

No.	Industry	Segment	Participant	Date
1.	Fine paper, printing paper, carton board, wood products		Senior manager	11.6.2015
2.		Cigarette packaging	Segment development manager	22.6.2015
3.		Cartonboard	Segment sales director	2.7.2015
4.			Research Specialist	3.8.2015
5.		Pharmaceutical	Segment development manager	25.8.2015
6.			Sales & marketing director	26.8.2015

Table 3. Customer interview details.

No.	Company	Industry	Turnover bn €	Role	Date
7.	A	Fast moving consumer goods	10 - 15	Global packaging director	23.9.2015
8.	B	Fast moving consumer goods	5 - 7	Global procurement manager	15.10.2015
9.	C	Specialty chocolates	0,5 - 1	Group manager	6.10.2015
10.	D	Power and automation	30 - 35	Team leader	18.10.2015
11.	E	Snacks, food and chocolates	35	Senior principal scientist	2.11.2015
12.					9.11.2015

The entire process can be seen from figure 3. A continuing analysis of interview results and a periodic literature examination were conducted throughout the project.

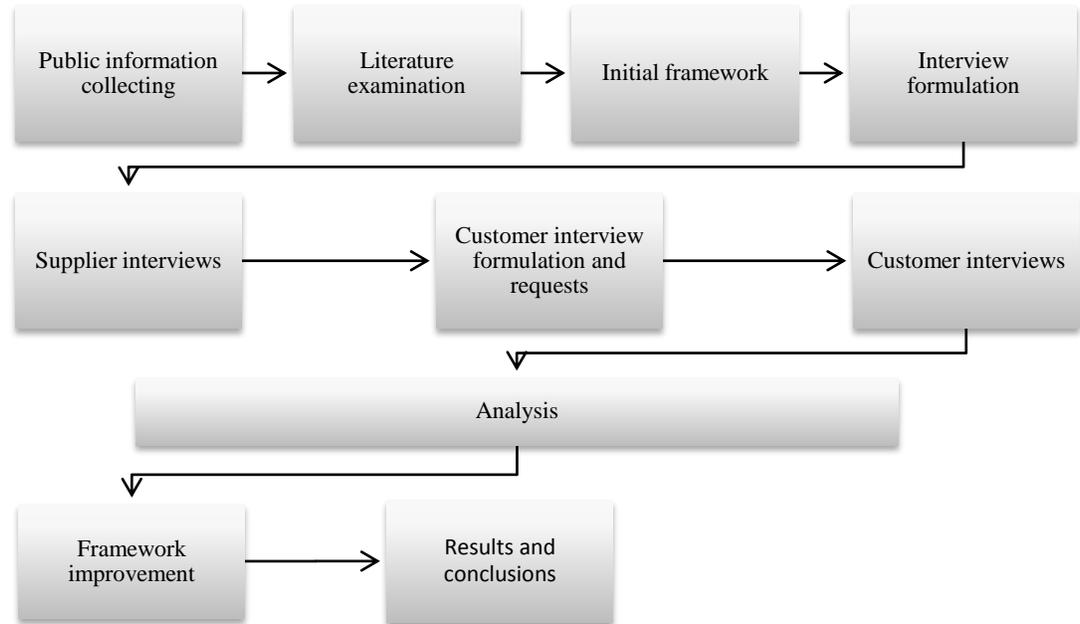


Figure 3. Phases of the research project.

This thesis consist of six main components, of which empirical chapters make up most of the material. A framework for examining the interviewees' perspectives is built around a strategy model by Keränen and Jalkala (2014) by adding components from other literature, discussing value propositions, customer relationships and loyalty. The main purpose of these additions is to develop a wider understanding of how inter-company dynamics affect value perceived from solution business and what needs to be considered when implementing intelligent packaging.

4. VALUE OF INTELLIGENT PACKAGING BUSINESS

This section discusses views of intelligent packaging business from the supplier's perspective and compares them with the prevailing views of customers. The current publicly available knowledge about intelligent packaging is discussed, after which more company specific issues are explored. Finally the views of potential customer companies are brought to light, in order to better understand the basis of following comparison and analysis.

4.1. Public image of intelligent packaging

Little knowledge of intelligent packaging's current public image exists outside of food packaging solutions, most of which is referred to alongside active packaging. (See: Active packaging 2015; Azom 2015; Brody A.L. 2006) Current concerns about intelligent packaging seem to involve legislation and the cost structure of intelligent packaging business (Danielli et al. 2008; Realini & Marcos 2014). There are organizations, such as AIPIA (Active & Intelligent Packaging Industry Association), that are determined to eliminate cost issues and deliver value through reduced waste from loss and spoilage, and increased profitability of intelligent packaging users. These points are a shared concern within the interviewed companies as well. How such change could be achieved is a matter worth exploring.

The relevance of AIPIA became apparent over the interviews as several of the interviewees or their organizations were involved with or part of AIPIA. This association offers supporting implementation, standardization platforms, events, connections and lobbying activities, with the aim of making intelligent packaging part of everyday life. Despite its wide reach within intelligent packaging industry, AIPIA refrains from managing concrete intelligent packaging as a business, which leaves open possibilities for companies to create their own systems. (AIPIA.info 2015)

Benefits of intelligent packaging are known by many parties in different areas of industry, but the lack of widely implemented solutions suggests to existence of an

underlying problem. Implementing these technologies is difficult for a singular company, since their effects span across whole supply chains and require contributions from several industries. Such industries include software, packaging, chip manufacturing, printing and their suppliers and customers, which suggests the need for long term investment.

4.2. Supplier's perspective to implementation of intelligent packaging

This section describes the case company's views of intelligent packaging from a supplier perspective. The chapters are divided by their precision towards the matter at hand, starting from a general view, the focus moves to the current strategy and specific views from different supply chains. In the end, the acknowledged problems are summarized.

4.2.1. General views of the current situation

Due to its stage in development and planning, a unified model for providing intelligent packaging has not been established on the examined supplier's side yet. There was a general agreement that dialogue with the customer will be necessary in order to provide desirable value. The state at which this dialogue is conducted varies however. As a manager from the pharmaceutical value chain stated:

-- we have not had enough dialogue, in my opinion. We were thinking internally about possible solutions and start up internal targets I think, and in my opinion that is the wrong way. We are missing probably the touch point. And, we have to find, partners with a high level of willingness --

This comment would indicate that multinational pharmaceutical companies might not be the best partners for early stages of intelligent packaging operations. The size of these companies is a factor as described by the supplier's senior manager:

“Smaller [companies] understand that environment better. The bigger [companies] sort of have this assumption that they can dictate it [schedule]. And that is true though. That’s what they do.”

