



How Efficient are Ready-To-Sell Packaging Solutions through IKEAs Supply Chain?

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Preface

In a commercial movie a lady bikes slowly in a pleasant tempo. At the same time a man shows up on his bike when overtaking the lady in high tempo. Later in the commercial the lady still bikes slowly in a nice and calm tempo and she overtakes the man who is changing his flat tyre. What is efficiency in this content? For us is efficiency about performing right activities in the right way in order to reach the goal in the best way possible.

As the final part of the Master of Science Degree in Mechanical Engineer, this Master Thesis was created. The thesis is a project for *IKEA of Sweden* in cooperation with the *Division of Innovation and Packaging Logistics at Faculty of Engineering, Lund University, Sweden*.

We would like to thank our supervisors Ola Knutsson and Mats Johnsson for their positivism regarding the report and our performance.

We would also like to thank all other IKEA co-workers whom we met during the project for their involvement and for taking their time to answer all our questions. Without all important comments regarding the subject it had been hard for us to find a conclusion. We would like to address a special thanks to the co-workers in the Älmhult IKEA store, who have let us take part in the replenish activity several times in the early morning hours.

May 29th 2009, Lund, Sweden

Johanna Klaesson and Marie Lundgren

Abstract

Title: How efficient are Ready-To-Sell packaging solutions through IKEA supply chain?

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Purposes: There are two purposes of thesis, the first is to determine: *How efficient are Ready-To-Sell packaging solutions through IKEAs supply chain?* And the second is to determine: *To what level are Ready-To-Sell packaging solutions utilized at IKEA stores? If the solutions aren't used as intended, what is the reason?* Based on the result from the case study the objective is to: *Identify possible potentials with Ready-To-Sell packaging solutions at IKEA.*

Method: Quantitative and qualitative data were collected, using methods as; *literature research, interview, survey and observation.* In the beginning of the study the approach was *Inductive* to create an understanding for the task. Further, when testing theories empirically a *Hyper-deductive* approach was used and finally *Abdicative* approach. The *Abdicative* approach was used since, the subject of shelf ready packaging solutions are new and the authors came up with own ideas and possible conclusions, tested during the project.

Conclusions: Ready-To-Sell has shown to be cost efficient for pallet solutions, all products didn't give a significant saving but a trend was found that *Picking cost* in warehouse impacts mostly. The thesis found Ready-To-Sell shelf solutions to be cost inefficient in general. This since the expenses of *Material* overcomes the savings from *Replenish*, the factors that mainly are affected.

Shelf Tray is less time efficient than pallet solutions, and some Shelf Tray products aren't time efficient at all. This is on contrary to pallet solutions which are significantly more time efficient. *Replenish cost* doesn't have a great impact of the financial savings but co-workers are very satisfied with quick replenishment and value the time saving high, it enable them to handle more article numbers during refill hours. Increased availability leads to more products in store which may impacts total sales.

Ready-To-Sell pallet solutions are utilized to almost 90% while the shelf solutions are utilized to 65%. Oversized packages are the main reason why not using the solutions according co-workers. It was also found that there is a connection between utilization and education concerning the impact of Ready-To-Sell solutions.

There is a saving potential using Ready-To-Sell pallet solution, especially when Regular package would have had picking in warehouse since it's the cost factor impacting savings mostly.

Keywords: Ready-To-Sell, Packaging, Package, Logistic, Cost, Efficiency, Supply Chain

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Definitions

Packaging

Packaging refers to a concept or a system, e.g. Ready-To-Sell packaging concept

Package

Package refers to a specific package, e.g. for a specific product

Estimated MDQ

Estimated Minimum Delivery Quantity is the quantity a package should hold in order to remain in store for two weeks, the target for IKEA

MDQ

Minimum Delivery Quantity is the quantity a package holds when delivered from warehouse to store

Refill Hours

Refill hours refers in the text to the time when co-workers refill products and is often the time in the morning before the store open up the doors for customer.

Open/Sell Hours

Open- or Sell hours in the text refers to the time when the store is open for customer.

ECR

Efficient Customer Response is used, especially within food industry, to coordinate actors through supply chain with objectives to increase efficiency

1 Introduction

In order to hold a competitive position on the market it's of high importance to continuously develop more efficient and effective working methods. The aim of introducing Ready-To-Sell packaging solutions at IKEA was to find a more efficient way of working in stores. This chapter provide a background of the Ready-To-Sell concept and discuss purposes of this master thesis. Further are focus and delimitations, target group and outline of thesis presented.

1.1 Background

Eighty percent of our purchase decisions are taken right in the store.¹ The first you see of a product is the package and therefore it has a great impact to catch our attention. According to Paine, one of the most important tools to marketing a product is through packages, and especially by the package design.²

Packaging has historically been seen as a necessary evil. It was before businesses realised the impact it has both on the selling potential, by working with attractive package design and image, and possibilities for efficient and effective handling through supply chain, by adapting right size and amount for high filling rate.

One company known to be well aware of costs and continuously working hard to cut cost through the whole supply chain are the home furnishing company IKEA. Already in 1956 the company explored the advantages of flat boxes which are one of IKEAs main concepts.³

IKEA is today the world's largest company within the business area, interior decorating,⁴ and they grow in sales volumes every year⁵. This aspect of expansion together with an ambition to increase the range in stores on existing space and desire to decrease prices and costs forms a challenging situation for IKEA.⁶

A big part (46 %) of costs which occur in a retail supply chain can be associated with getting products from the stock in store to the shelf.⁷ A study by DULOG shows that costs for selling and handling a product is covered by 16,2% of selling the price, and more than 62% of this amount stands for activities related to handling in retail.⁸ Therefore there's a great potential for savings in the last part of the supply chain.

IKEA controls its supply chain, from supplier to customer⁹ and can therefore easier optimize the whole supply chain. The company have historically put great weight in optimization of the distribution logistic, from supplier to stores loading platform, by flat packages and high filling rate.

¹ Mild Nygren, G. (2008) *Förpackningens hemliga språk*. p 19

² Corner, E. & A. Paine, F. (2002) *Market Motivators – the special worlds of packaging and marketing*. p 68

³ http://www.ikea.com/ms/sv_SE/about_ikea_new/about/history/1940_1950.html (2009-02-06)

⁴ Söderman, S. (2002) *Affärsutveckling med exempel från H&M, IKEA, ABB, och Volvo*. p 276

⁵ <http://www.ikea-group.ikea.com/?ID=10> (2009-02-05)

⁶ Cecilia Johansson *Manager Packaging Concept, IKEA of Sweden*. 2009-01-21

⁷ (2006) *Packaging: Making an impression*. p 45

⁸ Saghir, M. (2002) *Packaging Logistics Evaluation in the Swedish Retail Supply Chain*. p 2-3

⁹ Klevås, J. (2005) *On opportunities of integrated packaging, logistics and product development – Experiences from a case study at IKEA*. p 62

Lean Retailing was a project at IKEA with aim to focus on how retail can be more efficient in order to broaden the optimization perspective by considering more than distribution logistic. One part of the discussion was to make handling in store more efficient and at the same time maintain the commercial impression.¹⁰

From the Lean Retailing the concept *Ready-To-Sell* packaging solutions were born at IKEA. This concept should make handling both efficient and commercial. The vision with Ready-To-Sell is: *Only supplier and customer need to touch a single item-pack in the IKEA pipeline.*¹¹

Since the Ready-To-Sell introduction 2005 no follow up studies have been done at IKEA and the company felt an analysis of the current situation was necessary to determine how efficient Ready-To-Sell packaging solutions at IKEA are by considering both quantitative and qualitative aspects.

1.2 Problem Discussion

The intention when introducing the Ready-To-Sell concept at IKEA was to make the replenishing in store quicker and more efficient to enable co-workers handle larger volumes and range using the same resources.

This argument led to questions concerning efficiency at IKEA. Is the replenishing procedure more efficient and is it cost efficient for the whole supply chain? In a supply chain there are many actors involved and many costs are affected. Who is affected by a change of packaging and is the concept better for all actors?

The question about utilization was raised as well. Are the packaging solutions used as intended and if not, why? Are there negative aspects with a quick replenishing?

1.3 Purpose and Objective

The initial purpose of this master thesis is to determine

How efficient are Ready-To-Sell packaging solutions through IKEAs supply chain?

And the second purpose is to determine

*To what level are Ready-To-Sell packaging solutions utilized at IKEA stores?
If the solutions aren't used as intended, what is the reason?*

Based on the result from the case study the objective is to

Identify possible potentials with Ready-To-Sell packaging solutions at IKEA.

1.4 Focus and Limitations

The supply chain at IKEA can simply be described to start at the supplier from where the products are transported either to warehouses and then further to stores or direct to stores in order to be available to customer, see Figure 1.1.

¹⁰ Cecilia Johansson *Manager Packaging Concept, IKEA of Sweden*. 2009-01-21

¹¹ Ibid.

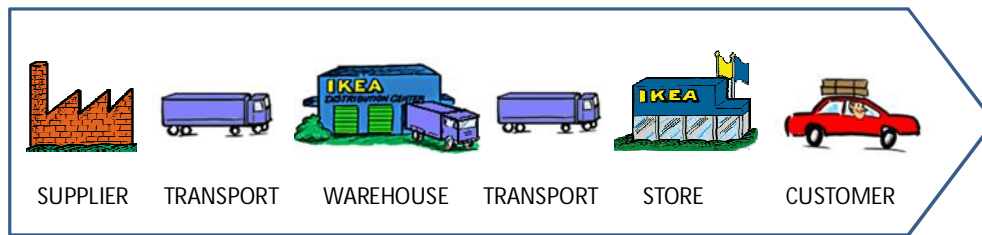


Figure 1.1 A stereotype model of IKEAs supply chain

The thesis delimitates from the customer and focus on the stores since the packaging concept mainly is designed to enable easy handling in store.

The range of IKEAs products are divided into *showroom-* and *market hall products*. The first category consists of furniture and the second represent “smaller” items e.g. impulse purchases the customers didn’t plan to buy. The thesis delimitates showroom articles, i.e. only investigate market hall products.

IKEA are acting all over the world, due to geographical barrier the master thesis haven’t been able to study the global market, instead a few markets have been selected to represent the worldwide situation.

1.5 Target Group

The major target group for this master thesis is co-workers at IKEA of Sweden working with packaging development such as packaging technicians at the different Business Areas and the department for Packaging Concepts.

Other packaging developer acting in the retail industry, Division of Innovation and Packaging Logistics at Faculty of Engineering, Lund University and other with interest in discussed topics may also find interest in the report.

1.6 Outline of the Thesis

In order to give the reader guidance through the report, an outline is presented. It’s a brief description of the content in the different chapters.

1 Introduction

This chapter provides a brief background to this project and a short presentation of the case company. A problem discussion and the purposes of the thesis are presented and, to enable an accurate proportion of the study, focus and limitations are also defined. Further the target group of the thesis is defined.

2 Methodology

The differnt methodological perspectives and approaches are presented together with a classification of the authors within these. Further is case study as method shortly described and a motivation of why this method is chosen presented. Finally are quantitative and qualitative data compared and data collection methods used in the study described.

3 Frame of References

In this chapter the frame of references will be described and relevant literature concerning packaging, logistics and packaging logistics are presented. Definitions concerning subjects relevant for the thesis will also be offered.

4 Case Study

Case study is a method recommended to be applied when answering questions such as *how* and *why*. Therefore a case study is applied for this project at IKEA. The section discusses the background for the thesis, how the authors approached the problem and how the case study is designed in order to fulfil purposes.

5 Packaging at IKEA

A packaging system describes the hierarchal levels; *primary-*, *secondary-* and *tertiary packages* and explain how the stages interact. This section describes the packaging systems at IKEA. The four Ready-To-Sell packaging solutions underlying the thesis are presented; *Pallet Tray*, *Tear Away*, *Tray on Tray* and *Shelf Tray*.

6 Analysis

Ready-To-Sell packaging solutions are utilized to different levels, depending on the solution, and are described first in this chapter in order to create an overall understanding for Ready-To-Sell, also a number of potential reasons for not using the solutions are discussed. Further, the aim of this section is to analyse how efficient the different Ready-To-Sell solutions are. This is done by discussing cost- and handle ability efficiency for each solution; *Pallet Tray*, *Tear Away*, *Tray on Tray* and *Shelf Tray*. And finally, the chapter analyse how well IKEAs Ready-To-Sell solutions meet Efficient Customer Response requirements to be successful.

7 Conclusions

This section will shortly discuss what the case study concluded based on this master thesis purposes presented in the introduction of the report. Results are based on comparison of Ready-To-Sell and Regular packages.

8 Recommendations and further research areas

The authors of this thesis have during the investigations at IKEA found factors which will enable co-workers to work in a more efficient way. The chapter will discuss recommendations and areas which should be further researched in order to more exact determine how cost efficient the packaging concept Ready-To-Sell are.

2 Methodology

The methodology chapter provides information and discussion about methodological perspectives and approaches a study can adapt. Qualitative and quantitative, primary- and secondary data are also explained in order to underlie methodological choices of this master thesis.

Methodology is the science about the systematic approach according questions about *who*, *what* and *why* in a research.¹² Methods aren't aims in it self, they are tools to be used as help in the research.¹³ It's important to study different variations of methods to find the most appropriate way to reach true and usable result for the research.¹⁴ Still, it's not realistic to think there's just one method giving the true picture of a situation,¹⁵ instead the best way might be to use a combination of two or more¹⁶.

2.1 Methodological Perspective

Depending on the point of view the researcher perceives the world, he/she belongs to a certain paradigm. A paradigm is described as a combination of *perception of reality*, *perception of science*, *ideal of science* and *ethical- and esthetical aspects*.

- *Perception of reality* is how the reality is constituted in a philosophical way. Is the subsistence arranged and logical or not?
- *Perception of science* is the knowledge we gained during experience and education and how it forms pre-understanding about the things we studies.
- *Ideal of science* is connected to the researcher and what he/she want to achieve with the study.
- *Ethical and esthetical aspects* is what the researcher means with moral, what is appropriate or not, and what is beautiful or not.¹⁷

From the four statements above the researcher can be described and categorized to belong to one of the three main methodological perspectives¹⁸:

Analytical perspective The researcher wants to explain the truth as objective and complete as possible. He/she believes that the totality is the sum of all the parts and that the parts don't interact with each other.

Systems perspective Also this perspective is objective but now the researcher believes there are synergies between different parts. He/she want to investigate relations.

Actors perspective In this perspective the reality is a social construction both affecting and affected by humans. The researcher believes that experiences have an impact on the result.

The authors of this thesis belong to a mixture between the second and the third perspective described above. They believe there are synergies between parts of the supply chain investigated, they also consider earlier experiences may impact the outcome.

¹² Holme, I. & Solvang, B. (1997) *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*. p 11

¹³ Ibid. p 11

¹⁴ Björklund, M. & Paulsson, U. (2003) *Seminarieboken – att skriva, presentera och opponera*. p 57

¹⁵ Holme, I. & Solvang, B. (1997) *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*. p 76

¹⁶ Ibid. p 85

¹⁷ Arbner, I. & Bjerke, B (1994) *Företagsekonomisk metodlära*. p 32

¹⁸ Ibid. p 69-70

2.2 Methodological Approach

Inductive, *hyper-deductive* and *abdicative* are three different ways to approach a study as a researcher. These are described as:

Inductive The researcher “follows the exploring way”. First he/she study the empirical data, free from theoretical pre-understandings, and than formulates the theory.¹⁹

Hyper-deductive The researcher “follows the manifested way”. By using already existing theories the researcher creates hypothesis which are being tested empirically.²⁰

Abdicative From possible conclusions considering the problem the researcher test and validate the results.²¹

The authors of this thesis have used all three approaches in different stages of the process. In the beginning of the study the main approach was *Inductive* in order to create an understanding for the task. Some theories were discovered and by testing them empirically also the *Hyper-deductive* approach was applied. The subject of Ready-To-Sell packaging solutions is quite new and it was hard to find theoretical material to lean on. That’s why the authors came up with own ideas and possible conclusions that during the study were tested, i.e. using *Abdicative* approach see Figure 2.1.