A perceived threat to pilot projects is a phenomenon that can be seen from past projects: Some customers have already tried sensor and indicator packages such as temperature monitoring, in order to verify functionality of their supply chain and therefore trust that the chain will remain functional. This may lead to abandonment of the intelligent packaging solution after the initial project is over. Another threat to implementation is that brand owners might not want to implement technology into their packaging until the infrastructure or customer’s capability of using it is completely covered. For example lack of mobile phones could be one such obstacle. There is no much use of mobile application compatibility in a package if only a portion of potential customers are able to use it. (Research specialist, 2015)

4.2.2. Current strategy

Through supplier interviews, it became apparent that implementation of intelligent packaging is still in a fairly early stage. While the supplier is a traditional forest industry company that relies on product-dominant supply operations, their vision of intelligent packaging seems to include possibilities of solution business. There is a general agreement that the initial way to start providing intelligent packaging solutions would be to work as an integrator in a network or a value chain. This setting may prove laborious due to the lack of existing solution business infrastructure within the company. Another apparent issue is the size of the supplier’s organization. Changing its structure to better support solution business would require a lot of commitment of time and resources. It is therefore likely that a dedicated internal organization will eventually be developed for dealing with intelligent packaging business (Research specialist, 2015). Information transfer from a value chain to another is not an established practice due to the traditional industrial company structure where different departments have their specific information to themselves.

Regardless of the perceived importance of suggested information transfer, a clear plan of action is not present. The interviewees stated that there should be more dialogue within the company as well, in order to improve customer value development (Pharmaceutical segment development manager, 2015) When interviewed about their response time of fulfilling arising customer needs regarding intelligent packaging, the answers varied from months to years, depending on the customer's industry. This seems to be caused in part by differences between the types of customers in different industries. While pharmaceutical or other unspecified companies could proactively come to the supplier, large tobacco or grocery chains would require careful planning and an approach from the supplier. These differences caused discrepancies among the interviewees' perspectives towards intelligent packaging and further underlined the need for active dialogue.

The direction that is currently perceivable based on the interviews aims to first touch on the right market segment and find suitable pilot project partners where the products are luxury and therefore pricing is looser. Eventual development could go towards large chains when there would be possibility for proper infrastructure advancement with partners. FMCG companies are a hope for the more distant future, as such products would have open possibilities for a large variety of solutions. (Senior manager, 2015)

When exploring the structure of the supply chain, it came up that current experience with intelligent packaging has not required focusing on the distribution within the chain. This raises the question if there has been a proper chain or network management planning this far, or if the products have just been sold to the customer without consideration of stakeholders further down the chain.

4.2.3. Views from different chains

Over the course of the conducted supplier interviews, differing perspectives and opinions could be observed. Some of these comments brought up points of

consideration. For example an implementation method that was not mentioned by other interviewees was suggested by the carton board segment sales director (2015):

“And of course, the most important to track where the material is. I mean today you go into the web and you order something from [clothes web store], and you know exactly what is happening in the supply chain. Where the goods are and when you will receive it and so on. We are far from there, even though we sell a much more expensive product.”

Using intelligent packaging solutions for just B2B transactions would be an investment that could be considered as both improvement to the supplier’s own supply chain and as a proof of confidence for their offering. Having a show of quality would work well with another point that came up over the interviews (Segment sales director, 2015):

“But I’m talking to brand owners and I know for sure that we can’t add much cost into the packages today. And, I think what we should really do, when we look at these projects, it’s to involve the stakeholders early in the projects.”

A potential help to development in these projects was also suggested in the same interview: The supplier should consider partnering up with good converters, even through licensing, if they had self-developed intellectual property (IP). Although this would mean opening one of the most valuable pieces of ownership within an intelligent packaging value chain to other companies, it could be considered in order to share responsibility in a network.

Another visible problem through experience was voiced by the senior manager: When there is an impulse from a customer, there is no actual knowledge of their willingness or ability to commit. This creates a risk that the supplier needs to trust the transaction will turn out positively while still investing in the project. Reasons for the possible failure of such projects are lack of knowledge from either the sales personnel’s or

customer's side, which can create a gap between reality and hopes of the customers. (Senior manager, 2015)

Regardless of the current uncertain environment and potential for different partners in different cases, there is a will to create a stable network of reliable partners. Current operations include just small, low effort application of RFID tagging and outsourced special solutions for a specific market. (Senior manager, 2015; Research specialist, 2015)

These RFID tags are a controversial topic however. A view voiced by the sales and marketing director emphasizes the importance of 100 % coverage with logistics solutions. The interview suggests that it might be more viable to focus on special end product based solutions in the future, unless a way to cover the whole chain would be achieved. (Sales & marketing director, 2015)

4.2.4. Acknowledged problems in implementing intelligent packaging

Due to little market testing and practical experience, the managers believe they do not have enough hard proof for making a confident case for intelligent packaging. Value assessment has an established model in the supplier's logistics solutions, which is based on metrics such as ROI and spent labor hours. This value assessment is conducted especially through software provider's experience, but other evaluation methods are to be developed. (Research specialist, 2015)

Another visualized problem in implementing intelligent packaging is that introduction happens through sales people and therefore it is unlikely that key decision makers will initially be engaged from the customer's company. These sales people do not necessarily have an expert's grasp of intelligent packaging but are rather given an additional assignment of selling such offering. This calls into question if a more profound contact should be established from the start. A potential starting point to this setting is a small support organization for the sales force. (Senior manager, 2015)

The supplier's pharmaceutical segment development manager states that intelligent packaging projects have been partially perceived as marketing costs and therefore their burden has been carried by producing companies, in the case of end user solutions. Therefore collection of valuable customer data or visible increase in sales is necessary in order to justify sales. (Pharma. seg. dev. manager, 2015)

Focused, clear and wide customer need discovery or research is not being conducted and not strategically planned in the near future by the supplier. Current customers are occasionally interviewed and surveyed however. Market trends are followed and potential interest is observed. Catalysts for this interest are trade shows and seminars related to intelligent packaging. (Research specialist, 2015)

Table 4. Obstacles with implementation

Obstacle	Awareness	Consensus	Solutions
Costs	X	X	X
Contact to right people	X	X	-
Contacting the right companies	X	-	X
Lack of business infrastructure	X	X	-
Internal communication issues	X	-	-
Lack of knowledge about real needs	X	X	/

Legend: X = Present, / = Partially present, - = Not present

The table 4 describes the supplier's views, attitudes and questions towards potential obstacles of implementation that emerged over all of the interviews. As indicated by the solutions column, some of the issues have been thought about already, while all of them do not have a clear consensus within the company. Awareness of these issues is clear, which is indicated by the Aware-column. Not every interviewee saw the issue in a similar way however, which can be seen from the consensus column that displays as X if the approaches were parallel towards the issue. The presence of potential solution ideas for the obstacle is displayed by the last column.