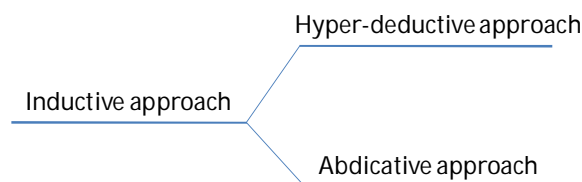


Figure 2.1 The thesis approach

2.3 Quantitative and Qualitative

In general quantitative methods generate information in numbers and quantities that can be evaluated with statistical methods and qualitative data is a deeper kind of information that is read from the researchers pre-understanding. There’s no competition between the qualitative and quantitative data collection types. The two methods can be used together to supplement each other in order to get a better picture of the situations investigated.²²

2.3.1 Quantitative

If the purpose of the study is reached by collecting data that could be measured or numerical valued a quantitative method is to be used.²³ One of the greatest strength with quantitative methods is the ability to generalize the data collected, but the strength also contributes to the weakness of the method. If the data collected doesn’t correspond with the aim of the research it doesn’t matter how many statistical conclusions there are.²⁴ A relation between two parameters isn’t more true or reliable because it is expressed in numbers.²⁵ If you are aware of

¹⁹ Davidsson, B. & Patel, R. (1994) *Forskningsmetodikens grunder – Att planera, genomföra och rapportera en undersökning*. p 20

²⁰ Ibid. p 20

²¹ Wallen, G. (1996) *Vetenskapsteori och forskningsmetodik*. p 48

²² Holme, I. & Solvang, B. (1997) *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*. p 76

²³ Björklund, M. & Paulsson, U. (2003) *Seminarieboken – att skriva, presentera och opponera*. p 63

²⁴ Holme, I. & Solvang, B. (1997) *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*. p 81

²⁵ Ibid. p 149

the weaknesses and limitations of the quantitative method the possibilities of getting a reliable and useful answer is high.²⁶

2.3.2 Qualitative

Qualitative data is the kind of data often collected from interviews and observations. This type of data is used when the researcher needs a deeper understanding in a specific subject, situation or phenomena.²⁷ The qualitative method is an attempt to go beyond the subject-object relationship between the researcher and the phenomena observed.²⁸ Qualitative data can't be generalized in the same way as quantitative data, e.g. it's hard to translate the interview answers in to numbers in an appropriate way.²⁹

When qualitative data is collected it's important to know the researcher may impact the person/persons participating in the activity. A relationship between the researcher and the respondent can occur. From this relationship the respondent may try to satisfy or dissatisfy the researcher instead of just telling the truth. By get in to the role of the "interested listener" the researcher has the best possibility to achieve a good result of the method.³⁰

To be able to meet the different purposes of the master thesis, cost- and handle ability efficiency, the authors uses both quantitative and qualitative data. Quantitative to meet up with the cost aspect and qualitative to see how actors in the supply chain are affected by Ready-To-Sell packaging.

2.4 Case Study

According to Gammelgaard "... the case study can- and should- bring new perspective into logistics management research based on more information and deeper insight. By the new perspectives, we may gain an insight into real logistics management processes."³¹

Defining the research question is one of the most important steps in a study. It's important to understand the *substance* i.e. what the study is about, and the *form* i.e. what kind of question is being asked.³² Depending on the question a research aim to answer, different kind of methods and strategies should be applied.³³ A case study is the relevant strategies when question starts with *how* and *why*.³⁴

Since the purposes of the thesis are formulated:

How efficient are Ready-To-Sell packaging solutions through IKEAs supply chain?

And

To what level are Ready-To-Sell packaging solutions utilized at IKEA stores? If the solutions aren't used as intended, what is the reason? (Why not use?)

²⁶ Holme, I. & Solvang, B. (1997) *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*. p 150

²⁷ Björklund, M. & Paulsson, U. (2003) *Seminarieboken – att skriva, presentera och opponera*. p 63

²⁸ Holme, I. & Solvang, B. (1997) *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*. p 92

²⁹ Ibid. p 98

³⁰ Ibid. p 98

³¹ Klevås, J. (2005) *On opportunities of integrating packaging, logistics and product development – Experience from a case study at IKEA*. p 21

³² Yin, R. K. (2003) *Case Study Research: Design and Methods*. p 7

³³ Ibid. p 5

³⁴ Ibid. p 7

The authors of the thesis found case study to be an approach well suited for the purposes. The *Design of Case Study* is further described in Section 4.4.

2.5 Data Collection

To get a spread of information and take both the quantitative and the qualitative parameters into consideration the authors of this thesis have chosen to use different kind of data collections; *literature researches, surveys, interviews and observations*, to obtain a result based on the purposes. Both *primary data*, i.e. data gathered for a specific study³⁵ and *secondary data*, i.e. data collected with other purpose than our specific study,³⁶ were collected in order to increase reliability. The different data collection methods are described below and in section 4.4 the choice of methods appropriate for this thesis are presented.

2.5.1 Literature Research

Literature is all kind of written materials such as books, articles and brochure and can be described as secondary data. It's of high importance to be critical when reading and using this material since it, due to its special objective, can be biased.³⁷ Literature research is a good method to obtain a general view in a topic when having limited resources.³⁸

In this master thesis literature such as books, articles and theses were studied in areas of logistics, packaging and packaging logistics to increase understanding for the task. Literature within the area of Retail Ready Packaging is today limited due to the relative new way of working for actors through supply chain. However Efficient Customer Response (ECR) has made a comprehensive guide about Retail Ready Packaging with focus in the food industry. The thesis applies this as a base of discussion when analysing Ready-To-Sell packaging efficiency within IKEA.

2.5.2 Interviews

Questionnaires applied personally, via telephone- or email contact are interviews. Since it contributes with data to a specific study it's called primary data. Number of respondents vary and are to be considered for the specific case.³⁹

An interview can be designed as *structured* meaning all questions are decided on beforehand and are asked in same order, *semi-structured* when all discussion areas are decided before but exact questions are made during the interview or *unstructured* when it's designed as a conversation where questions arise during the interview.⁴⁰

Advantages applying interviews are the opportunity to eliminate misunderstanding since the interviewer can ask follow-up questions. Interviews can also contribute to a deeper understanding of a topic. There is a risk to unconscious bias questions, especially when unstructured interviews are applied.⁴¹

2.5.3 Survey

A survey includes different questions or statements together with answer options which are determined before the study. The answer options can for e.g. be yes or no, a scale or

³⁵ Björklund, M. & Paulsson, U. (2003) *Seminarieboken – att skriva, presentera och opponera*. p 68

³⁶ Ibid. p 67

³⁷ Holme, I. & Solvang, B. (1997) *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*. p 67

³⁸ Ibid. p 69-70

³⁹ Björklund, M. & Paulsson, U. (2003) *Seminarieboken – att skriva, presentera och opponera*. p 68

⁴⁰ Ibid. p 68

⁴¹ Ibid. p 68,70

possibility for the respondent to describe.⁴² By applying a survey in a study it contributes to a good base of primary data using relatively small efforts.⁴³

How many respondents answering a survey to obtain a reliable result depend on the study and need to be considered for each case.⁴⁴ But to hold as many results as possible it's of high importance to keep the survey structured, give a serious impression as well as avoid too comprehensive survey, otherwise the answer frequency may be low and unreliable.⁴⁵

2.5.4 Observation

Observations can be applied in many different ways, the observation can be *open* or *hidden* where the first describe a situation when the participant are informed about the observation and accept it while the last describes the opposite situation. The observer can also act *active*, take part in the activity or *passive*, without participating.⁴⁶

⁴² Björklund, M. & Paulsson, U. (2003) *Seminarieboken – att skriva, presentera och opponera*. p 68

⁴³ Ibid. p 70

⁴⁴ Ibid. p 68

⁴⁵ Holme, I. & Solvang, B. (1997) *Forskningsmetodik - Om kvalitativa och kvantitativa metoder*. p 173

⁴⁶ Ibid. p 110-115

3 Frame of Reference

In this chapter the frame of references will be described and relevant literature regarding packaging, logistics and packaging logistics will be presented. Definitions concerning subjects relevant for the thesis will also be offered.

3.1 Efficiency and Effectiveness

Efficiency relates to internal activities of a company or supply chain and is measured internally while effectiveness relates to external activities and is best measured at the interface with end customer.⁴⁷ These are illustrated in Figure 3.1.

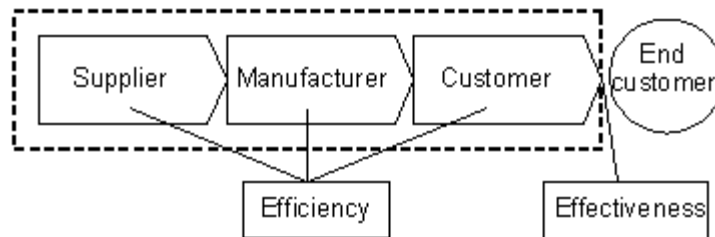


Figure 3.1 Efficiency and effectiveness in a supply chain

Efficiency referred to logistic can be expressed in different variables all represented for a certain purpose, e.g. customer service, costs, capitalization, environment, flexibility and time.⁴⁸

3.2 Packaging

3.2.1 Definition

The view of packaging functions has during the last year changed from just meeting protective requirements towards being an important part of the supply chain. Therefore a large number of definitions of *Packaging* exist.⁴⁹

Paine present following definition of Packaging⁵⁰:

“Packaging is a means of ensuring safe and efficient delivery of the goods in a sound condition to the ultimate consumer, supplemented by efficient reuse of the packaging or recovery and/or disposal of the packaging material at a minimum cost.”

An other common definition used in packaging literature is from EU-directives where Packaging is defined as⁵¹:

“Packaging shall mean all products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer. ‘Non-returnable’ items used for the same purposes shall also be considered to constitute packaging.”

⁴⁷ Saghir, M. (2002) *Packaging Logistics Evaluation in the Swedish Retail Supply Chain*. p 54

⁴⁸ Jonsson, P. & Mattson, S. A. (2005) *Logistik: Läran om effektiva materialflöden*. p 27

⁴⁹ Lumsden, K. (2006) *Logistikens Grunder*. p 481

⁵⁰ Paine, F. A. (1981) *Fundamentals of Packaging*. p 3

⁵¹ (2004) *European Parliament and Council Directive 94/62/EC - on Packaging and Packaging Waste*. p 4

Further the EU-directive describe that packaging can consist of primary- or sales packaging, secondary- or grouped packaging and transport- or tertiary packaging.

Also the meaning of packaging and package are often mixed up, both in literature and in everyday speech, and refers often to the same thing.⁵² In this thesis packaging refers to a system or a concept while package refers to a package for a specific product.

3.2.2 Packaging System

Packaging can be classified as *primary-/consumer-/sales packaging*, *secondary-/group-/retail packaging* and *tertiary-/transport packaging*. Primary packaging has direct contact with the product, secondary packaging is designed to contain numerous primary packaging and tertiary packaging consists of several secondary packaging. Together they form the packaging system with hierarchical levels, see Figure 3.2.⁵³

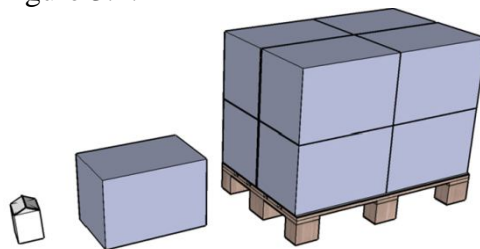


Figure 3.2 Packaging system; *primary, secondary and tertiary*

When developing new packages, or overlooking an existing system it's of high importance to have a holistic view and place the consumer in the centre meanwhile all requirements on a package are satisfied.⁵⁴ It's also important to bear in mind that different levels in the packaging system are of interest depending on where in the supply chain they interact.⁵⁵

3.3 Logistic

Logistic is to plan, implement and control transport and stock keeping of goods from raw material to end customer.⁵⁶

It can be described as the science about effective/efficient flows of materials. Logistic is a concept including all the different activities helping right product/service to get to right place at right time. Logistic aims to get a better result for the total supply chain.⁵⁷

3.3.1 Definition

The Council of Supply Chain Management Professionals, who is one of the world's greatest interest organisations in logistics, defines Logistics as follow⁵⁸:

“Logistics is the process of planning, implementing and controlling the efficient, effective flow and storage of raw materials, in-process inventory, finished goods, services, and related

⁵² Klevås, J. (2005) *On opportunities of integrating packaging, logistics and product development – Experience from a case study at IKEA*. p 33

⁵³ Hellström, D & Saghir, M. (2007) *Packaging and Logistics interaction in retail supply chains*. p 198-199

⁵⁴ ECR (2008) *Förpackningsguide för Dagligvaror – från producent till konsument*. p 5

⁵⁵ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. p 31

⁵⁶ Aronsson, H. Ekdahl, B. & Oskarsson, B. (2006) *Modern Logistik – för ökad lönsamhet*. 3rd Ed. p 21

⁵⁷ Björnland, D. Persson, G. & Virum, H. (2003) *Logistik – För konkurrenskraft – ett ledaransvar*. p 16

⁵⁸ *Ibid*. p 14

information from point of origin to point of consumption (including inbound, outbound, internal, and external movements) for the purpose of conforming to customer requirements.”

An other way of defining Logistic is made by Christopher⁵⁹:

“... process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through the organization and its marketing channels in such a way that current and future profitability are maximized through the cost-effective fulfilment of orders.”

Logistic is not just to do the right things, but also to do them in a right way. One of the most important issues in logistics is to strive for as low total cost and as high customer satisfaction as possible.⁶⁰

To sum up the logistic activities within a company the aim is to⁶¹:

- Reduce transport- and inventory costs
- Be able to respond to the customer demand
- Have enough raw material for production
- Rise the material turnover to minimize frozen capital

3.3.2 Total Cost

Logistic involves different parts of the supply chain, but when discussing logistic cost it's often the total cost that is discussed. It might be right to increase one specific cost if there is a greater gain in other parts of the supply chain.⁶²

The traditional way of making the supply chain efficient is by optimize each part separately. This way of working leads to sub-optimization, to avoid this should logistic development be done in different dimensions at the same time with a holistic view for total supply chain efficiency.⁶³

3.4 Packaging Logistic

Packaging has a big impact on the supply chain and its efficiency. Depending on the packaging and how it interacts with the different activities in the supply chain it can be more or less efficient.⁶⁴

The traditional packaging literature focuses on the customer and how to please the customer. In packaging logistic all the actors in the supply chain is to be seen as the customer or user. If the packaging can please all the needs of the actors and processes along the supply chain a more efficient supply chain is created.⁶⁵

3.4.1 Definition

Packaging Logistic as a concept is still quite new and the definitions to be found don't exactly consist with each other.

⁵⁹ Klevås, J. (2005) *On opportunities of integrating packaging, logistics and product development – Experience from a case study at IKEA*. p 38

⁶⁰ Aronsson, H. Ekdahl, B. & Oskarsson, B. (2006) *Modern Logistik – för ökad lönsamhet*. 3rd Ed. p 21

⁶¹ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. p.30

⁶² Ibid. p 30-31

⁶³ Ibid. p 30-31

⁶⁴ Hellström, D & Saghir, M. (2007) *Packaging and Logistics interaction in retail supply chains*.

⁶⁵ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. p 33

Hellström and Saghir explain Packaging Logistic as⁶⁶:

“...the synergies achieved by integrating logistics and packaging systems with the potential of increased supply chain efficiency and effectiveness, through the improvement of packaging and logistics related activities.”

Packforsk defines Packaging Logistics as⁶⁷:

“...an approach that aims at developing packages and packaging systems in order to support the logistical process and to meet customer/user demands.”

3.4.2 Logistic Management

Historical the logistic tasks have been optimized within each function which led to the business as a whole was sub-optimal. More recently the management approach has been to integrate logistics task and reduce functional barriers. *Storing facilities, Inventory, Transportation, Unitization and packaging and Communications* are elements that should be interlinked through a supply chain to obtain logistic efficiency. For example if communications and transport can be linked effectively a retail can move from keeping stock in store to having direct flow of products to sale space in store, a Just in Time (JIT) approach.

Elements of logistics are expensive if not controlled effectively, for example holding stocks just in case it's needed, but when using logistic tools in a right way there can be many benefits, e.g. by appropriate integration of demand and supply retailer can provide a better service to consumer by having products available in store which is fresher and with higher quality to less costs.

Many retailers have chosen to collaborate closely with their supplier in order to maximize the efficiency in the retail supply chain.⁶⁸

3.4.3 Packaging as a Cost Driver

The package follows the product through the whole supply chain from the filling/production to the end consumer. The greatest packaging related cost is normally generated when the packaging interacts with activities in the supply chain. Costs arise within handling, storing, transport and damaged products and can all be related to the package solution.

The packaging isn't only a cost, it can also create income i.e. its marketing functions. The packaging in its self can add value to the product and increase customers' appreciation.⁶⁹

Cost

Costs increases in the supply chain are normally divided into *direct-* and *indirect costs*. Direct cost is caused by a certain product or service while indirect costs can't be referred to a specific product or service. Depending on e.g. packaging type, manufacturing device, packaging material and retail, the relationship between indirect and direct cost vary. The costs are shown in Figure 3.3.

⁶⁶ Klevås, J. (2005) *On opportunities of integrating packaging, logistics and product development – Experience from a case study at IKEA*. p 45

⁶⁷ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. p 33

⁶⁸ Fernie, J & Sparks, L. (2004) *Retail logistics: Changes and challenges*.

⁶⁹ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. p 38

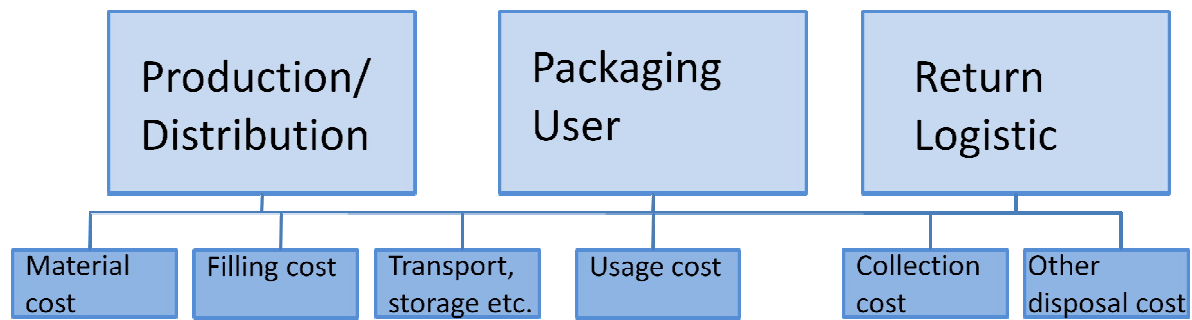


Figure 3.3 Packaging related direct costs ⁷⁰

Production / Distribution

Material cost includes both direct and indirect costs. The direct cost is the actual cost of packaging material or ready-made packaging. The indirect cost is constituted of administration for purchasing of material, storage of material and packaging.

Filling cost is mainly direct as packaging equipment and manual labour. Maintenance of device and staff management is the indirect part.

Transport- storing- and handling cost are all affected indirect. If the packaging is well adapted to the supply chain it can make the flow more efficient and on the contrary an inefficient packaging solution contributes to a higher cost.

Packaging user

Usage cost is the price the user has to pay for the packaging, direct cost. Indirect cost referred to the packaging user can be disposal cost or additional costs that the user has to pay for broken products because of insufficient packaging.

Return logistic

Collection and Recycle cost are both direct- and indirect costs e.g. affected by the design and packaging material choice.

Other disposal cost is direct cost of garbage collection for the packaging that's not being collected and re-cycled.⁷¹

Income

According to Mats Johnsson, packaging can add value to the whole logistic system. By focusing on the different functions of the packaging, e.g. handle ability, ergonomic and information, instead of just seeing it as a protection it might gain the value to the product.⁷²

Packaging can help communicate something about the product to the customer e.g. a glossy packaging to a luxuries product or an environmental-friendly packaging to help identify the producer as environmentally-friendly.⁷³

⁷⁰ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. Modified figure p 40

⁷¹ Ibid. p 40

⁷² Johnsson, M. (1998) *Packaging Logistics – a value added approach*.

⁷³ Klevås, J. (2005) *On opportunities of integrating packaging, logistics and product development – Experience from a case study at IKEA*.

By constructing a packaging solution that is well adapted to the different aspects of the supply chain, great financial savings can be made.

Efficient and effective packaging can save money for a company in the following ways⁷⁴:

- Lighter packaging may save transportation costs.
- Careful planning of packaging size may allow better space utilization of warehousing and transportation.
- More protective packaging may reduce damage.
- More environmentally conscious packaging may save disposal costs and improve the company's image.
- Usage of returnable containers provides cost savings as well as environmental benefits through the reduction of waste products.

3.5 Packaging Requirements

According to Saghir, packaging is⁷⁵

“a coordinated system of preparing goods for safe, secure, efficient and effective handling, transport, distribution, storage, retailing, consumption and recovery, reuse or disposal combined with maximising consumer value, sales and hence profit.”

Consequently packaging should meet many requirements generated from the product as well as from the surrounding environment, and several ways of categorise these exists. In this master thesis these are categorized as functions related to **logistic/flow aspects**, **market aspects** and **environment** as shown in Figure 3.4.

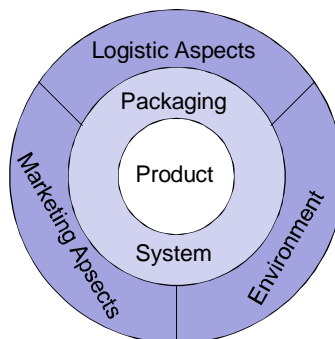


Figure 3.4 Logistic- Marketing- and Environmental aspects⁷⁶

Flow functions of a packaging refer to the logistic flow, i.e. transport, handling and storing, with aim to increase efficiency through supply chain. The requirements rise at different parts of the flow and can be described as followed⁷⁷:

Product protection Package should protect the product against distribution environment and vice versa.⁷⁸

⁷⁴ Klevås, J. (2005) *On opportunities of integrating packaging, logistics and product development – Experience from a case study at IKEA*.p 40

⁷⁵ Hellström, D & Saghir, M. (2007) *Packaging and Logistics interaction in retail supply chains*. p 199

⁷⁶ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. p 34

⁷⁷ Ibid. p 32,34

⁷⁸ Ibid. p 52

<i>Handle ability</i>	Handle ability refers to how well packaging is compliant to handle activities through supply chain including reverse handling as well. ⁷⁹
<i>Flow information</i>	Packaging should provide flow information so the product and its destination can be identified. ⁸⁰
<i>Volume efficiency</i>	Volume efficiency is a measure describing utilization of available volume through total supply chain. Filling rate quantify volume efficiency. ⁸¹
<i>Weight efficiency</i>	Weight efficiency defines as utilization of load carriers available load capacity related to product weight. ⁸²
<i>Right size</i>	Packaging solutions should provide the right amount products and right size of packaging to meet demands at different stage in the supply chain. ⁸³

Market functions refer to features which add value somewhere in the supply chain by make the product more attractive. Market requirements can be divided into following⁸⁴:

<i>Product information</i>	Packaging should provide necessary information about the product.
<i>Selling ability</i>	Packaging should have selling ability by communicate through design and layout.
<i>Safety</i>	Packaging should be safe e.g. child safety and theft proof.

Environmental functions refer to packaging features which intend to decrease environmental stress, improve resource economy and enable easy recycling of packaging. Environmental requirements are described as⁸⁵:

<i>Resource economic</i>	Resource economic means the usage of material and energy should be kept to minimum at manufacturer.
<i>No hazardous material</i>	Packaging should contain minimal usage of hazardous substances in packaging production and packaging material.
<i>Minimal waste</i>	Packaging should contribute to a minimum waste and enable easy recycling or reusing.

⁷⁹ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. p 76

⁸⁰ Ibid. p 58

⁸¹ Ibid. p 62

⁸² Ibid. p 63

⁸³ Ibid. p 72

⁸⁴ Ibid. p 34-35

⁸⁵ Ibid. p 35

3.6 ECR Ready-To-Sell packaging

The concept Ready-To-Sell packaging refers to a package which is ready to put on the shelf at the retailer⁸⁶ without single unit handling when replenish⁸⁷. Ready-To-Sell packaging cover all types of shelf ready packaging such as pallets and display packaging.⁸⁸

3.6.1 Packaging Requirements

Except for all functions a packaging should accomplish as described in Section 3.5, a Ready-To-Sell packaging should fulfil additional requirements to be successful and to bring value within the supply chain, since the packaging also will be displayed. These requirements are as followed^{89,90}:

- Easy to identify* The purpose is to minimize errors during handling through the supply chain. Whether staff looking for replenish at retail or picker locate right product at warehouse. To help identification the product can e.g. be visible through plastic films and have barcodes and product name visible.
- Easy to open* Open the Ready-To-Sell packaging should not require more than one person and preferably, without using tools e.g. knife. If perforation is used, it's expected to be easy to apply without adventuring the appearance of the display package. It should easily communicate how to use/open, such as instructions or illustrations. The activity must contribute to simpler and quicker replenishment.
- Easy to dispose* The time and effort to dispose the packaging should be minimized so resource savings when replenish don't result in cumbersome, time consuming handling. The requirement of using tool should be avoided during disposal. Also as little package material as possible should be in use and different material should be easily separable.
- Easy to shelf* Product should remain stable in Ready-To-Sell packaging after wrapping materials are removed to avoid damages caused by instable Ready-To-Sell packaging. If possible, the Ready-To-Sell packaging dimension should be optimized for ISO⁹¹ modular to utilize filling rates through supply chain.
- Easy to shop* The Ready-To-Sell packaging and product should appear attractive to the customer and essential information being visible, whilst information aimed for others than customer, e.g. barcodes, should be avoided on the front facing part. By creating a Ready-To-Sell packaging which display the brand and product identification it can contribute to the shopping experience in a positive way. Physical aspects are also to be considered, it should be easy to pick and replace the product from the packaging.

⁸⁶ ECR Sverige (2008) *Förpackningsguide för Dagligvaror – från producent till konsument*. p 14

⁸⁷ Dominic, C. et al (2000) *Förpackningslogistik*. 2nd Ed. p 25

⁸⁸ ECR Europe (2006) *Shelf Ready Packaging – Addressing the challenge*. p 4

⁸⁹ ECR Sverige (2008) *Förpackningsguide för Dagligvaror – från producent till konsument*. p 14

⁹⁰ ECR Europe (2006) *Shelf Ready Packaging – Addressing the challenge*. p 15

⁹¹ International Standard Organisation

Depending on the situation such as product, complexity and Ready-To-Sell packaging solution the requirements importance differ and should be handled individually. Where in the supply chain the functions can bring value is showed in Figure 3.5.⁹²

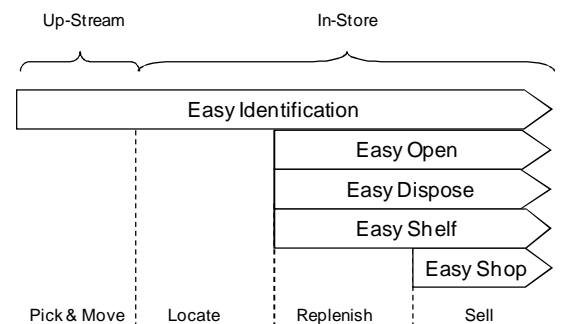


Figure 3.5 ECR Ready-To-Sell packaging requirement⁹³

3.6.2 Conditions for Successful Ready-To-Sell packaging

When adopting a Ready-To-Sell packaging solution a common understanding and willingness for collaborate as partners, is essential for success. It's also of high importance to have a total supply chain view with a mutual goal of enhancing shopper experience and not to implement it secluded without reference to existing supply chain demands.⁹⁴

By mapping the supply chain impacts in different parts, due to the Ready-To-Sell packaging solution, costs and revenues can be identified. These cost and revenues can be balanced in order to identify the potentials with a Ready-To-Sell packaging solution.⁹⁵

Products holding high sales volume and good opportunity for shopper benefits have great potential to generate good advantages.⁹⁶

A Ready-To-Sell packaging solution should build on existing standards that contribute to supply chain optimization.⁹⁷

To ensure a Ready-To-Sell packaging solution implementation is successful it's important to measure and track the change. For example, if an available Ready-To-Sell packaging solution doesn't meet the expected usage the thought benefits will not be achieved, therefore measure utilization of Ready-To-Sell packaging in store is important. Also sales volume, on shelf availability and productivity may be of interest to measure.⁹⁸

When introducing new Ready-To-Sell packaging, instructions should be communicated to the store manager and further to co-workers in store. If the co-workers understand why Ready-To-Sell packaging is used and expected benefits they are more likely to adopt best practice of the new packaging. Instructions should briefly describe how to open and use, merchandise, replenish and dispose the Ready-To-Sell packaging.⁹⁹

⁹² ECR Europe (2006) *Shelf Ready Packaging – Addressing the challenge*. p 15-21

⁹³ Ibid. Modified figure p 15

⁹⁴ Ibid. p 11,22,23

⁹⁵ Ibid. p 29,30

⁹⁶ Ibid. p 25

⁹⁷ Ibid. p 11

⁹⁸ Ibid. p 33,36

⁹⁹ Ibid. p 38

3.6.3 Advantages and Disadvantages

Implementing a Ready-To-Sell packaging solution can contribute to advantages such as easier and quicker replenishment resulting in reduced replenishment costs, increased on-shelf availability and product visibility, reduced out of stocks and increased sales volume.¹⁰⁰ From a shoppers point of view IGD have found the packaging solution look clean, tidy, more appealing¹⁰¹ and easier to find since it draws attention.¹⁰²

Depending on conditions for Ready-To-Sell packaging the solution can have a reverse effect. From shoppers point of view negative aspects have been discovered when perforation is torn the wrong way, which affect the appearance negative, when empty boxes are left on the shelf¹⁰³ and when the packaging prevent accessibility to a product e.g. packaging collar and shelf disable access to product¹⁰⁴ or when products are to tightly packed¹⁰⁵.

3.7 Availability

It seems clear that stock out leads to decreased sales since the product can't be displayed or sold. The customers react negatively to the stock out and experience a lower satisfaction when choosing product. Stock out does also increase the likelihood of unsatisfied customers switching stores on subsequent shopping trips.¹⁰⁶

By improve product availability the customer satisfaction and total sales can increase.¹⁰⁷ It's important for stores to get better in making their customer to buy more. There are no new customers and merchants must get better in persuading existing customers to purchase more. This is possible by having more personal in store that can make the products to occur as exactly what the customer need.¹⁰⁸

¹⁰⁰ ECR Europe (2006) *Shelf Ready Packaging – Addressing the challenge*. p 10,11,17

¹⁰¹ (2006) *Packaging: Making an impression*. p 2

¹⁰² ECR Europe (2006) *Shelf Ready Packaging – Addressing the challenge*. p 45

¹⁰³ (2006) *Packaging: Making an impression*. p 2

¹⁰⁴ ECR Europe (2006) *Shelf Ready Packaging – Addressing the challenge*. p 45

¹⁰⁵ *Ibid.* p 35

¹⁰⁶ Fitzsimon, G. J. (2000) *Consumer response to stockouts*. p 249-266

¹⁰⁷ <http://www.techmedia.dk/default.asp?Action=Details&Item=4065> (2009-05-29)

¹⁰⁸ Berfield, S. (2009) *Getting the most out of every shopper*. p 45

4 Case Study at IKEA

Case study is a method recommended to be applied when answering questions such as how and why, therefore a case study are applied for this project at IKEA. The section discusses the background for the thesis, how the authors approached the problem and how the case study is designed in order to fulfil the two purposes.