Cost is the first challenge we can hear from all sides in this business, which is no doubt also one of the most researched. There are different ways of managing costs which may include trying to manage economies of scale and perhaps justifying the costs with sufficient added value. Secondly it is generally agreed that there is no clear picture of the best way for contacting a customer, as it is currently done in the traditional way through normal sales people (Sales & marketing director, 2015; Pharma seg. dev. manager, 2015). Third obstacle is the decision of contacting the right companies for cooperation. The main focus has been on large companies this far, and there does not seem to be a consensus on the right size of future partners, but any partner that is readily available, will be considered for the moment (Research specialist, 2015). Fourth and fifth of the major obstacles tie together, as there is no solution business infrastructure

for the moment. There is an awareness and a shared view that something needs to be developed, which leads to the fact that there is no proper communication between different entities of the company currently (Segment sales director, 2015; Pharma seg. dev. manager, 2015). The last major issue is an acknowledged case that there is no true information of the real value of potential offerings. There are applied solutions and different metrics but in the end, a lot is to be determined. (Research specialist, 2015)

All in all, it seems that there has been more examination and questions than discovery of answers for implementation of intelligent packaging. The supplier appears to be acting based on emergent cases of what is readily available in the market, rather than systematically going through different options. This direction leans towards justification for designing an organization for managing intelligent packaging and finding leads on their own. The next section explores the views of potential customers for later comparison and analysis. Similarities and stark differences to supplier's statements should be witnessed.

4.3. Customers' view on implementation of intelligent packaging

The content of this section covers customer companies' views of intelligent packaging and its implementation possibilities. The first topic describes the customers' starting point for intelligent packaging, in terms of their knowledge. Next chapters list perceived and expected benefits after which the practical arrangements of potential implementation are comprehensively described.

4.3.1. Knowledge about intelligent packaging

Through interviews of potential intelligent packaging customers, it has become apparent that organization's size makes a visible difference in how intelligent packaging, or solution business in general is perceived. It is evident in the following chapters, that the larger the company, the better equipped it is to manage its own network of intelligent packaging operations and development. Being able to reliably

manage these operations on their own seems to discourage paying others for a complete solution. (Senior principal scientist 2, 2015)

While there are differences in implementation, the need for clear value communication and potential monetary benefit is the same. There is a general interest in intelligent packaging in the customer side although the awareness of possible offerings varies. Although there are plenty of companies that are members of AIPIA and therefore fairly informed of intelligent packaging, this thesis also includes interview results from parties that are not involved with AIPIA. The lack of knowledge about intelligent packaging is not due to lack of interest but rather appears to be caused by different priorities of the interviewed people.

Table 5. Knowledge about intelligent packaging

Company	Status
A	<ul style="list-style-type: none"> • AIPIA members, but no profound knowledge
B	
C	<ul style="list-style-type: none"> • Considered RFID in the past
D	<ul style="list-style-type: none"> • RFID-customer
E	<ul style="list-style-type: none"> • Focus shifted – No interest on firm level for the last three years • Theoretical experiments in the past, but no success • AIPIA member

Unless directly exposed to intelligent packaging from outside, smaller companies might not have the luxury of exploring such solutions. This becomes visible from company C interview where they state that cost, the question of true need and understanding of available possibilities are limitations to adoption of intelligent packaging. These could be rectified with information search, which does not seem necessary enough for resource allocation. When comparing the expected activity of the supplier, there are differences between companies, although the necessity of dialogue is commonly acknowledged. An exception to this is company D, which seems satisfied

with getting a deal for an order of RFID tags that they can implement by themselves. They do not consider project business necessary because of the sufficiency of their internal processes. While company E also views intelligent packaging as an internal development, their attitude towards co-creation is much more favorable.

4.3.2. Benefits

This section covers potential customers' expectations of intelligent packaging, in terms of co-creation of intelligent packaging solutions and expected benefits from being part of a network.

Table 6. Co-creation

Company	State
A	<ul style="list-style-type: none"> • Existing practice • Sometimes hard to ensure sufficient gain for self
B	<ul style="list-style-type: none"> • Preferably continuous development together
C	<ul style="list-style-type: none"> • Hopes for supplier's activity towards smaller companies • Quality control personnel initially the right target
D	<ul style="list-style-type: none"> • Software supplier sells machinery and own company markets to component suppliers as an offer
E	<ul style="list-style-type: none"> • Need for co-creation voiced, but not imperative • IP is a problem, attainable by own or joint development • Worries about technology's downsides • Preferred to buy products instead of solutions

Partnership is seen as a necessity in most cases, due to lack own knowhow. There are hopes for economies of scale benefits through network operations.

From companies A and E, we can get the image that there is a strong interest towards intelligent packaging solutions, even with own ideas of potential applications. There seems to be more understanding about intelligent packaging's potential benefits, but concerns of implementation exist. This leads to the imparity between interest and

willingness to act. Unless there is a clear need, companies A, B and C stated that they would continue their operations as usual until a well planned offering from a potential supplier would be presented. A co-creation approach is expected if these companies are to adopt intelligent packaging due to resource constraints.

When planning partnerships, it may be beneficial for customers to find one that can serve as a single producer, which will yield benefits from the economies of scale. Single supplier partnership is supported by the Company A interview:

“You know a lot of our suppliers work also for our competition. And a lot of our suppliers do innovation with us, and different innovation with our competition. So they use basically, their facilities to do slightly different things. - - Then of course they need to get economies of scale. Then ideally they would spread it within the industry, but in different categories - -.”

Having the benefit of supplying similar products to several companies, or partnering with a large company would make it easier to bring down the cost of intelligent packaging and support infrastructure development. Abdulsamad, A., Stokes, S., & Gereffi, G. (2011) bring up power asymmetry as a leverage for promoting development, which on the other hand presents the challenge that it is necessary for the supplier to keep their customers happy. By careful selection of partners, it should be possible to avoid tensions from large customer networks or power asymmetry, as is clear from concerns from Company A interview:

”No problem if [company X] uses printed electronics, but if a competitor in the same category uses, it will be a problem”

Such concern was expressed in the company A, B and C interviews and it can be expected to pose an obstacle to open commercialization of intelligent packaging. This is clear from company E’s interview as well, since they would prefer to develop

intellectual property on their own. In comparison to this single supplier approach, company D interview brought up the process of open competition between intelligent packaging suppliers. It seems like company D's interest is merely in products instead of a whole solution, so it is to be expected that they will focus on managing the network by themselves. An indication of this tendency is also their way of providing intelligent packaging offers to their suppliers: They have negotiated a bulk offering with intelligent packaging and chip manufacturers which can then be adopted by their partners at a cheaper price than would normally be available.

Co-creation also prompts the question of required response time and structure of project business. A general consensus could be observed from the interviews as the usual answer to initial response times was mostly from two to a maximum of four weeks, depending on how refined idea the customer requires. Within this time, the supplier is expected to provide either an idea or a prototype for the need. After the prototyping phase, a project with weekly contact is hoped to deliver a product to the market within a year. All in all, a vision is consistent, but varies a lot based on the project specifics.