4.1 Briefly about IKEA

IKEA was founded by Ingvar Kamprad 1943 in Småland in Sweden. The name IKEA is formed by the founders initials I.K. together with first letter from Elmtaryd and Agunnaryd, the farm and the village where Ingvar grew up.¹⁰⁹

The first IKEA store was opened 1958 in Älmhult. At that time were the products sold in the store provided by suppliers in the area around Småland.¹¹⁰ Today has IKEA expanded to 259 stores located in 37 countries (February 2009), offering approximately 9500 products provided by 1380 suppliers in 54 countries all over the world. The IKEA group has about 127 800 co-workers and its sales for financial year 2008 were 21,1 billion euro¹¹¹, an increase of 7 % from 2007¹¹².

IKEAs vision is *to create a better everyday life for the many people*. The business idea support this by *offer a wide range of well-designed, functional home furnishing products at prices so low that as many people as possible will be able to afford them*.¹¹³

IKEAs unique concept may explain its success; flat packaging, self service in store and customer's willingness to assemble products themselves keeps transport-, labour- and storage cost to minimum.¹¹⁴ This enables IKEA to offer products at low prices to their customer.¹¹⁵

IKEA is well known as a company viewing packaging and logistics as essential factors,¹¹⁶ something well reflected in the organisation, IKEA are having numerous packaging technicians continuously improving packaging solutions in order to be more efficient, e.g. Ready-To-Sell packaging solutions.

4.1.1 IKEA of Sweden

IKEA of Sweden (IoS) is a part of the IKEA group located in Älmhult in Sweden. IoS is responsible for product development activities and are divided into different Business Areas (BA:s) each responsible for product development, packaging development and planning of a certain range, e.g. BA8 textile and BA9/50 cooking & eating/oasis. IoS have beside the BA:s competence functions working over the BA borders, e.g. Packaging Concept working with an overall strategy for packaging solutions at IKEA.¹¹⁷

¹⁰⁹ <http://www.ikea-group.ikea.com/?ID=43> (2009-02-02)

¹¹⁰ *Framtiden är full av möjligheter – Historien om IKEA konceptets utveckling*. p 5

¹¹¹ Financial year 2008 cover the period from 1 September 2007 to 31 August 2008

¹¹² http://www.ikea.com/ms/sv_SE/about_ikea_new/facts_figures/index.html (2009-02-02)

¹¹³ <http://www.ikea-group.ikea.com/?ID=2> (2009-02-02)

¹¹⁴ Warnaby, G. (1999) *Strategic consequences of retail acquisition: IKEA and Habitat*. p 412

¹¹⁵ <http://193.108.42.168/?ID=5> (2009-02-02)

¹¹⁶ Klevås, J. (2005) *On opportunities of integrating packaging, logistics and product development – Experience from a case study at IKEA*. p 62

¹¹⁷ *Ibid*. p 63

4.2 Background to the Case Study

Five years ago a project at IKEA, in collaboration with McKinsey, resulted in *Lean Retailing*, the aim was to study how IKEA could be *leaner*, *quicker* and *simpler* in the stores. One part of the projects outcome was Ready-To-Sell packaging solutions and the concept was born at IKEA. The concept should, due to quicker replenishment, enable the co-workers to handle larger volumes and range using same resources.

IKEA had been working with retail ready packaging solutions for a while but without having it neither as a concept, nor in the same extension as it became after introduction of Ready-To-Sell. Just ahead of the formal introduction a brief study focusing on saving potential in store was made by co-workers at IoS, but further investigations in how the solutions actually works in supply chain and impact cost factors through the logistic flow haven't been done.

Aronsson means, in order to create good conditions for a successful alteration it's necessary to analyse the current situation i.e. knowledge of where the organization is today, and how a change can conduct to improvements.¹¹⁸ IKEA never did this kind of analyse before introduce Ready-To-Sell and therefore a study felt accurate to analyse how efficient the concept is today.

The master thesis is a case study performed at IoS in order to investigate how efficient Ready-To-Sell packaging solutions are within IKEAs supply chain.

4.3 Case Study Approach

In order to understand the problem the thesis reflected what an efficient package in general is and what requirements it should meet. Following main qualifications came up:

- Protect product through supply chain
- Enable easy handling
- Require minimal handling
- Have selling ability
- Use minimal material
- Enable high filling rate through distribution channel

Many of these qualifications a package should meet can be linked to costs, e.g. minimal handling affect labour costs; high filling rate through distribution channel affect transport- and space costs, and if the packaging don't protect the product it affect quality costs.

Further these qualifications impact actors in different sections of the supply chain, and when evaluating how efficient a packaging is a holistic view is essential. Figure 4.1 illustrates the major packaging requirements connected to IKEAs logistic flow where the impact is greatest.

¹¹⁸Aronsson, H. et al *Modern Logistik – för ökad lönsamhet*. p 173



	SUPPLIER	WAREHOUSE	TRANSPORT	STORE
Protect product	X	X	X	X
Easy handling	X	X		X
Minimal handling	X	X		X
Selling ability				X
Minimal material	X			
High filling rate		X	X	

Figure 4.1 Major packaging requirements connected to the logistic flow

When designing the case study at IKEA this illustration was applied and complemented with literature studies, internal IKEA documents and tools.

4.4 Design of Case Study

According to Yin the design of a case study is the “... *logic that links the data to be collected (and the conclusions to be drawn) to the initial question of study.*” By designing the study in advance it will be easier to keep focus on the research question and it also makes it easier for the researcher to make right decisions along the way.¹¹⁹

The master thesis designed the case study in advance to be able to focus on the Ready-To-Sell concept. The main purpose is to determine

How efficient are Ready-To-Sell packaging solutions through IKEAs supply chain?

With aim to fulfil the purpose the thesis decided to investigate; *cost* efficiency by an own designed total cost model applied on a number of selected IKEA products, *handle ability* through the supply chain i.e. how supplier, warehouses and stores experience the concept, and how efficient Ready-To-Sell are *according to ECRs requirements*. Figure 4.2 illustrate how the main purpose is divided into the three parts. Methods for achieving the purpose are; a total cost model, interviews, surveys, and theory.

¹¹⁹ Yin R. K. (2003) *Case Study Research: Design and Methods*. p 19

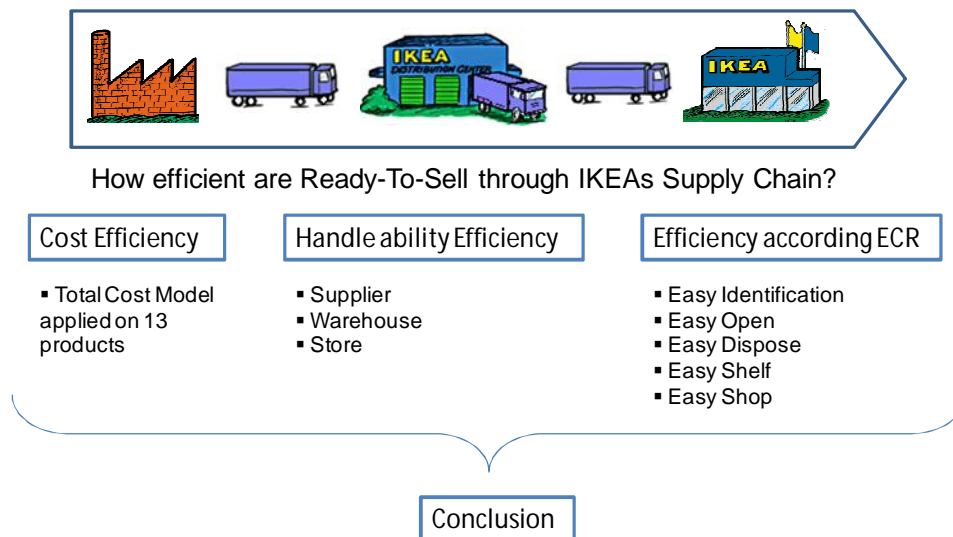


Figure 4.2 The main purpose and how it's divided in order to be fulfilled

In order to create a better understanding, the authors of the thesis decided to investigate the level of utilization and also why stores choose to not use the solution. The second purpose is to find out

To what level are Ready-To-Sell packaging solutions utilized at IKEA stores? If the solutions aren't used as intended, what is the reason?

Methods for achieving the second purpose are; observations performed in different stores, interviews and surveys.

4.4.1 Cost Efficiency through Supply Chain

A few products using a Ready-To-Sell packaging today are selected by the thesis in order to investigate the cost efficiency. The costs are, according to the result from the total cost model, compared to a Regular package solution for selected products and are closer described in Appendix C, Appendix D, Appendix E, Appendix F.

Selection of products

IKEA are working with four standard Ready-To-Sell packaging solutions, these are *Pallet Tray*, *Tear Away*, *Tray on Tray* and *Shelf Tray* and are explained in Section 5.2. Between two and four products from each category applying a Ready-To-Sell packaging today are selected to represent the packaging solution. For every specific product one alternative package, or in the thesis called Regular package, is designed in order to be able to compare the Ready-To-Sell packaging and in this way conclude cost efficiency.

The products are selected from different conditions such as items either from BA 8, textile or from BA 9/50, cooking & eating/oasis; package using a lot and little material; low price and medium price items; packages require maintenance during open hours and packages without maintenance requirements.

In total 13 products are selected where costs are followed up through supply chain, Table 4.1 shows the selected products by product name and category they belongs to.

Table 4.1

Pallet Tray	Tear Away	Tray on Tray	Shelf Tray
NÄCKTEN	IRMA	IKEA 365+	RIBBA
TOFTBO	FLÄCKIG	BUSIG glass	DIOD
	FANTASTISK	VÄGHULT	ALVINE BÄR
		BUSIG napkin	SAXÅN

Total cost model

The idea of using a total cost model is that the model should be customized for a specific situation in order to describe the financial consequence of a decision. Aronsson describe one way to design a total cost model: foresee how the logistic flow may be affected of a change, consider what cost factors will be affected and which of these are necessary to include in the total cost model. The model should only include factors having a significant impact of the logistic flow in order to create a simple model.¹²⁰

In this master thesis a total cost model is designed according to Aronsson's methodology to be able to conclude how cost efficient Ready-To-Sell packaging solutions are at IKEA. The model is divided into parts of IKEAs supply chain where costs affecting in each part of the flow are considered. Literature, the author's skills in logistics and internal tools at IKEA, e.g. Cost Simulation¹²¹, are used to determine the total cost model. Figure 4.3 illustrates the total cost model and all cost factors. The cost factors are further described in Appendix A.

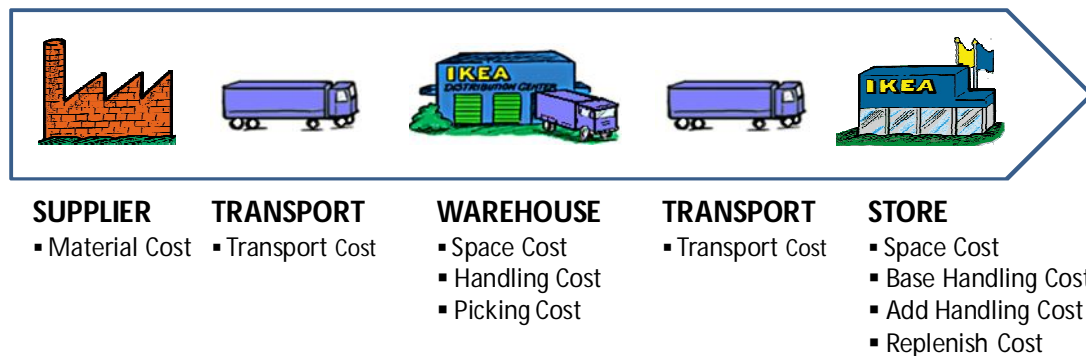


Figure 4.3 Total cost model with aim to determine the Ready-To-Sell cost efficiency

This model only considers cost factors which are directly affected of a packaging modification. The result should not be seen as the real total cost, the aim is instead to see a relations of impacts, e.g. *Material cost* in relation to *Replenish cost*.

IKEA is divided into 12 markets and the thesis has in consultation with co-workers at IoS selected to apply Germany (DE) as a reference for all calculations.

4.4.2 Handle Ability Efficiency through Supply Chain

With aim to get a better understanding of how the Ready-To-Sell packaging solutions are experienced to fulfil both the main purpose and the second purpose, surveys and interviews

¹²⁰ Aronsson, H. et al *Modern Logistik – för ökad lönsamhet*. p 36

¹²¹ Cost Simulation is a tool used at IKEA as a decision base when choosing supplier, distributor or when discussing transformations in the product matrix. Its purpose is mainly to show the costs in the supply chain. Cost Simulation enables you to change some of the input parameters to investigate how changes in the business setup affect the cost landed sales place for that business setup. A simulation is always for a defined supplier business setup.

are performed with co-workers in all parts of the supply chain. Also observations are carried out to get a hint of level of utilization.

Interviews

To receive a deeper understanding such as positive aspects and problems with a Ready-To-Sell, interviews were performed at all stages of the supply chain. In general a *structured* interview base was applied with co-workers to ensure answers from different respondents easily could be compared.

The authors of the thesis conducted approximately ten *structured* interviews with suppliers around the world, mostly of them via email but also one *semi-structured* interview personally to enable both supplementary questions and a deeper understanding. Three *semi-structured* interviews with co-workers working in warehouse were performed both in Sweden and Poland. These co-workers had experience of picking as well as loading and unloading in the warehouse. Approximately 15 respondents from seven different stores located in Sweden and Poland took part in a *structured* interview to create an understanding for how the Ready-To-Sell packaging solutions are experienced in store. The interview guides can be found in Appendix B.

The respondents were selected in consultation with managers at the different parts of the logistic flow and most of them had experiences from working at IKEA for several years, whether it's replenish in store, maintain during open hours or handle packaging solutions in warehouse.

Surveys

To give many respondents the opportunity to express their opinions and thoughts of Ready-To-Sell packaging solutions in store a survey was performed. The target group for answering was approximately 50 IKEA co-workers mainly with refill and maintain tasks in six different stores in south Sweden.

The survey was developed based on theory within the area and consultation with supervisors at IKEA as well as Division of Innovation and Packaging Logistics. To ensure all questions were easy to understand, it's not too heavy to complete and the structure was clear, the survey was tested on a co-worker with several years experience replenish at IKEA. The survey was then iteratively redesigned to simplify for the respondents. Appendix B shows the survey.

To be sure the respondents understand the survey and to be observant on potential misinterpretation, two control questions with relationship was made. These were checked in order to control the reliability of the survey.

Observations

To determine to what level the different Ready-To-Sell solutions are utilized the method *hidden passive observation* was applied. About 80 products using the solutions were selected to be observed at nine IKEA stores located in Sweden and Poland. The aim was to observe if the solutions are used as intended or if it's replenished e.g. on shelf or in basket. Most of the selected items belong to IKEAs base range to ensure they were sold at all visited stores. In Appendix B the observed products are presented.

To determine the replenish time including time to maintain with a Ready-To-Sell packaging solution and a Regular package solution an *open active-* and *open passive observation* was applied.

5 Packaging at IKEA

A packaging system describes the hierarchal levels of a packaging; primary-, secondary- and tertiary packages and explains how the level interacts. This section describes the packaging systems at IKEA. The four Ready-To-Sell packaging solutions underlying the thesis are presented; Pallet Tray, Tear Away, Tray on Tray and Shelf Tray.

5.1 Packaging System

IKEA have a limited number of standard packaging constructions which should be used to a maximum. These are designed to meet the need for specific product, production process as well as supply chain requirements. All packaging solutions are designed and constructed for global distribution. A packaging should contribute to maximal handling efficiency through the supply chain.

When designing a new package for a specific product an estimated Minimum Delivery Quantity (MDQ) is calculated in order to obtain a delivery frequency of two weeks. The package size should then be created to meet the quantity of estimated MDQ, i.e. *estimated MDQ ≈ MDQ*.

5.1.1 Unit Load

IKEA have different kinds of standard pallets accepted to use. When deciding which pallet to use, forecast and locations of suppliers and stores are considered. Due to phytosanitary reasons, i.e. prevent and protect plants from pests spread, it's not allowed to use untreated solid wood pallets for cross border shipping. Two different main categories of pallets exist, *EUR pallet* and *Ocean pallet*, where the later is used for cross border shipping, see Table 5.1.

Table 5.1

Category	Full / Half	Name	Measure
EUR pallet	Full	A	1200x800
	Half	B	600x800
Ocean pallet	Full	AO	1140x760
	Half	BO	570x760

The half pallet is only allowed for non picking items. The level of usage of half pallet increased as the Ready-To-Sell concept was introduced. Half pallet as a sell solution enables smaller delivery quantities, i.e. historically a full pallet containing Multipacks were picked in warehouse which today can be packed on a half pallet delivered direct sale space without picking.

5.1.2 Multipack

Multipack is a secondary packaging containing a number of articles decided upon the estimated MDQ and weight limitations of 15 kg.

5.1.3 Consumer Packaging

Consumer packaging according IKEA is the packaging that comes with the products and ends up at the customer's home. Consumer packaging aren't considered in the thesis more than when discussing visibility in store.

5.2 Ready-To-Sell Packaging Solutions

Among the standard box construction used within IKEA a number of Ready-To-Sell packaging solutions exist. These should be used to maximum in order to minimize manual single item handling. IKEA defines a Ready-To-Sell packaging as follow:

“The product can be sold without any single-item handling just by removing the transport packaging”

To be classified as a Ready-To-Sell packaging it should meet different requirements:

Safe for customer at all times

Easily handled by one person in the shop

Adapted to size of pallet/shelf/bin

No need to manually cut cardboard

The product/consumer packages clearly visible for the customer

Strong and stable in size and shape

Enable flexible sale space management

Minimized waste handling during open hours

In October 2008, the decision regarding these requirements was taken. Earlier they were quite similar, except for the requirement concerning *flexible sales space management*. This wasn't at all considered in the beginning when the Ready-To-Sell concept was introduced and most of IKEAs range is packed in packaging constructed before the new requirement came up. However, the thesis considers the new requirement when analysing.

As mentioned earlier, IKEAs standard Ready-To-Sell packaging solutions are *Pallet Tray*, *Tear Away*, *Tray on Tray* and *Shelf Tray*. This master thesis is based upon these standard solutions when evaluate how efficient Ready-To-Sell are at IKEA. Since all packages are designed for a specific product it's common to mix two of the solutions to meet the demand of a product better.

5.2.1 Pallet Tray

Pallet Tray is a packaging solution in half or full pallet size. It consists of a tray in the bottom, two cardboard sides over lapping each other and a top lid, see Figure 5.1.



Figure 5.1 Principal model of a Pallet Tray Ready-To-Sell solution

The Pallet Tray is suitable for products with good stability that easily can be stacked on each other and stays without any support. The packaging is more of a transport wrapping than an

actual sell solution since almost all material are removed when opening it. The material used for the packaging is often double corrugated cardboard in order to support products during transport.

5.2.2 Tear Away

Tear Away have the appearance of a giant box, often with one or two cut-outs on the sides of a half- or a full pallet. During transport the cut-outs are closed with a corrugated cardboard sheet and on top there is a protecting lid. Figure 5.2 illustrate a principal model of a Tear Away packaging.



Figure 5.2 Principal model of a Tear Away Ready-To-Sell solution

The products sold in Tear Away need to be stable and stackable, but unlike the Pallet Tray solution the products have support from the packaging. The material used for this type of solution is often double corrugated cardboard.

5.2.3 Tray on Tray

Tray on Tray is trays stacked on top of each other on a full- or half pallet. During transport the packaging solution is often supported by edge protectors to increase stability. The packaging solution can have numerous appearances, e.g. boxes stacked on each other or sheet between layers. Figure 5.3 illustrate one appearance of a Tray on Tray.



Figure 5.3 Principal model of a Tray on Tray Ready-To-Sell solution

Tray on Tray solution suites many different kinds of products and type of tray are created to meet the requirements for a specific product.

None of the pallet solutions, i.e. Pallet Tray, Tear Away and Tray on Tray, are allowed to be picked in the warehouse since they are sell solutions. They should be seen and delivered as one unit to stores. As the pallet solutions are sell solutions they always have a direct flow in stores, i.e. 100% goes direct to sale space without being divided and partly stocked in stores. *Picking-* and *Additional handling cost* are therefore **always zero** in the total cost model for the pallet sell solutions; Pallet Tray, Tear Away, Tray on Tray.

5.2.4 Shelf Tray

Shelf Tray consists of a tray, ready to put in the shelf, and a transport protection. Two common types of Shelf Tray solutions are *Tray and Collapse box* and *Tray and Hood*. Figure 5.4 shows a *Tray and Collapse box*.



Figure 5.4 Principal model of a Shelf Tray Ready-To-Sell solution

Shelf Tray is meant to be used for products with a selling capacity less than a half pallet and should be sold from a shelf. The packaging is used for all types of products to ease the handle ability when replenish.

5.3 Labelling

The labelling on IKEAs packages follows many different criteria regarding how many labels it should be on each package, what's printed on it and where to place it. There are also different regulations the package has to follow which depends upon the type; Multipack or Unit Load.

5.4 Packaging in Warehouse

Warehouses in IKEAs supply chain works with *neat & clean*, meaning all goods interacting with the end customer should be neat and clean. Damaged goods should be rejected so the end customer never sees dirty, broken or damaged packages.

Most of the co-workers in the warehouses, participating in the thesis study, weren't informed white packages are Ready-To-Sell packaging, aimed to meet customers.

5.4.1 Half Pallet

Handling half pallets in warehouse is often more resource-demanding than full pallet handling. The equipment, fixture and forklifts, are adapted to full pallets. In many warehouses there is also partly automatic handling and these establishments are only able to handle full pallets holding measures inside the pallet size, i.e. can't handle half pallets and full pallets with overhang.

Half pallet is quite new in the IKEA supply chain and warehouses have fixture consisting of racks adapted to full pallet size. To make it possible for the warehouses to store half pallets in these racks, major investments in shelves is needed. Half pallets also have to be stored in double rows to maximize the space utilization. Double rows make it more complex to have an efficient flow of goods in the warehouse, i.e. FIFO, First In First Out.

5.4.2 Shelf Tray

Some of the Shelf Tray solutions are more sensitive than regular Multipacks when picked. The Tray and Hood can be a problem when picking since the hood falls of because of an inadequate taping. The co-workers need to handle these types of packaging in a more careful way.

5.5 Packaging in Transport

As in the warehouse no exceptional notation is taken whether it's a Ready-To-Sell packaging or not. The transport action itself is the same irrespective of packaging, it's the loading and unloading activities that might differ.

Picking pallets are more complex to load since the top surface isn't as smooth as full- or half pallet. It's also more complex to load efficiently when a mixture of full- and half pallets will be loaded since the stack ability and stability decrease

6 Analysis

Ready-To-Sell packaging solutions are utilized to different levels, depending on the solution, and are described first in this chapter in order to create an overall understanding for Ready-To-Sell. Also a number of potential reasons for not using the solutions are discussed. Further is the aim of this section is to analyse how efficient the different Ready-To-Sell solutions are. This is done by discussing cost efficiency and handle ability efficiency for each solution, Pallet Tray, Tear Away, Tray on Tray and Shelf Tray. And finally, the chapter analyse how well IKEA's Ready-To-Sell solutions meet ECR requirements to be successful.

At the beginning of this thesis, before deeper investigations started, the authors study the stores in order to understand how IKEA co-workers are working with packages and especially Ready-To-Sell. They found many Regular packages to be own-designed in stores to look like a sell solution with quicker replenishment as the main argument from co-worker. Many of these packages don't give a commercial impression and the authors also discussed if time really is saved when creating own-designed sell solutions. Figure 6.1 illustrates two examples on own-designed sell solutions found in stores.



Figure 6.1 Own-designed sell solutions the thesis found in stores during the case study

After seeing these kind of solutions the authors' spontaneous impression was that Ready-To-Sell must be a good approach for IKEA. It displays products commercial, enable quicker replenish and without jeopardize damages by cut corrugated cardboard. But the thesis also found the Ready-To-Sell solutions aren't always used at all or as intended.

6.1 Level of Utilization of Ready-To-Sell in Stores

Result from observations implies that most of the Ready-To-Sell packaging solution is used as intended. Figure 6.2 illustrate to what level the Ready-To-Sell packaging solution is utilized. The result is based on observation of 80 products belonging to one of the categories Pallet Tray, Tear Away, Tray on Tray and Shelf Tray. These observations are performed in 8 stores located in Sweden and Poland.

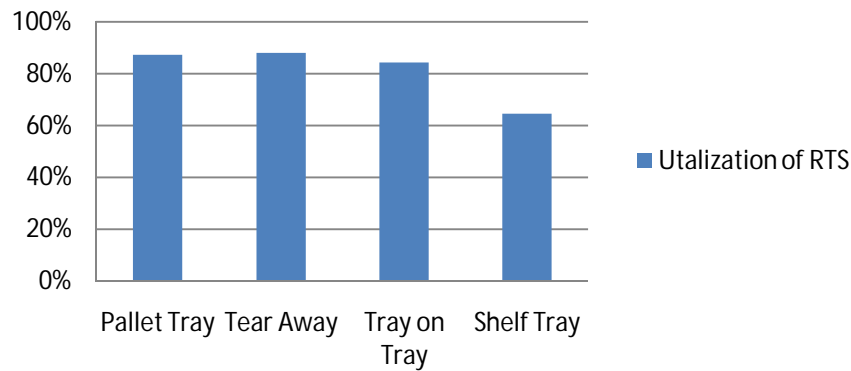


Figure 6.2 Level of utilization

The figure shows that all pallet solutions; Pallet Tray, Tear Away and Tray on Tray are utilized to a high level, above 80%. This is a good result since Common Store Planning (CSP) recommends 86% of Ready-To-Sell packaging solutions to be used.

CSP is a tool for retail which shall simplify the store planning process, secure commerciality and the quality of home furnishing knowledge. Once every year Global Retail builds a concept store which is used as a guideline for stores worldwide in e.g. how to display product groups and so on. The CSPs recommendation to use 86% of Ready-To-Sell packaging solutions is based on MDQ and actual sale volume, if a packaging is located for more than 10 weeks in store it's recommended to not use the packaging solution, i.e. divide the products between the shelf/basket and stock in store.

The Shelf Tray solution is utilized to approximately 65%. Reasons for not using this specific solution are further discussed in section 6.5 *Analysis of Shelf Tray*.

In general there can be many reasons for not using the Ready-To-Sell packaging solution as intended. Some reasons are specific for markets or stores, meanwhile other are depended on external factors. The thesis decided to discuss, based on impressions collected from interviews, surveys and observations during the project, following potential reasons:

- If co-workers in the stores got *education/instruction* Ready-To-Sell the usage increase.
- *Incorrect MDQ* in relation to actual selling quantity can result in divided packages, one part is replenished manually and the other kept in stock.
- Differences in *behaviour and culture* may impact the utilization.
- If a *product or a product family*¹²² has several suppliers delivering in different packaging solution it impact the result of utilization.

6.1.1 Education/Instruction

One point of analysis when investigate why the Ready-To-Sell packaging solution is not used as intended is associated with education activities. If co-workers have gone through an education in how to use the packaging solution, or information about possible savings with Lean Retailing, it tends to impact the level of usage. Figure 6.3 show the relations between

¹²² Product family signify a product which for example can be available in several colors and sizes.

level of utilization¹²³ and level of education¹²⁴. The piles S1-S6 represent six different stores (Store 1, Store 2...), all located in south of Sweden.

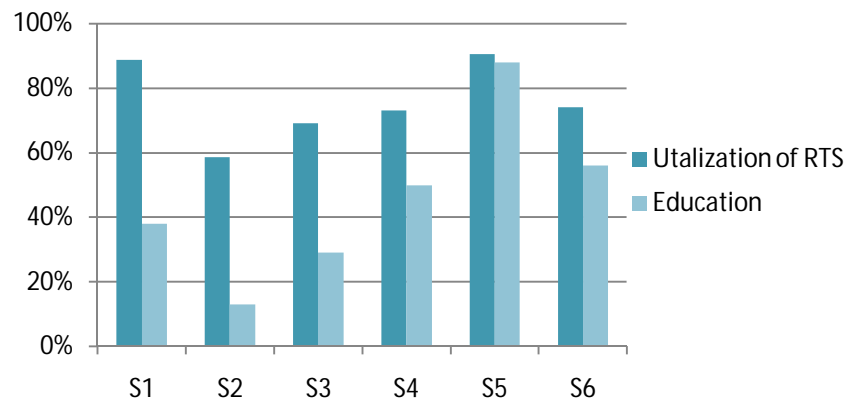


Figure 6.3 Utilization of Ready-To-Sell in relation with level of education

From the figure above it appears Store 5 has the highest level of utilization. It also illustrates the same store has the highest level of education. In the meantime the figure shows Store 2 is having the lowest level of both utilization and education. This trend goes through all stores except for Store 1.

The case study also found a need for education, 59% of co-workers who haven't had any education consider a need for it, especially an introduction to Lean Retailing and a work shop about Ready-To-Sell solutions for newly employed co-workers.

Education is an important aspect in order to increase utilization of Ready-To-Sell as intended. ECR also points out instructions and information as one of the most important aspects, since co-workers are more likely to adopt best practise if they understand expected benefits.

6.1.2 Incorrect Dimension of MDQ

According to the co-workers in store, the most common reason for not utilizing the pallet packaging solution such as Pallet Tray, Tear Away and Tray on Tray is oversized MDQ. An incorrect MDQ can be explained by either a forecast larger than the actual selling quantity, a specific market or store is selling less than on average or, if a product has been in range for a while and the selling quantity has changed since start without changing the packaging solution it results in an incorrect MDQ.

The case study also implies that even if the MDQ, in relation to sell quantity, is correct for a specific store the package is divided and partly kept in stock because the store has limited space, i.e. too many article numbers available on a small area.

To create a more efficient packaging it might be better to create it a bit smaller than estimated MDQ to prevent divided packaging in store, reduce additional handling and maximize level of utilization in store. It's also important to on regular basis, analyse how the products sell quantity meets requested size of the package, and modify the solution if necessary.

¹²³ The level of utilization shows a mean value calculated from utilization of Pallet Tray, Tray on Tray, Tear Away and Shelf Tray based on observed stores named S1 to S6.

¹²⁴ The level of education is based on results from approximately 50 surveys.

6.1.3 Behaviour and Culture

Observations are performed in Sweden and Poland and result points out a difference in Ready-To-Sell utilization. Figure 6.4 illustrates level of utilization in Sweden and Poland, where 6 stores in Sweden and 2 stores in Poland are visited, this represent approximately 30% of each countries total number of stores.