Table 7. Expectations

Company	State
A	<ul style="list-style-type: none"> • Waiting for viable printed electronics
B	<ul style="list-style-type: none"> • Hoping for customer relation improving products • Benefit only when more desirable than normal products
C	<ul style="list-style-type: none"> • Efficiency is crucial • Extra operations to be avoided
D	<ul style="list-style-type: none"> • Pricing is a problem only to small suppliers • Believes in use at inventory or storage management
E	<ul style="list-style-type: none"> • High turnover products could use the extra data • Hesitation of benefits by some • Tamper evidence could be useful in some cases • Interaction with the consumer really interesting

The points mentioned in Table 7 are very important topics for each company. The overall opinion leans towards efficiency improving systems, either in terms of supply chain improvement or cost reduction due to reduced manual labor. Companies A, B and E also believe in interactive products which could help engaging the end customer. Regardless, the interviews indicate that changing pricing is justified only when the new product would be clearly better or can be acquired at a cheaper price. General consensus seems to be that intelligent packaging cannot be a significant part of the product's cost, therefore limiting the possibilities of what it can be implemented to. A major reason for this is the competitiveness on each of the interviewed companies' markets. There are no luxury products that could easily justify significant extra costs in the customers' portfolios, so a way of limiting the price increases needs to exist. An exception to this is company D, which does not consider intelligent packaging important past their own production lines.

4.3.3. Practical arrangements

Topics in this section describe the customer companies' views of intelligent packaging's practical aspects, in relation to solution business and value in networks.

Table 8 describes the views about IT solutions, which require consideration as intelligent packaging often has the possibility of connectivity.

Table 8. IT solutions

Company	Status
A	<ul style="list-style-type: none"> • Necessary for logistics solutions, but afraid of large costs
B	<ul style="list-style-type: none"> • Crucial to get for the whole chain or retailers will not agree
C	<ul style="list-style-type: none"> • If necessary for the product, provides a good possibility
D	<ul style="list-style-type: none"> • SAP designed to operate with RFID-signatures. The rest is done in-house.
E	<ul style="list-style-type: none"> • Great hope for internet of things, especially in the future • For example ingredients & origins listed interactively

IT as an attached solution has a generally varying reception. Since companies D and E are larger and can potentially manage their own IT systems, such additions on top of intelligent packaging are seen more favorable by them. The rest of the interviewees saw potential issues with an IT service, mostly worrying about the potential cost and the necessity for the scale of implementation. Especially important this is for the fast moving consumer goods companies, as they claim retailers will not agree to implementing NFC systems if their competitors still use systems such as QR-codes. Adopting intelligent packaging for logistics in a whole FMCG network presents a very large barrier of entry. Contrary to these views, company E has an expectation that internet of things will be a reality in the future and therefore has a much more positive view of developing a refined IT infrastructure.

As Table 9 shows, all of the interviewed customer companies have a fairly simplistic supply chain where they mostly use large logistics companies for delivering their products to either their own stores or retailers. Understanding the supply chain of the potential customers is necessary for finding the key stakeholders that might affect intelligent packaging implementation.

Table 9. Structure of supply chains

Company	Status
A	<ul style="list-style-type: none"> Over 50 focused factories → Large logistics company → Retailers
B	<ul style="list-style-type: none"> Little information from interviewee: <i>“We are sending our products to big trade chains and to smaller trade partners.”</i>
C	<ul style="list-style-type: none"> Manufacturing → Large logistics company → Stores
D	<ul style="list-style-type: none"> Funnel network, where company D works as a connection A lot of interlinked component manufacturers, whose components are combined to make own products
E	<ul style="list-style-type: none"> Packages through converters → Logistics → Retailers Converters are the main companions <i>“To manage is possible, to change is difficult”</i> Not tailored for the future, new facilities improve this.

The more complicated system is the supply structure before their own manufacturing. Generally this part includes different material or component suppliers which the interviewees did not regard as an important part of intelligent packaging discussion, except for company D. This part is important due to the amount of different components that they purchase. It would be highly beneficial if all the incoming components could be digitally kept track of from the start.

Overall attitude towards introducing intelligent packaging to supply chains is not without concern about the rest of the stakeholders. For example company E views their chain as a traditional supply which would be difficult to mold into one that would support intelligent packaging in the future. Table 10 covers the customers' beliefs of their possibilities of being able to convince the rest of their supply chain to implement intelligent packaging with them.

Table 10. Convincing stakeholders in the networks

Company	Status
A	<ul style="list-style-type: none"> Logistics improvements need to be justified. Just own benefit is not good enough for the chain.
B	<ul style="list-style-type: none"> Price/benefit ratio is very important for convincing
C	<ul style="list-style-type: none"> Believes they can dictate by choosing their partners
D	<ul style="list-style-type: none"> Others must be convinced since it is not always 100 % benefit for every stakeholder.
E	<ul style="list-style-type: none"> It would be necessary push from quality control or safety Initially done by innovating with a small brand or a region

It is generally considered important to divide the benefits well to each actor in the chain when considering logistics solutions. The need of the solution is the key as there is no room for “nice-to-have” solutions. While company C can dictate what their logistics partners need to do in terms of intelligent packaging, the rest of the interviewees deem it necessary to have a plan for convincing their value chains. This was hinted when discussing the division of benefits along the value chain. Most do not see implementation as a benefit for every actor in the chain and for those that would benefit, the positives need to be well communicated. Company E suggested that this would be achieved through incremental implementation in a very specific region or for a particular product. Such development would require early participation from all sides of the project, which can be seen from the results in Table 11 as well.

Table 11. Participating in development

Company	State
A	<ul style="list-style-type: none"> • Willingness to be involved as soon as possible
B	<ul style="list-style-type: none"> • Needs must be fulfilled 100 %, for example 80 % is not enough.
C	<ul style="list-style-type: none"> • Resource constraints prevent early involvement
D	<ul style="list-style-type: none"> • Hopeful for building new ideas to keep up to date • Development mainly internal at the moment
E	<ul style="list-style-type: none"> • From the beginning • Very open for co-creation in the case of old or common IP

Participation and co-creation is seen as the way to go for smaller companies, while larger like D and E would prefer their internal operations to manage development. How early to participate depends on the available resources. Regardless, within these constraints, there is willingness to contribute early in order to ensure fulfilling needs of the company better. A disparity between the final offering and requirements is seen as a difficult issue, so it should be avoided properly.

Reference marketing possibilities are also considered by the interviewees. There is need for secrecy only in the case of products which are directed towards consumers [cA ref]. Reference marketing in intelligent packaging solutions in logistics is possible for most of the interviewed companies and it is already being conducted in some. Company B also sees an opportunity for trickle down benefits through reference marketing [cB ref]. Having a partner that is willing to work as a reference would be useful for the supplier as well, since a good example could be used as an internal motivator and a case of success. After exploring specific aspects of co-creation willingness, we can observe the interviewees' own ideas of how to find intelligent packaging viable for their company.

Table 12. What would make intelligent packaging viable?

Company	State
A	<ul style="list-style-type: none"> • Efficiency in the chain and proper tamper evidence
B	<ul style="list-style-type: none"> • An argument for consumer's purchase → Added value
C	<ul style="list-style-type: none"> • A large benefit for quality control • RFID has been a difficult case due to low added value: compare cost vs QR-codes
D	<ul style="list-style-type: none"> • Important to get it to each supplier → Reduction of manual labor
E	<ul style="list-style-type: none"> • Cost reduction and upscaling (for example for OLEDs)

The overall tone is that improved efficiency of the supply chain and inventory/storage management would be important and most likely to prompt intelligent packaging implementation. Easier returns from the retailer are also seen as a big benefit as well. On top of the shared need for more efficiency, there were varying opinions to what would justify implementation. Company B's approach to this would be to start with a successful short term solution, even on marketing side, from which it could be developed to long term improvements or development.