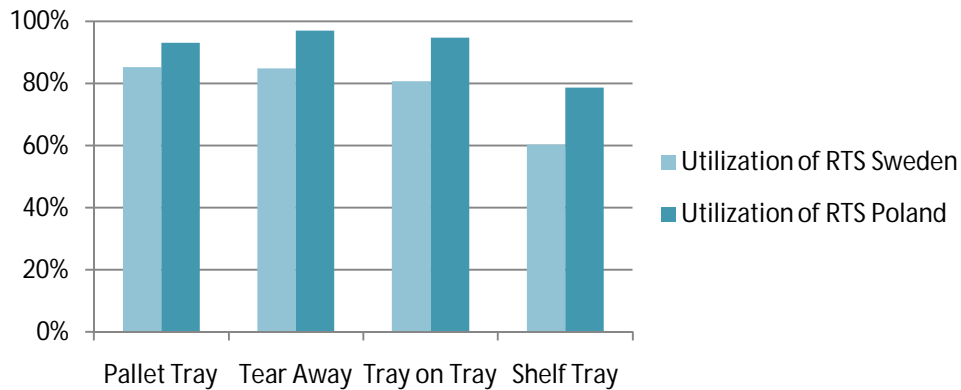


Figure 6.4 Level of Ready-To-Sell utilization in Sweden and Poland

Poland uses all solutions to a higher level than Sweden does. In Poland the co-workers have taken a decision to always use the Ready-To-Sell solution if it's delivered that way. Through observations the thesis also found Poland having a higher level of own created sell solutions of Regular packages, not intended to be displayed for customers, e.g. Happy boxes¹²⁵ and Tv-boxes¹²⁶. The decision to always use Ready-To-Sell is also taken in some stores in Sweden but they still replenish item by item more than in Poland. Can cultural differences be a reason?

Swedish co-workers might have an other relation and behaviour to their managers compared to Poland, e.g. if the manager gives direction to use Ready-To-Sell the Swedish co-worker takes a greater initiative to unpack them. Especially Shelf Tray is something the thesis found out to be replenished on the shelf instead of using the solution. Interviews with Swedish respondents imply they sometimes replenish on shelf instead of using the sell solution since their personal opinion is that they find it more appealing from a customer point of view.

Since IKEA opened their first store over 50 years ago in Sweden, their history is longer regarding stores, than in Poland. Swedish co-workers who have worked in store for many years probably have a more practiced behaviour with manually refilling than Polish co-workers. Ready-To-Sell which is a relatively new way of working was officially introduced at IKEA 2005 and if co-workers have been working for many years with manually refilling, this behaviour may be harder to change.

6.1.4 Products and Product Families in Different Solutions

It's not exceptional that one product is provided by more than one supplier, especially if an article is available in several colours. Since the suppliers may have different conditions, e.g. establishment, it may result in different packages. From a commercial perspective it's a negative to display them in various ways and the study has also explored that co-workers in these cases, when packages differ, often decides not to use the Ready-To-Sell solution.

¹²⁵ Happy box is a box cut as a smile in order display the products

¹²⁶ Tv-box describes a box with a square cut-out with aim to display the products

RIBBA for example is a frame product family offered in many sizes and colours provided by several suppliers. The frame in size 18x24 cm investigated by the thesis has more than five suppliers and one of them deliver in a Regular box meanwhile the other deliver in a Shelf Tray package. Using Shelf Tray for some colours and replenish on shelf on other won't create a uniform impression. And the thesis has found RIBBA to be replenished on shelf to a level of 88% with lack of uniform impression as one argument.

Textile is a good example where a decision is taken to use white packages for pillows and covers. This creates a homogeneous impression in store.

To increase level of utilization of Ready-To-Sell it's therefore important to communicate an overall homogenous feeling by using both same construction and same colour of packages of a product family. Figure 6.5 illustrate RIBBA replenished on shelf mixed with Shelf Tray and brown and white packages mixed.



Figure 6.5 Mixed packages types

6.2 Analysis of Pallet Tray



6.2.1 Cost Efficiency with Pallet Tray

Two products are selected from the category Pallet Tray to represent the Ready-To-Sell packaging type when investigate the efficiency from a cost perspective. The selected products are NÄCKTEN hand towel and TOFTO bathmat. A more detailed explanation of how cost impacts in the supply chain for those products can be found in Appendix C.

The two selected products imply a diverse result concerning cost efficiency using a Ready-To-Sell compared to a Regular package. TOFTBO contributes with a cost saving meanwhile NÄCKTEN have the same overall cost regardless of packaging type, costs are only transferred from one factor to another.

The main contributor to cost saving using Pallet Tray for TOFTBO is due to picking in warehouse, about 60% of total decreased costs relates to this *Picking cost*. Picking is never needed for a Pallet Tray but TOFTBO in a Regular require picking. Since NÄCKTENs

Regular solution meets the estimated MDQ well picking isn't necessary and as a result doesn't contribute to decreased costs. Figure 6.6 illustrates the shares of total cost for NÄCKTEN and TOFTBO.

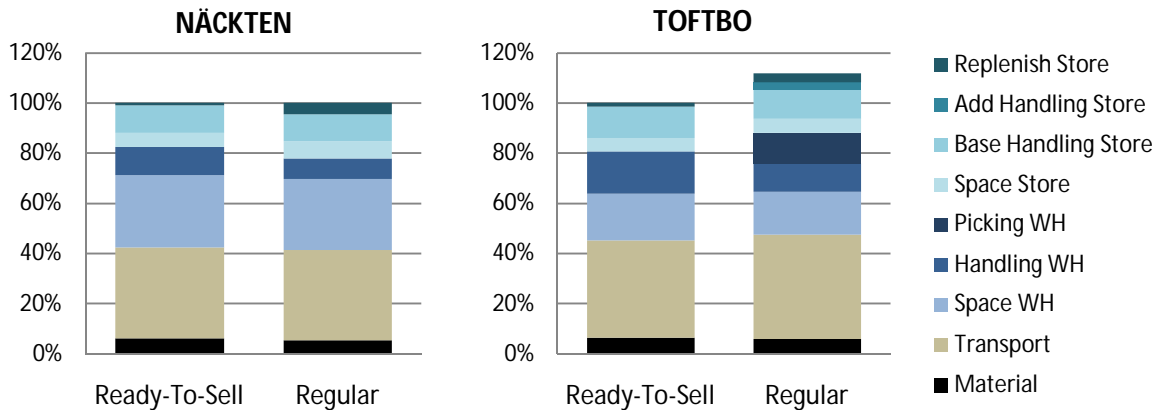


Figure 6.6 Shares of total cost for NÄCKTEN and TOFTBO

It's revealed a lot of time is saved in replenish when using a Pallet Tray instead of manually handle Regular packages, 400% for NÄCKTEN and 150% for TOFTBO but as Figure 6.6 shows is the *Replenish cost* in store just a small part of the overall costs and therefore doesn't impact the financial savings significant.

It should also be mentioned the replenish time spent on a Pallet Tray is distributed differently than a Regular package. 50% of the total replenish time¹²⁷ with a Pallet Tray is spent during open hours with preparing before a new delivery arrives, meanwhile a Regular spend 100% of the replenish time during refill hours in the morning. This can as a result increase availability of products since a larger goods flow can be handled in the morning during refill hours. The definitions of *During open hours* and *During refill hours* are explained in Appendix A and Figure 6.7 illustrate shares of the time for NÄCKTEN and TOFTBO.

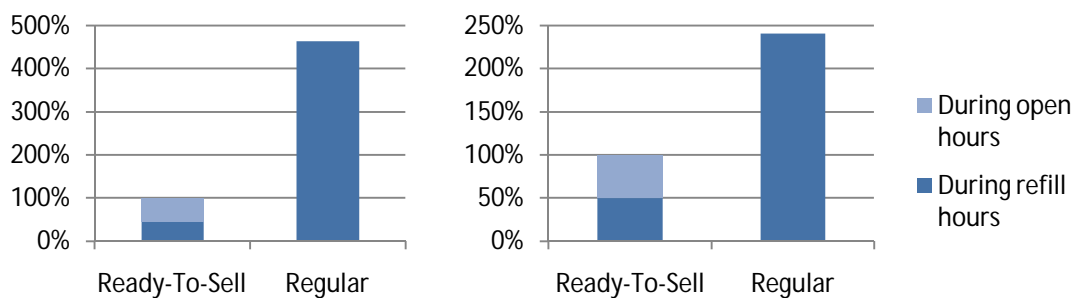


Figure 6.7 Replenish time divided into *During open hours* and *During refill hours* for NÄCKTEN and TOFTBO

The Pallet Tray solution use about 60% less material, calculated in m², than a Regular package, but since the corrugated cardboard is double to enlarge stability and white material is used, *Material cost* for Pallet Tray increases.

The main factor for increased cost using a Pallet Tray, instead of a Regular package, is *Handling cost* in warehouse. This is because both selected products are delivered on half pallets and handling cost in warehouse is higher per m³ for half- than full pallets.

¹²⁷ The replenish time include prepare before a new delivery; open transport package, open package and place in sale space, and maintain during sell. These are further explained in appendix A.

To summarise, it's hard to tell how cost efficient a Pallet Tray packaging is since the selected products gives an inconsequent result. More than two products need to be selected in order to investigate how efficient it is. Both selected products are packed on a half pallet and to broader the view it should also be products packed on a full pallet among these.

Table 6.1 sums up costs impacting a Pallet Tray solution through the supply chain and describe why it's affected. Factors discussed in the table are direct related to the modification.

Table 6.1

Cost Factor	NÄCKTEN	TOFTBO
Material	Increase	Increase
	Less material calculated in m ² but selected products are packed in a double corrugated cardboard packages	
Handling warehouse	Increase	Increase
	Selected products are packed on a half pallet, Pallet Tray, which have higher handling cost per m ³ than Regular on full pallet	
Picking warehouse	-	Decrease
	Pallet Tray never require picking, Regular pallet quantity meet estimated MDQ so doesn't require picking	Pallet Tray never require picking, Regular require picking since estimated MDQ < pallet quantity
Add handling store	-	Decrease
	Both solutions have direct flow in store, i.e. 100% goes direct to sale space	Regular have indirect flow and Pallet Tray have 100% direct flow to sale space
Replenish store	Decrease	Decrease
	Quicker replenish in store using Pallet Tray instead of manual handling with Regular	

It's discovered that 100% for NÄCKTEN respectively 62% for TOFTBO use the Pallet Tray solution as planned. Since the *Replenish cost* stands for a very small part of the total supply chain costs the decision to replenish in other ways than planned doesn't impact the result significant.

6.2.2 Handle ability Efficiency with Pallet Tray

The Pallet Tray interacts with actors through the supply chain and the thesis considers suppliers, warehouses and stores opinions.

Supplier

In general don't the suppliers working with Pallet Tray see any problem with the packaging solution, but when asking about specific topics some issues were addressed. E.g. using Pallet Tray as packaging solution, instead of a Regular Multipack, increases the size of the unit which affects handle ability since it's more complex to handle big units.

The *Material cost* is often increased when having a Pallet Tray instead of Regular packages, because a double corrugated cardboard is needed to support the large surfaces on the Pallet Tray, something suppliers contacted mentioned. It's also common to use white corrugated

cardboard instead of brown for Pallet Tray and also this contributes to increased *Material cost* for the supplier.

In order to work as consistent as possible do the suppliers prefer to deliver their products in the same kind of packaging to all their customers. IKEA often have different packaging requirements than other customers, e.g. Pallet Tray instead of Regular boxes, which increase the complexity for the suppliers. I.e. suppliers prefer to deliver in Regular boxes if that's the solution other customer have.

A supplier, participating in the study, didn't have the establishment needed to fill and handle Pallet Trays. Since IKEA required this type of packaging for the products an investment in packing establishment was needed for the supplier.

Warehouse

The co-workers at warehouses aren't affected in any specific way by handling Pallet Tray solutions. They handle all pallets in the same way and don't put any extra effort in carefulness even if the package is white. All pallets, no matter of sale solution, must be handled neat and clean.

Store

From observations it's found 87% of Pallet Tray solutions are used in the stores, and only 13% of the packaging solution is replenished in other ways, e.g. replenished on shelf or put in a basket. The three most common reasons for not use the Pallet Tray solution are

- The quantity of products the Pallet Tray holds is too big relative the selling quantity in the store.
- Limited space in store meaning all Pallet Tray solutions can't be used as intended.
- A decision is taken in store to not use the Pallet Tray solution for a specific product.

Most co-workers are satisfied with the Pallet Tray solution and the overall rating is very high, this is confirmed by on average give the Pallet Tray rating 8 out of 10 regarding satisfaction.

It seems quick and easy replenishment are the major benefits using Pallet Tray. Co-workers also mentioned the main disadvantageous with a Pallet Tray are: it sometimes holds too many products in relation to actual selling quantity, and it's time consuming to prepare before a new delivery. Some co-workers also brought up products falling out of the package as a problem, this is particularly for soft products and light weight products with low friction, see Figure 6.8.



Figure 6.8 Towel in a Pallet Tray looking quite messy

Co-workers find it very easy to understand how to make the products ready to sell, i.e. remove plastic wrapping, lid and sides. This is surprising since it during observations was found the side walls weren't always removed as intended, see Figure 6.9.



Figure 6.9 Walls not always removed as intended¹²⁸

Co-workers also imply Pallet Tray doesn't have the ability to display the product in an attractive way (it got approximately grade 6 out of 10). This can be due to instability and customer impression it looks messy like displayed in Figure 6.8. Otherwise there aren't any packaging material blocking the products and visibility is high.¹²⁹

IKEA have different requirements a packaging must fulfil to be classified as a Ready-To-Sell. In Table 6.2 it's described how Pallet Tray responds to these requirements based on co-workers opinions and observations.

¹²⁸ The first picture was taken in a store the thesis visited, the authors removed the sides and are illustrated in the second picture.

¹²⁹ One source could be confusion considering what kind of packaging solution they were supposed to respond to since this solution is used as a non Ready-To-Sell packaging for some products, e.g. blankets are packed in a "Pallet Tray" but are supposed to be put in a basket, if the sides are removed all blankets will fall out. The survey respondents can therefore have misunderstood what kind of packaging the question was about.

Table 6.2

IKEA Requirements	Comments
<i>Safe for customer at all times</i>	Safety for customers isn't considered in the thesis.
<i>Easily handled by one person in store</i>	Co-workers find it easy to open the Pallet Tray on their own.
<i>Pallet/Shelf/Bin size adapted</i>	IKEA always, when possible, work with standard sizes of unit loads.
<i>No need to manually cut cardboard</i>	Cardboard lid and sides can easily be removed without cutting. However straps and plastic need to be cut.
<i>The products are clearly visible for the customer</i>	Almost all material goes away when replenish, only the bottom tray remains, products are therefore visible for customer even when half sold.
<i>Strong and stable in size and shape</i>	The packaging itself is stable, double corrugated cardboard is often used. The problem is when products itself doesn't have any support.
<i>Enable flexible sale space management</i>	Pallet Tray doesn't enable flexible handling due to the single unit design, e.g. before a new delivery items need to be removed manually.
<i>Minimal waste handling during sell hours</i>	The Pallet Tray doesn't claim any time with waste handling during open hours since all material goes away when replenish. The only time spent during open hours is when instable products have fallen off.

6.2.3 Conclusion concerning Pallet Tray

Investigations points out a cost saving using Pallet Tray solution instead of a Regular package. This size of the saving is, among other things, due to estimated MDQ (how well the quantity in package meet estimated MDQ). This affects *Picking cost* which found to be the greatest contributor for cost savings.

Pallet Tray contributes to a big time saving in store during replenish, but the financial saving potential is quite small since the *Replenish cost* only consist of a small part of the overall supply chain cost. Other benefits with a quick replenish, not direct related to cost savings, is the opportunity to handle larger goods flow.

If a supplier provides products to other customers than IKEA in Regular boxes, the supplier would prefer to deliver the same way to IKEA since *Material costs* are lower and Multipacks are easier to handle. But in general don't the suppliers see any big problems.

The overall impression from co-workers in stores is in general very positive. They find quick and easy replenishment to be the greatest advantageous. Products sold from a Pallet Tray are visible but at the expense of inflexible handling, i.e. no material left to support flexible handling before a new delivery arrives, items need to be removed manually, but from a commercial point of view are the products well visible for customers.

6.3 Analysis of Tear Away



6.3.1 Cost efficiency with Tear Away

The three products representing the packaging solution Tear Away in the thesis are; IRMA throw, FLÄCKIG mixing bowl and FANTASTISK napkin, all using Tear Away solution

today. A closer description of how costs are affected in the supply chain applying Tear Away and Regular can be read in Appendix D.