When observing the quantifiable benefits of intelligent packaging, the clearest benefit can be seen in logistics solutions. All of the interviewees concluded that their companies have methods of quantifying the benefits of implementing new ideas. The intensity of these methods varies however. Being aware of how customer companies work with uncertainty from new products should help finding the right approach. Company A offered a vague idea that they would need to be able to communicate the benefit of the package to their customers in order to realize the advantages. Companies B and E prefer test markets and following metrics and feedback from the customers. They have profound experience in estimating future sales and established practices on product implementation that could be used for quantifying their benefits with enough confidence.

Company D prefers a different approach which is common in product dominant strategies as also referred to by Keränen and Jalkala (2014). This approach disregards any other types of intelligent packaging but RFID-tags, since its function is to measure labor hours spent over the supply chain. The interviewee stated that they seek to implement RFID technology to all of their suppliers and expect to significantly reduce hours spent on manual data collection.

Table 13 displays the customers' preferences towards certain structures of the strategy model by Keränen and Jalkala (2014). The interviewees were presented the question if they would favor a contact through a specialist person or a team, a project where they provide feedback which affects how the supplier works or simply a plain offering based on estimations of their communicated needs. A chance to describe their own idea of business interaction was provided.

Table 13. Arranging co-creation

Company	State
A	<ul style="list-style-type: none"> Project operations, based on efficient dialogue and feedback
B	
C	<ul style="list-style-type: none"> Expects prepared offering from a supplier that is willing to manage the network.
D	<ul style="list-style-type: none"> Enough if a supplier provides a good offer Internal development in use
E	<ul style="list-style-type: none"> Initially through project approach, later with a specialist If development outside the company, would prefer a close contact with value specialists

The interviews show that large enough companies, such as D and E can afford to conduct internal development based on their needs as long as there is a chance to create their own IP. If a supplier owns an IP or is developing a product that the customer could join in, co-creation is seen as a favorable option. ***project & specialist*** If the IP is open, companies D and E consider it much cheaper to buy these products and develop

their complementary systems on their own. For the rest of the interviewees, a co-creation partnership seems like the obvious choice due to resource constraints.

In the co-creation scenarios, a project based life-cycle strategy seems like the most favored way of operation for the customers. Proper discourse and continued feedback through meetings or phone contact are expected over this interaction. The interviews with companies A, B and C would suggest that as long as the offering is good, a partnership would be viable.

4.3.4. Challenges and obstacles

Last section of the customer interviews explores perceived obstacles with the implementation. Table 14 describes what customer side counts as their known challenges for implementation of intelligent packaging.

Table 14. Challenges

Company	State
A	<ul style="list-style-type: none"> • Stock exchanged company – long term investments hard to justify • Need for short term solutions
B	<ul style="list-style-type: none"> • Large quantities – Cannot cause extra workload • Costs must be well justified
C	<ul style="list-style-type: none"> • What/where is the true need for intelligent packaging?
D	<ul style="list-style-type: none"> • Small orders and large numbers of single products are expensive • <i>”If a problem arises in the system, nothing works anymore.”</i>
E	<ul style="list-style-type: none"> • Everything needs to have food compliance • Making sure the value is worth the cost (OLED) • RFID tags: balance between information and size

Two main concerns emerged from the interviews: accumulation of costs over the whole chain presents a challenge, and the question if differentiation will be sufficient to justify adoption.

Company A voiced a need for exclusivity of certain solutions in their field as the costs of such projects would be an extra that requires profound justification. Contrary to this however, company B and C claimed that it would be unlikely that such exclusivity could be demanded from a supplier, and that they would rather regard it as a really good incentive for cooperation. Company E's interview revealed that they would prefer solving this problem by developing their IP on their own, or in a joint development agreement with other organizations such as universities or technology providers. Based on the other interviews however, this does not seem likely for smaller companies.

As acknowledged by the supplier and stated by company C, there is no possibility for "nice to have"-products currently, so the offerings need to be economically viable business cases. Economic viability includes different specifics for different companies however. While company A requires quickly realized benefits due to stock market metrics, others focus on more specific challenges: Company B is worried about increasing labor hour requirements within the value chain when company D uses intelligent packaging exactly for decreasing them. All this shows that potential customers are largely unaware of the offerings of intelligent packaging providers.

When production volumes are high and economies of scale is a significant factor, extra work within the production and packaging chain could create unbearable burden or inflation of costs. In order to convince the customers to care about new offerings, a significant difference between the old and the new has to be communicated, as company C's interview shows:

“If a project that needs something -- is able to generate significant value to the company, then it is just about allocating resources and making calculations. -- In that I can say I talk for a large majority of companies.”

This comment came up when discussing lean manufacturing, which is seen as the important way of managing value chains. Being able to prove intelligent packaging's suitability to lean manufacturing would make offering logistics solutions much easier. A consensus of the major issues can be made. Costs are the concern that needs to be dealt with before proper consideration of business should be done. Comments that describe this issue are varying. For example the basis for company D's concern is that their suppliers are mostly small component manufacturers whose products will have a large increase in cost with an RFID chip for example. This relates to company E's comment that the production needs to be up-scalable. Both of these views are summarized by company B:

“Large consumption is required to get the price down. There's a dilemma.”

While environmental values are not a typical topic for the implementation of new solutions, they are valid in this case, since a large number of intelligent packaging structures include batteries or printed metallic components. Attitudes towards separately recyclable components of such packaging solutions vary with different ideas for solving this problem, but in the end, batteries are seen as a challenging obstacle. This leads us to Table 15 which hints to why the companies do not see batteries completely blocking development, but rather as something that has to be overcome.

Table 15. Need for proof

Company	State
A	<ul style="list-style-type: none"> • If one follows example of others, it is already too late.
B	
C	
D	<ul style="list-style-type: none"> • Not looking for anything new, so no need for proof
E	<ul style="list-style-type: none"> • Consulting core technology developer, pitches to an “internal customer” • Category or region must be in mind before doing this • Sometimes markets cannot tell what they want, so own ideas

The interviewees were asked if they would think their companies required proof of working intelligent packaging solutions before being able to adopt them. This provided two types of answers: Either there was no need for hard proof, as that would mean somebody already found the blue ocean innovations and they would be late to the market, or the proof could be derived from evaluation and analysis within the company. Most of the required proof seemed to be necessary for internal convincing, so that a project could be officially started or taken further. For example company E employs an internal pitching system where the idea is brought to evaluation with a prepared business plan, which may then be approved if deemed well enough.

5. ANALYSIS: IMPLEMENTATION OF INTELLIGENT PACKAGING

This chapter covers analysis and discusses the implications found from the interviews. Drivers and barriers for intelligent packaging solutions in value chains are the first topics, among which the general differences and similarities between the interviews are covered. Later parts go through strategies and outcomes of said implementation.