The thesis found the Tear Away solution to be a cost efficient solution. How efficient the solution is varies noticeably, about 0% - 55% higher cost using a Regular instead of Tear Away, and is due to different conditions discussed below. Figure 6.10 shows shares of total cost occurred in the supply chain for the selected products.

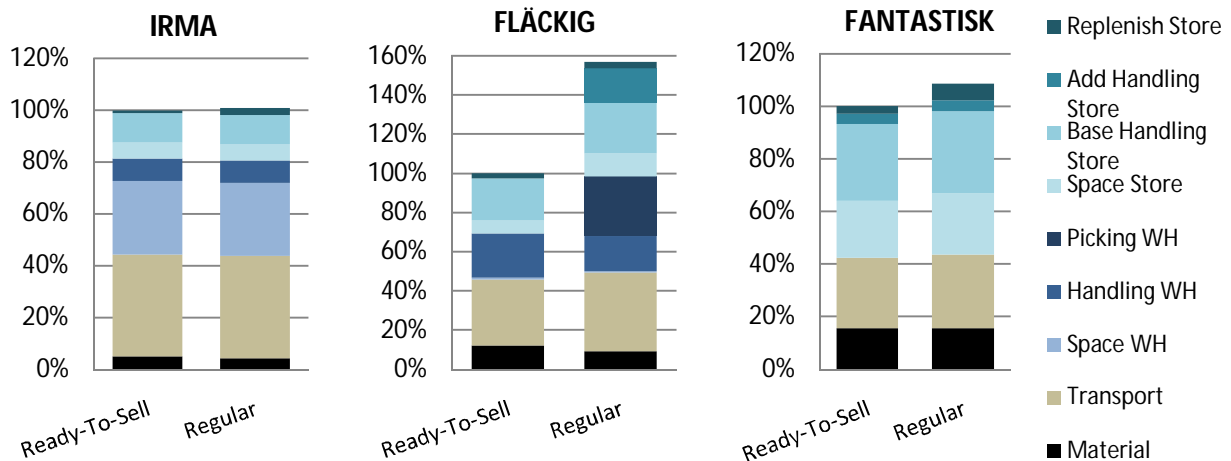


Figure 6.10 Shares of total cost for IRMA, FLÄCKIG and FANTASTISK

IRMA is delivered in a Tear Away and the Regular package is like a “pallet tray”¹³⁰. The costs occurring in the supply chain for the two different packaging types are similar and no major conclusions can be drawn with the result from this comparison. The replenish time for the Tear Away is quicker but as seen in Figure 6.10 is the *Replenish cost* just a small part of the overall cost and therefore doesn’t affect the total cost significant.

The total cost for FLÄCKIG is 55% higher using a Regular package. The difference is mainly referred to the handling. The Regular package demands picking in the warehouse as well as additional handling in the store. *Picking- and Additional handling cost* represents almost 70% of the total cost increases with the Regular package.

FANTASTISK is cost efficient in a Tear Away, approximately 10% out of the total cost. Since the product is delivered directly from the supplier to the store, no costs are related to the warehouse. The filling rate for the Tear Away solution is higher than for the Regular solution. This can be seen as increased cost for the Regular packaging along the whole supply chain but still *Replenish cost* in store is the greatest contributor to the higher cost for the Regular package. Of total saving for FANTASTISK in Tear Away the *Replenish cost* savings stands for more than a third.

Because of the different circumstances for the selected products it’s hard to see relations in costs between the products, a summary is shown below, see Table 6.3.

¹³⁰ The thesis chosen this “pallet tray” solution since POLARVIDE throw is provided in this solution, but the “Pallet Tray” isn’t meant to be a sell solution, it’s to be replenished in baskets.

Table 6.3

Cost Factor	IRMA	FLÄCKIG	FANTASTISK
Material	Increase	Increase	Decrease
	Less packaging material is needed for Tear Away but it's more expensive due to double corrugated cardboard		Less than half of the material is needed in m ² for Tear Away but the difference in cost is minimal due to double corrugated cardboard
Handling warehouse	-	Increase	-
	Same size and filling rate for packages being compared	Tear Away are on a half pallet, higher handling cost per m ³	Direct delivery from supplier to store
Picking warehouse	-	Decrease	-
	Tear Away never require picking, Regular pallet quantity meet estimated MDQ	Tear Away never require picking, Regular require picking since estimated MDQ < pallet quantity	Direct delivery from supplier to store
Add handling store	-	Decrease	Decrease
	Both solutions have 100% direct flow to sale space	Regular have indirect flow and Tear Away have 100% direct flow to sale space	Both have indirect flow to sale space but due to different filling rate Regular have higher cost
Replenish store	Decrease	Decrease	Decrease
	Quicker replenish in store using Tear Away instead of manual handling with Regular		

The table shows an inconsequent result in how costs impact in the supply chain for products representing Tear Away in this thesis.

To get high reliability in the result further investigation needs to be done. Products should be selected out of different categories representing e.g. direct flow from the supplier to the store, high and low filling rate and Multipack boxes or “pallet tray” solutions for the Regular package.

6.3.2 Handle ability Efficiency with Tear Away

Supplier

According suppliers working with Tear Away there are both positive and negative issues with the solution. *Material cost* often increases because of the double corrugated cardboard that is needed to support the packaging. White corrugated cardboard is not used at all for Regular packages but common for Tear Away and as cost for white material is higher than brown, *Material costs* for Tear Away may increase.

Tear Away is more complex to handle than a Regular box due to its size. The negative aspects with the size is that handling inside the production plant is complex, but a positive aspect related to the size is that the loading of big units is easier and require less workforce affecting labour hours.

Warehouse

The co-workers at warehouses are not affected in any specific way by handling Tear Away solutions. They handle all pallets in the same way and don't put any extra effort in carefulness even if the packaging is white. All pallets, no matter of sale solution, must be handled neat and clean.

Store

Tear Away is the packaging solution having the highest utilization, 88%, i.e. 12% doesn't use the sell solution as intended and the three most common reasons for not using the Tear Away as solution is

- The limited space in store, meaning all Tear Away can't be used as intended.
- A decision is taken in store not to use the Tear Away solution for a specific product.
- The attractiveness of the Tear Away is not gratifying.

The overall satisfaction with the packaging solution is high. Co-workers find it easy to understand how to use and open a Tear Away. Also the quickness to open and make it ready to sell and then collect the transport wrapping for disposal is appreciated. The packaging doesn't claim much waste handling time during open hours.

The most frequent negative comment is about the unattractiveness, 30% of the co-workers find the Tear Away unattractive when the products have sold about one third. This means that more than half of the time on the market hall, the Tear Away looks unattractive. To make the product more visible to the customers the co-workers sometimes choose to cut bigger cut-outs in the package which increasing risk for damages see Figure 6.11, or unpack the products into baskets.



Figure 6.11 Cut-outs of a Tear Away

The Tear Away is mostly constructed with two cut-outs, one on the long side and one on the short side. The flexibility of the packaging solution is affected of this and it can be hard to fit openings to planned sales space. To make the product more visible and the packaging more flexible co-workers sometimes cut new openings in the Tear Away which can damage the products.

The stability of the products sold in Tear Away isn't gratifying at all times, depending on what kind of products it is they fall out, this is significant for old packages while newer often have divider supporting the stability of the products. The divider is also good from a flexibility perspective, it's easier to move products from an almost empty Tear Away to a new. Figure 6.12 illustrate the idea of divider used for Tear Away.

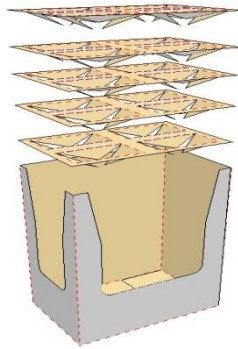


Figure 6.12 Tear Away with stabilising dividers

The different requirements a Ready-To-Sell packaging must fulfil according to IKEA is discussed below in Table 6.4, considering Tear Away.

Table 6.4

IKEA Requirements	Comments
<i>Safe for customer at all times</i>	Safety for customers is't considered in the thesis.
<i>Easily handled by one person in store</i>	The refill process is quick and only requires one person.
<i>Pallet/Shelf/Bin size adapted</i>	IKEA always work with standard sizes of unit loads when possible. Tear Away is often adapted to half or full pallet.
<i>No need to manually cut cardboard</i>	Lid and sides can easily be removed without using knife. When creating new cut-outs in order to make the product more visible the co-workers cut the cardboard. Straps and plastic need to be cut.
<i>The products are clearly visible for the customer</i>	When the product has sold about one third of the unit it can be hard for the customer to see the product due to packaging material is blocking.
<i>Strong and stable in size and shape</i>	The packaging itself, often constructed double walled, is stable but during sell the edges by the cut-out can be damaged. Different products can be instable in Tear Away if not a stabilising divider is used.
<i>Enable flexible sale space management</i>	The flexibility of Tear Away is low. New Tear Away solutions are better since it enable flexible handling previous a new delivery. When a Tear Away is constructed with two cut-outs it affects the flexibility in a negative manner.
<i>Minimal waste handling during sell hours</i>	All materials, lid and sides, are removed when opening the Tear Away. There is no waste handling during open hours except for the Tear Away having dividers which have to be removed during open hours.

6.3.3 Conclusion concerning Tear Away

The case study found Tear Away to be a cost efficient concept. Even though the result differ for the thesis selected products a trend is found, *Picking cost* in warehouse impacts most and are the main factor for lower cost using a Tear Away solution instead of a Regular package. Estimated MDQ and product quantity the package hold decides if picking is necessary.

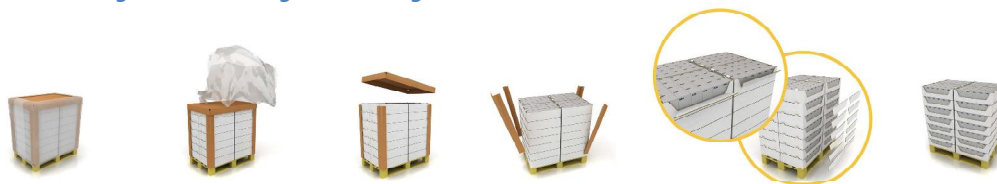
A lot of time is saved using a Tear Away during replenish, up 2,5 quicker replenish. But as the *Replenish cost* only stands for a small part of supply chain cost it doesn't affect the total cost significant. However are co-workers very satisfied with quick replenishment and value the time saving high, it enable them to handle more article numbers during refill hours.

Suppliers find the large unit complex to handle in plant but mentioned quicker and easier loading as advantages.

In stores is Tear Away evaluated to be the most utilized Ready-To-Sell packaging solution at IKEA. Co-workers have an overall positive impression and find it easy to understand how to open. Negative aspects pointed out are; low visibility due to big box blocking the products, inflexible when planning the sale space due to fixed cut-outs on two sides and instability since products (depends on the features of the product) easy falls out. Ways to handle these negative aspects are by using dividers.

Dividers enable higher stability, prevent products from falling out and create a possibility to increase visibility by designing larger openings on the sides. Another positive aspect using dividers is the increased flexibility when preparing prior to a new delivery.

6.4 Analysis of Tray on Tray



6.4.1 Cost Efficiency with Tray on Tray

Four products are selected to represent the Ready-To-Sell packaging category Tray on Tray. These are IKEA 365+ pot with a lid, BUSIG drinking glass, BUSIG napkin and VÄGHULT tea light holder. Appendix E shows a detailed explanation of how cost arises through supply chain for those products.

Tray on Tray solution turned out to be cost efficient. In general does it contribute to lower cost for IKEA 365+, BUSIG glass and VÄGHULT compared to the option using a Regular package. Meanwhile BUSIG napkin wouldn't be affected from a cost perspective. Figure 6.13 and Figure 6.14 illustrates shares of total cost based on Ready-To-Sell for selected products.

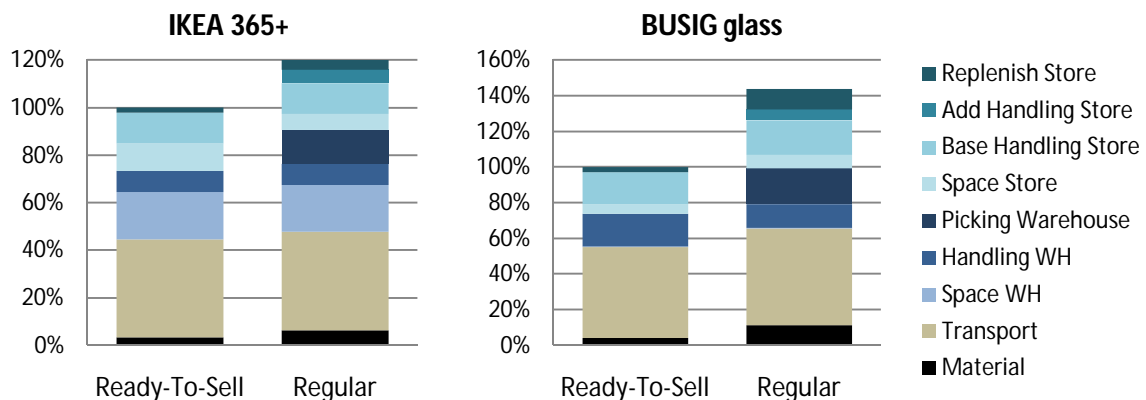


Figure 6.13 Shares of total cost for IKEA 365+ and BUSIG glass

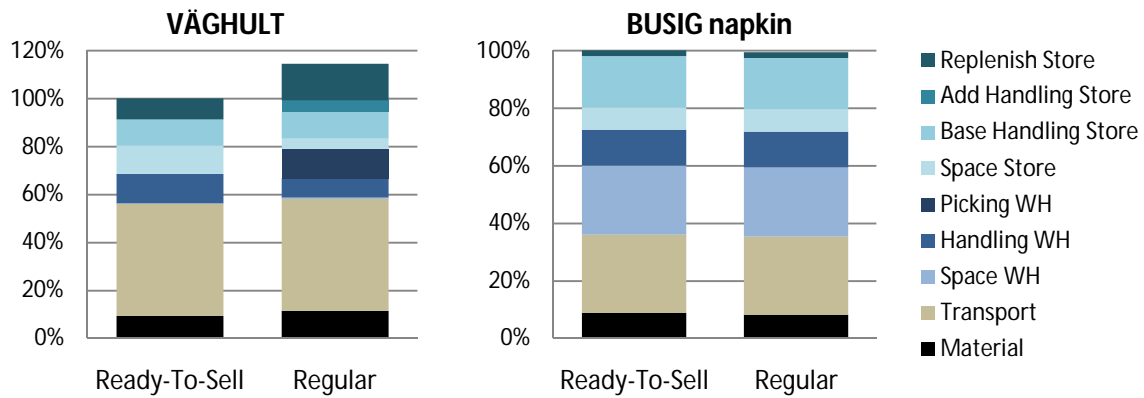


Figure 6.14 Shares of total cost for VÄGHULT and BUSIG napkin

Investigations found *Picking cost* to be the main contributor for lower cost using Tray on Tray. This is due to a Ready-To-Sell packaging never is picked in warehouse which a Regular packaging can be, depending on how well estimated MDQ and quantity in package are met. Selected products have picking for Regular packaging except for the BUSIG napkin.

Another factor affecting cost savings is *Additional handling cost* in store, a Ready-To-Sell packaging should never be divided and therefore always have a flow of 100% direct to sale space. A Regular packaging however can be divided and be kept in stock in store if quantity in packaging doesn't meet actual sale quantity which contributes to an *Additional handling cost*.

On average is less material used in a Tray on Tray solution compared to Regular package. Investigations found relations between material usage, visibility and flexibility, Figure 6.15 illustrate one way of categorizing Tray on Tray as *Very Open Tray* and *Open Tray*, each having features contributing to benefits as Table 6.5 describe.