5.1. Drivers & barriers for intelligent packaging solutions in value chains

This section gives an overview of the driving forces behind intelligent packaging ideas, even through some existing problems, which eventually pose a possibility for improvement. Barriers and concerns that do not immediately present a possibility for a solution but require consideration are separated into their own chapter in the end however.

5.1.1. Differences & similarities between supplier and customer perspectives about intelligent packaging solutions in value chains

The current setting of the case supplier's intelligent packaging is rather turbulent. There are visible differences between the reality and customer expectations, which are listed in table 16.

Table 16. Observed findings.

Issue	Supplier	Customers
Starting point	Emergent, through sales people	Need for proper involvement
Contact method	Promotion and customer initiated mainly	Initiation from suppliers unless there is a direct need
Partner specifics	All the possible without current moderation	Single immediate, many in a network
Expected Point of contact	Sales people	Quality controllers
Service speed	Prioritizing and specific	Project based and moderate
Perceived gatekeepers	Customers' procurement personnel	Internally: Procurement, Externally: Retailers and logistics companies

The issue with the starting point is a point of improvement for the supplier. Current organizational structure allows for emergent sales through traditional sales people, with little proactivity from the whole organization. The interviewed customers expect more profound contact than what they have experienced this far. A reason for this disparity could be due to another gap between customers and the supplier. The contact method between the supplier's actual actions and customers' expectation presents a controversy: The supplier has mainly promoted intelligent packaging and expected customer contact, whereas the customers wait for supplier initiation unless they have a very specific need. This also leads to the next point, which is the partners that involved companies are looking for. Due to being at the early stages of intelligent packaging implementation, the supplier is looking for any and all possible partners without specifically considering who to contact. The customers hope for a single supplier to contact them at first, but would be willing to work in a network eventually, in order to make use of economies of scale, access to resources and extensive expertise of different parties.

Practical aspects that affect initial approach are presented in table 16 involve the expected point of contact, service speed and perceived gatekeepers. As there is no specified intelligent packaging marketing organization, the first contact from the supplier comes from sales people, with other responsibilities on the side. This could be less of a problem if there was research backing up the decisions to reach for the right people. At the time however, there exists lack of knowledge about the right touch point within the customer (Sales & marketing director, 2015). Based on the customer interviews, the likeliest party to have interest in promoting intelligent packaging in their value chains would be quality control personnel. Service speed simply covers the planned timeframes and approach to projects. The supplier's current intelligent packaging organization's size dictates that high emphasis on prioritizing which customer is served fast is necessary. The customers on the other hand are generally content with a moderate response time as long as project time frames are met and contact maintained throughout the interaction.

5.1.2. Drivers for intelligent packaging implementation

A clear separation between logistics solutions and other packaging improvements is observable in the views of customer organizations. As also stated in the supplier interviews, the logistics solutions seem most viable for the moment. These improvements are generally fairly basic and based on tracking and tracing via RFID-tags. Avoiding overstock and helping returns from retailers surfaced from the customer interviews as a potential starting point for new projects.

The supplier should carefully consider the size of future partners due to several implications: The lack of enthusiasm about open co-creation by companies D and E creates noticeable difficulty. Supplier interviews also highlighted concerns about large companies from different supply chains. These concerns included the need for clear value proposition before any contact along with the lack of past success. It is probable that value chains where customers are smaller and more flexible than for example

multinational pharmaceutical companies, might prove better for pilot projects. The type of relationship also restricts both sides over time. With a larger partner, it could be expected that more systems would be entwined within the intelligent packaging operations.

One of the major reasons company D might not consider co-creation with a solution provider is that they might want to implement intelligent packaging in new areas where the supplier couldn't quickly follow. Such concern is countered by company E's aforementioned idea of initial implementation: Gradual expansion of intelligent packaging operations would either open the possibility for other companions or give time for the supplier to follow with their lead. Gradual implementation also coincides with the customers' need to be involved in the development of said solutions as early as possible. As such, this also lines up with the carton board manager's idea of customer's early involvement. (Segment sales director, 2015)

When examining the potential customer's size, the aforementioned perspective differences arise. There are comments that depict a lack of consensus within the supplier organization. As stated by the cigarette packaging segment development manager (2015):

"I still think that if [we] are to offer intelligent packaging, we will need to carry the responsibility and we will need to have the same language on the supplier side. If our customer is at the table, all the matters have to have been discussed through already before joint meetings --"

This opinion portrays the view that for some companies, such as large cigarette chains, all the sides of the chain need to be present with a unified voice (Cigarette packaging segment development manager, 2015). Whereas the customer interviews hinted that people with the right information could manage their intelligent packaging operations

without the need for presence of the rest of the chain (Global packaging director, 2015; Global procurement manager, 2015; Group manager, 2015).

5.1.3. Barriers & concerns about intelligent packaging implementation

There are plenty of obstacles and difficulties with the implementation of intelligent packaging. A problem that arises from consumer goods packaging is that the benefit of the intelligent solution needs to be either apparent or communicated to the end customer very well as the company A interview shows:

“Somehow you need to communicate to the consumer -- that it makes their life easier. Either you communicate on the pack, internet or maybe TV. - - So communication is really - - the key. That’s true for all innovation, if you have something innovative and nobody knows about it, you’ve wasted your money.”

This comment leads to the problem that smaller firms such as the company C has: Profound awareness about intelligent packaging is not common and therefore needs a push from the producers of such products. While company A interview indicates that they would need to arrange media attention through TV ads for example, in order to have desirability for consumers. At the same time, company B representative suggests that it is necessary that learning about intelligent packaging should be easy enough for consumers to not require separate media promotion. Ease of use is one of the factors that again comes back to efficiency and extra costs as worries about implementation. Similar experiences can be derived from supplier interviews as well when asked about possible obstacles of implementation (Segment sales director, 2015):

“It’s mainly costs, I would say. And environmental aspects, recyclability and, convenience. Needs to be easy to use, easy to understand.”

As shown by supplier interviews, logistics solutions other than RFID-tags have been tried in the past, but their success has been short lived. This problem could be explained by company E's statement about temperature monitoring devices:

“-- I think [it] is also what happens for -- and it's nice to have smaller devices, and very small devices by now. It's something that would also do as a solution. -- But on the other hand, -- the question is if it's a value of the product is enough. Usually when you have issues like that in the supply chain, if it's not good enough, you do that with bigger devices. You would not monitor all the packs all day --”

Company E's interviews also revealed that implementing solutions that are not protected by supplier's own IP might cause other companies to attempt adopting these technologies if they became successful. This poses both a problem and an opportunity to suppliers that would like to conduct solution based business. Firstly it is clear that customers would be hesitant to adopt a system that their competitors might just as easily invest in. Fortunately this is not a problem in every case, as can be seen from the customer interviews. For example, logistics solutions require high cost efficiency which in turn is made possible by large markets and high production volumes, which are further discussed in the strategy section.

There seems to often be an expectation that other side of the transaction will be worse off, which reduces the enthusiasm for co-creation regardless of the side. In this case, it would be beneficial for the partners to be of similar size to prevent abuse of power. Abdulsaman et al. (2011)

5.2. Strategies for implementing intelligent packaging solutions in value chains

The type of structure where a company manages their network where different actors focus on specific roles in order to provide a solution together is favored by Keränen & Jalkala (2014) and Pekkarinen et al. (2012). Being able to manage partnerships with right sized companies as suggested would speak in favor of business interaction with

smaller partners, which has not been seriously considered yet by the supplier (Research specialist, 2015).

When comparing the current way of introducing intelligent packaging by the supplier and the hopes and suggestions of customer organizations, it can be evaluated that assigning this task to traditional sales people is not efficient. A clear trend and preference towards service dominant attitude from a supplier is expected. Not only is it preferable, but it is seen as the only way to go for those that cannot manage intelligent packaging operations by themselves. The current perspective of customer organizations coincides with findings by Keränen & Jalkala (2014), but the supplier organization seems to be lagging slightly behind, as described (p.80):

“-- firms with limited resources, which lack dedicated professionals and/or advanced practices, tend to adopt an emergent value sales strategy, which involves sporadic efforts to evaluate and document customer value primarily for sales and marketing purposes.”

This is evident as at the time of the interviews, there was no dedicated intelligent packaging organization for customer contact, but it has been regarded as an experimental and additional work for other professionals around the company. A gradual change to this is expected to happen however, as the supplier develops their operations. (Research specialist, 2015)

At first, it should be considered that in order to reach sufficiently profound contact with potential customers, it seems necessary to focus on few enough partners so that there will be time for proper dialogue. As the pharmaceutical segment development manager suggested, the number of initial contacts should be reduced to low number of right partners. This would reduce the searching costs and make it possible to dedicate resources more efficiently and promote cooperation for both sides. (Pharma. seg. dev. manager, 2015)

Increasing supplier's efficiency for serving additional customers on top the original few could be potentially achieved by developing effective knowledge management systems. As Storbacka (2011) (p.709) suggests:

“A solution provider does not create solutions that deliver value to customers, but rather engages in long term collaboration, and co-creates value with the customer”

Such consistent business also calls for the systematic data management as suggested by Keränen & Jalkala (2014).

Another way of conducting the said solution business would be the BOOT-model as suggested by Pekkarinen et al. (2012). It suits an integrator focused organization in the sense that the consortium of involved companies are managed by the BOOT-company. In comparison to simply managing the chain of products and services through intensive contact and subcontracting, the manager of this network would make use of its size and rather pay for the use of the smaller network partners' capital. Commitment at such scale would likely necessitate some level of pre-existing intelligent packaging business due to the long term contracts. After building a basis with a loyal customer, a BOOT-type network could be considered for several reasons:

- Reaching hard to get resources with a manageable schedule and flexible payment arrangements would be accessible for customers.
- Competitors for the supplier would be greatly limited after making the contract, due to long term agreements.
- Closer supplier-customer relationships would develop throughout the contract period, due to perceived security.
- Customer satisfaction expected to improve due to a continuous business relationship.

When developing intelligent packaging for a consumer interface, it seems to be important for the supplier to be able to communicate the perceived benefits to their customer in order to progress further with their offering. This is crucial because most companies do not know what their options are and therefore do not see a need, even if one would exist within the firm. Such view is recognizable from the interviews when asking about the interviewees' knowledge about intelligent packaging: Most either did know very little about intelligent packaging or their available information has not provided any positive indications of solutions that would benefit their core processes. Interviewees agreed that it is likely that there are people within the organization that have plenty of pressing needs, but cannot communicate them to the right people.

Creating economies of scale without a large single customer side partner would require wide marketing efforts, effective promotion or other types of involvement by a supplier. Such volumes could be attained via introducing logistics solutions to networks where several, even competing companies would be part of the system. This collaborative adoption seems to suit the interviewees as long as the competitors would not gain advantage through end customers. If a supplier was to achieve a deal at this scale, it would also help solving the problem of producing large enough volumes for cost efficient production. (Global packaging director, 2015)

Secondly it would be beneficial for the supplier if there were more willing customers after implementing a successful technology. The interviewed companies did not consider technology adoption as a problem if it was not introduced to their direct competitors but perhaps on a different industry or market. Such implementation also raises a tricky question which is also visible in the supplier interviews: What does the supplier give into this package and what do they own? Initially it might seem that working as an integrator or a middle-man in an IP heavy network would be a difficult issue, but based on the interviews with the smaller companies, proper network manager is essential for those that cannot dedicate resources to managing intelligent packaging

operations. This seems to contradict an opinion voiced by sales & marketing director (2015) of the supplier:

"-- unless we're an actor that owns some right, knowhow, skill or a piece of that value chain, in which we can genuinely compete with other actors, I think it will be completely useless to go wandering around and invest in it."

Based on the overall view of the interviews, this negative attitude would hint to the supplier having experiences mostly from interactions with large companies such as D and E that have the potential for their own development.

While there should be proof of a working intelligent packaging concept in the long run, most of the customer organizations agree that they should not wait for proof from the markets, since they want to be innovators instead of followers. Taking the risk of participating in a pilot project is not out of the question, as long as there is "*an interesting business case*" (Group manager, 2015). This concern could be alleviated with a proper value proposition. By answering the question by Anderston et al. (2006 p.5) "What is *most* worthwhile for our firm to keep in mind about your offering?", a solution for early problems could be comprehensively planned.

When customer value creation is being designed, the level of desired customer loyalty should be considered (Kotler et al. 2009). Based on the supplier interviews, the current level of engagement is not at a level that would widely promote long term cooperation with several partners. As Keränen & Jalkala (2014) suggest, a relationship where value is assessed and realized, systematic customer data management is important. This type of interaction would require additional effort in terms of reporting, which is not part of sales personnel's ordinary work in a traditional industry company. (Keränen & Jalkala 2014; Research specialist, 2015)

In order to support the sales force better, development of a database for sharing customer relationship data would be beneficial. Having the possibility of continuous evaluation of ongoing operations and a reference tool for intelligent packaging personnel is a necessity in other than emergent value sales strategy (Keränen & Jalkala, 2014). If there is no time for common sales personnel to familiarize themselves with intelligent packaging and properly start promoting them, an underlying support organization might be a suitable solution. The potential customers that do not possess intelligent packaging operations of their own will require proper information before initiating a relationship with a supplier (Group manager, 2015). Specialists are an important part in this interaction as typical sales people may not be motivated or well enough equipped for creating trust about their offerings in terms of intelligent packaging. (Pharma seg. dev. manager, 2015; Senior manager, 2015)

5.3. Outcomes of implementing intelligent packaging solutions in value chains

As indicated by customer interviews and noted from the supplier interviews, a disconnection can be seen between the interested parties of both organizations when it comes to intelligent packaging. The supplier sees contacting the right people initially difficult as the interaction is done through marketing and sales people, who have their primary priorities elsewhere and are used to working with the procurement and purchasing. Based on the customer interviews, the most likely people to take up intelligent packaging and motivate the rest of the chain would be quality control personnel. Knowing this would necessitate information gathering and storage for later sales operations, so that the pitching time could be efficiently used based on the quality controllers' needs.

The supplier's developing supporting organization suggests an intention to shift towards the life-cycle value management strategy. Having a specified group, or even a person as initially planned, managing the hand over phases of the project between different departments would ease the transition to a proper solution business organization. Such low investment is bound to cause a bottleneck in developing the

business further as the requirement for personnel will likely be higher as soon as more partners are gained. It is also not immediately certain that this type of support organization would make a life-cycle value management strategy viable, as a data management system is necessary along with a division of labor between different organizational units. In the case of company D, they found RFID solutions as a necessary addition for a future where manual labor within the supply chain needs to be reduced, while efficiency could still be improved. Achieving such savings seems like a significant prospect to the firm and therefore they have engaged in it on their own right.

As discussed earlier, such planning and development alone is likely not as feasible as there are many more components that factor into producing a typical offering. An example of this would be company A's FMCG chain where more than 50 factories produce different products that are then distributed around the world. The difference to company D's situation is that these products are shipped to retailers and their materials and components are provided by wildly different types of companies. Involving and convincing all of the necessary stakeholders within the value chain in this case would be necessary, but an arduous endeavor. Initiating such project on their own might prove to be too much for companies of this size. This also begs the question if it would be beneficial for the intelligent packaging supplier to engage in such project either. A careful financial analysis and realistic estimations of implementation would be in order.

Based on this position about RFID-technology for FMCG markets, it can be seen that intelligent packaging implementation would need to be very gradual and start in a specific area of the customer's markets as suggested by company E (Senior principal scientist 2, 2015). Even if the customer managed to convince their material providers and immediate partners to cooperate, the final say in logistics solutions is in retailer's hands which is a hard case, unless more companies implemented RFIDs in their supply chains.

While logistics solutions do not seem initially viable for FMCG markets, but probable later down the line when suppliers' intelligent packaging organizations can support wide scale implementation, marketing and customer interaction devices bring hope. A successful product on the consumer markets could pave way for further interest within the customer companies. Although reference marketing in consumer products is not considered positive, it could be used in internal marketing at the customer.

When asked about the size of past companions, the supplier's research specialist stated that they have not perceived small customers as interesting partners, but should probably consider them in the future. The flexibility of used converters is a likely limiting factor to the potential number of small partners however (Research specialist, 2015). Proper customization for these customers' needs would either require increasing capacity for processing their requirements or cause extra set up times due to changing configuration. This issue is also depicted by the sales & marketing director's comments: The supplier's current specialized equipment for intelligent packaging operations is very limited and mostly based on demo purpose machinery (Sales & marketing director, 2015). It might be difficult to justify the use of these devices for small customers or investing in new machinery specifically for them.

In the end, the perceived value within an intelligent packaging value chain seems to be most solidly in the intellectual property of a key innovation. If there is a case of openly available technology, the customer interview data suggests that an integrator style solution business could be viable for interaction with smaller companies that cannot allocate resources for managing intelligent packaging by themselves. Whether this type of business would be profitable will depend on plenty of factors, several of which were revealed over the customer and supplier interviews:

- Cost/benefit ratio
- Contact to right people, for other than logistics, the best might be quality control
- Involvement of as many actors in a network as possible
- Adding enough value to justify attempting it

The studied models and customer interviews suggest that, as long as there is an owned IP, creating a support system with systematic data management for it would seem efficient. If the supplier does not own a core technology within the value chain, the most viable option seems to be managing the said network where the customer cannot create their own intelligent packaging operations. Regardless of the chosen path, using data from customer interactions is necessary for easing the amount of work in the long run. Having the knowledge of customer interactions readily available also would make it more likely that know-how and knowledge and customers would stay with the company even if a sales person left the company. In addition to this, being able to utilize a knowledgebase would help maintaining and improving customer contact through need recognition and better future estimation.

6. SUMMARY AND CONCLUSIONS

Making the acknowledgement that being a qualitative research affects the starting point of this thesis is necessary. As a researcher who interprets information gained through interviews from different people and companies in different proportions, a completely unaffected position and point of view are unlikely to persist in reality. Regardless of this, the results of this paper should prove useful for both the involved companies and other parties that consider intelligent packaging, or value generation in networks in general. (Tuomi, J. & Sarajärvi, A., 2011)

The main findings of the thesis are presented by first revisiting the framework that was constructed based on a strategy model by Keränen & Jalkala (2014), after which the overall results are discussed through the research questions. The framework emphasizes the importance of systematic data management in the core of value creation business. Three major components of this value creation are value propositions, value co-creation and continuous value assessment, which work as a justification for the suggestions for the research questions. These questions are reviewed in terms of drivers, strategies and outcomes of implementing intelligent packaging solutions in value chains. Interview analysis has yielded the answers to the first two questions and application of the theory framework provides the answer to the third.

RQ1: Why have intelligent packaging solutions not been widely implemented in networks? The initial cost of intelligent packaging solutions greatly outweighs its perceived benefits for the potential customers. This is either due to unawareness of the reality of the market or past testing or calculations. Being able to implement intelligent packaging would require significant efforts in logistics solutions due to the friction caused by stakeholders such as logistics companies and retailers. Companies that are large enough to leverage their size in such negotiations are also potentially large enough to manage intelligent packaging operations by themselves and thus do not require an integrator or a solution provider to manage or establish networks.

RQ2: Where is the perceivable value in intelligent packaging networks? The clearest and mutually unified statement about the value of intelligent packaging focuses on intellectual property (IP). Customers expect that a supplier owns an IP and would prefer to co-develop it further with them. In the case of old IP, the customer would prefer to participate as there would be no danger of copying, while in the case of a new IP, a possibility for exclusive rights or first mover advantage are seen as a good prospect. If the supplier lacks an original IP, there is little to no perceived value for large companies. Smaller companies that cannot manage a network on the other hand, believe that the value lies in the ability to pull a network together to bring economies of scale benefits and potentially good offerings through co-development.

RQ3: How should intelligent packaging business be initiated in networks? Based on the explored theories, it can be concluded that the initiation should be done with a proper value offering through a foundation on comprehensive analysis. The key in this value offering is in the answer to the question: “What is *most* worthwhile for our firm to keep in mind about your offering?” This conclusion is justified by the direct answers from potential customers and discovery from the examined theory. A position to strive for after this starting point is suggested in the constructed framework: A specialized organization that actively interacts with the customer and continuously and routinely records and analyzes the acquired data. This type of operations enable a possibility for value offering and value co-creation with the customer. From a successful initiation, future implementation becomes easier and gradual development for the rest of the network should be possible with a viable business case.

Lastly, the dilemma of economies of scale remains: Will a customer want an intelligent packaging solution before there is a significant network behind it, and will there be a significant network if customers do not want to join? For this, I suggest attempting to find enough small and willing partners that will eventually work as a good reference of successful implementation and possibly create a network of prospective companies.

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