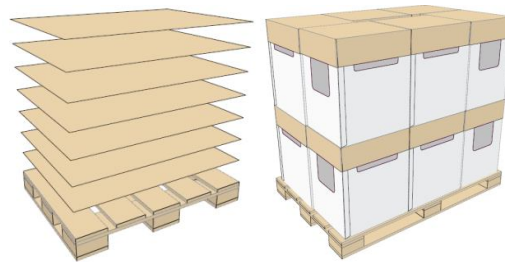


Figure 6.15 Example of *Very Open Tray* and *Open Tray*

Table 6.5

	<i>Very Open Tray</i>	<i>Open Tray</i>
Material	Use little material	Use quite a lot material
Visibility	Very visible for customer since just little or no material blocks the product	A lot of material blocking the products
Flexibility	Doesn't enable flexible handling, trays are too big to be handled as one tray	Enable flexible handling due to the small tray
Time	Doesn't claim much time during open hours, but when preparing prior to a delivery products need to be removed item by item	Time consuming maintaining during sell but doesn't claim much time preparing prior to a delivery

If using this classification, IKEA 365+ and BUSIG drinking glass would be placed in *Very Open Tray* while VÄGHULT and BUSIG napkin would be placed in *Open Tray*. The first two products uses less than half the amount material compared to Regular resulting in high visibility, and they also have very low flexibility since the tray are too big to be handled by one person or too instable to be carried. Due to low flexibility the product claim much time when preparing prior to a delivery as described in Table 6.5.

VÄGHULT and BUSIG napkin however use about the same amount material as the Regular package. But on the contrary does the solution block the products due to the material usage. In order to increase visibility the package claim time during open hours, e.g. remove products from half empty trays and remove trays. But the small tray enable flexibility which is an advantage previous a new delivery.

Although time is consumed differently depending on the solution both contributes to quicker replenishment than applying Regular packages. And even though *Very Open Tray* is time consuming when preparing for a delivery investigations found the solution to be quicker (less total time) than *Open Tray*. Table 6.5 shows the time savings for selected products compared to their Regular packages.

Table 6.6

	Time savings	
IKEA 365+	120%	} <i>Very Open Tray</i>
BUSIG drinking glass	140%	
VÄGHULT	75%	} <i>Open Tray</i>
BUSIG napkin	0%	

Although it's a big time saving potential with a Tray on Tray solution it should be notified that the *Replenish cost* is just a small part of the overall cost, and therefore not resulting in a great financial saving potential.

The largest cost increase through the supply chain is when using a half pallet Tray on Tray solution, since *Handle cost* in warehouse is larger than handling of full pallet, measured in cost per m³¹³¹ This increased cost for handling half pallet is always lesser then applying picking of Multipacks in warehouse.

The factors affecting mostly and direct related to the package for selected Tray on Tray products are summarized in Table 6.7.

¹³¹ It's more expensive to handle two half pallets than one full pallet.

Table 6.7

Cost Factor	IKEA 365+	BUSIG glass	VÄGHULT	BUSIG napkin
Material	Decrease	Decrease	Decrease	Increase
	Less material used in the Tray on Tray packaging			Slightly more material and white boxes
Handling warehouse	-	Increase	Increase	-
	Both solutions contain same quantity on full pallet	Tray on Tray are packed on half pallet having higher handling cost per m ³ than Regular packed on full pallet		Both solutions contain same quantity on full pallet
Picking warehouse	Decrease	Decrease	Decrease	-
	Regular require picking which Ready-To-Sell doesn't			None of solution require picking
Space store	Increase	-	Increase	-
	MDQ>estimated MQD, Tray on Tray pallet on sale space for long	No significant difference	MDQ>estimated MDQ, Tray on Tray pallet on sale space for long	No significant difference
Add handling store	Decrease	Decrease	Decrease	-
	Tray on Tray have 100% direct flow to sale space meanwhile Regular has indirect flow to sale space			Both solutions have 100% flow direct to sale space
Replenish store	Decrease	Decrease	Decrease	Decrease
	Quicker replenish in store using a Tray on Tray instead of manual handling with a Regular			

As the table imply is cost affected in different ways due to different circumstances.

6.4.2 Handle ability efficiency with Tray on Tray

Supplier

Depending on the design on the Tray on Tray for the specific product suppliers are satisfied to different levels with the concept. Suppliers providing products in *Open Tray* find that material needs to be stronger to support the weak construction with cut-outs since package stability doesn't fulfil the requirements, e.g. can't be stored more than two layers.

Suppliers find the products more secured in a Regular box since products are less damaged internal, in the plant, as well as external, in transports and in IKEA stores. The trays are more complex to handle than Regular boxes, harder to fold and stack. The suppliers also find it hard to fill the trays with products, mostly when the tray is wide.

One of the suppliers found the change from Regular to Tray on Tray costly, a major investment was made and a lot of tests carried out. The tests aimed to find the most optimal solution concerning material, cut-out, load capacity etc.

Warehouse

When Tray on Tray is handled as one unit the co-workers at warehouses aren't affected in any specific way but investigations found the co-workers handle pallets more careful when

products are visible, like Tray on Tray on solutions. This affects the co-workers more than what colour it is on the corrugated cardboard.

Some Tray on Tray is picked in warehouse even though it's not allowed to pick a Ready-To-Sell. When co-workers in the warehouse handle these trays it can be hard because of the size and construction. A tray without lid or cover has to be placed on top on a mixed pallet going out to the store. This means that the products are unprotected from dust and dirt in the warehouse, which can affect damages and attractiveness in the stores.

Store

Tray on Tray has a high utilization and co-workers are overall satisfied with the solution. The three most common reasons why not using Tray on Tray are

- The quantity of products the Tray on Tray holds is too big in relation to the selling quantity in a store.
- A decision is taken in store not to use the Tray on Tray solution for a specific product.
- The product has more than one sale space and products in a package are divided to different areas.

Approximately 60% of co-workers find it quick and easy to replenish a Tray on Tray and the main disadvantage mentioned is the time needed during open hours to maintain the products attractive and visible.

Compared to the two other Ready-To-Sell pallet solutions, Tray on Tray is considered the most flexible. This is due to the smaller unit a tray can be seen as, which enable co-workers to move more than one product at the time when preparing in advance for a new delivery.

The IKEA requirements for Ready-To-Sell packaging are discussed for Tray on Tray in Table 6.8.

Table 6.8

IKEA Requirements	Comments
<i>Safe for customer at all times</i>	Safety for customers isn't considered in the thesis.
<i>Easily handled by one person in store</i>	Co-workers find it easy to open a Tray on Tray on their own.
<i>Pallet/Shelf/Bin size adapted</i>	IKEA always, when possible, work with standard sizes of unit loads.
<i>No need to manually cut cardboard</i>	Corrugated cardboard lid can easily be removed without cutting. However straps and plastic needs to be cut.
<i>The products are clearly visible for the customer</i>	The Tray on Tray solution can be divided into two main categories, <i>Very Open Tray</i> which contributes to high visibility of products and <i>Open Tray</i> with lesser visibility.
<i>Strong and stable in size and shape</i>	The stability depends on material usage, product and design of the Tray on Tray. In general is stability satisfying.
<i>Enable flexible sale space management</i>	<i>Very Open Tray</i> isn't flexible, single item handling is needed, but <i>Open Tray</i> enables flexible handling due to smaller trays.
<i>Minimal waste handling during sell hours</i>	<i>Very Open Tray</i> doesn't claim waste handling time during the open hours since little material is used. The other category <i>Open Tray</i> requires more time to maintain during sell to avoid untidy impression.

6.4.3 Conclusion concerning Tray on Tray

The thesis found Tray on Tray to be cost efficient in contrast to Regular. How efficient it is depends upon many aspects but the main factor is if picking in warehouse is necessary when using a Regular, since Ready-To-Sell never require picking.

Further, the study found relations between; material, visibility, flexibility and time for Tray on Tray solutions and categorised them as *Very Open Tray* and *Open Tray*. Where the first represent a solution with positive aspects; claiming little material, not time consuming maintaining during open hours and contributes to high visibility. The positive aspects are on expense of low flexibility. Meanwhile *Open Tray* has characteristic features as high flexibility, low visibility and time consuming during open hours.

Investigations found *Very Open Tray* to be most cost efficient, but character of product decides which solution suites best.

Suppliers find Tray on Tray more complex to work with compared to Regular packaging and they also emphasize the construction of the trays to be weak and harder to stack on top of each other.

Tray on Tray is the Ready-To-Sell solution which during transport allowing most visibility of the products and the study found it affects co-workers way of handle the pallet in warehouse, they are more careful since the products are visible. The thesis also found that picking of trays in warehouse occurs, which shouldn't. This can impact product quality and customers' impression in a negative manner since products easier can be damaged, dirty and dusty.

Co-workers in stores are in general positive towards Tray on Tray and the most favourable about the concept is the quick and easy replenish it enables and in some case the flexibility. On the contrary is the most frequent comment from customers that it's time consuming to maintain during sell hours.

6.5 Analysis of Shelf Tray



6.5.1 Cost efficiency with Shelf Tray

The four products chosen for comparison when evaluating the cost efficiency through the supply chain of IKEA for Shelf Tray are; DIOD drinking glass, RIBBA photo frame 18x24, ALVINE BÄR quilt cover and SAXÅN shower curtain. A more detailed description of cost connected to packages for chosen products can be found in Appendix F.

The package for RIBBA is a *Tray and Hood*, and the other three products have *Tray and Collapse box* solutions, therefore is the analysis split in two different parts when discussing cost efficiency.

Shelf Tray – Tray and Hood

As can be seen in Figure 6.16 the total cost for the Regular solution¹³² is lower than the Shelf Tray solution. The filling rate is higher in the Regular package and the consequence out of it is visible in this result. Higher filling rate implies lower *Handling-* and *Storing costs* in both store and warehouse and decreased *Transport cost*. All these factors together have a greater impact on the total cost than advantages from quick replenishing with Shelf Tray. With these results it's stated that Shelf Tray isn't a cost efficient solution for RIBBA.

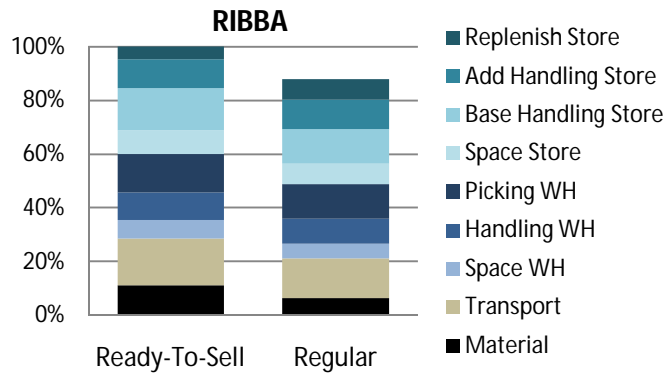


Figure 6.16 Shares of total cost for RIBBA

It has been observed the Shelf Tray seldom are used, instead the frames are unpacked on the shelf. However, it's interesting that the more expensive solution isn't utilized in the stores. In the case when co-workers decide to replenish on shelf instead of using the tray the cost are about the same as Figure 6.17 shows.

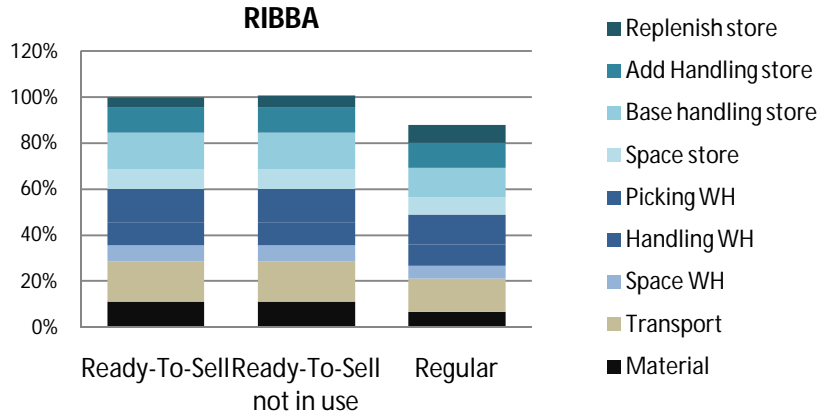


Figure 6.17 Shares of total cost for RIBBA including the case when Shelf Tray isn't utilized

RIBBA comes in several different colors, the black frame is often delivered in a Regular package while the other colours comes in Shelf Tray. This mix between packaging solutions is one of the most common reason for not to use Shelf Tray, it looks untidy on the shelf with different packages for the same kind of product.

Shelf Tray – Tray and Collapse box

The products using this packaging solution are DIOD, ALVINE BÄR and SAXÅN. As can be seen in Figure 6.18 it's only for DIOD the Shelf Tray is cost efficient. The saving is not significant and no major conclusions can be drawn from this difference.

¹³² RIBBA is delivered from several suppliers having Shelf Tray as the package solution. But one supplier provide the frames in a Regular package solution the thesis chosen to compare the Shelf Tray with.

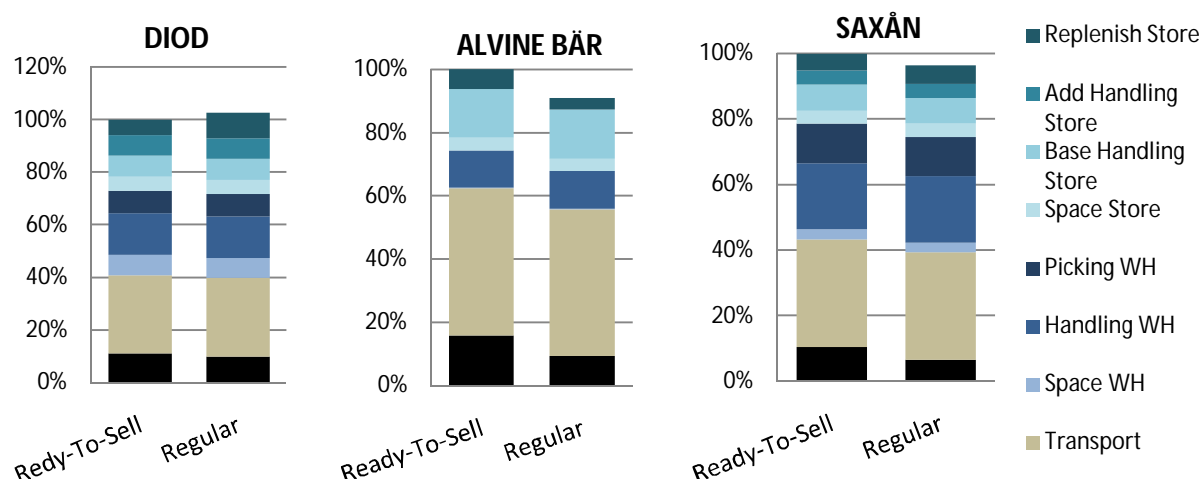


Figure 6.18 Shares of total cost for DIOD, ALVINE BÄR and SAXÅN

As for all of these three products, it's *Material-* and *Replenish cost* that changes. To be cost efficient with Shelf Tray, the gains in replenish must overcome the expenses for additional packaging material needed. Table 6.9 shows the direct related cost factors affected by the packages.

Table 6.9

Cost Factor	DIOD	ALVINE BÄR	SAXÅN
Material	Increase	Increase	Increase
	More package material is needed for the Shelf Tray and the material is more expensive due to white colour of the tray.		
Replenish store	Decrease	Increase	Decrease
	Quicker replenish in store using Shelf Tray instead of manual handling with Regular	Slower replenish in store using Shelf Tray instead of manual handling with Regular	Quicker replenish in store using Shelf Tray instead of manual handling with Regular

For ALVINE BÄR the replenish time is actually shorter with a Regular package than with Shelf Tray. Collapse boxes are intended to be easily opened but it's common that suppliers use more tape than the packaging specification requires, the tape is the main reason why it takes long time to open the boxes. There are two types of collapse boxes, the one used for quilt covers and other textiles are more time consuming due to over-taping, than the other type used for eating and cooking. The difference comes out of the two different ways the boxes are closed and taped, see Figure 6.19.

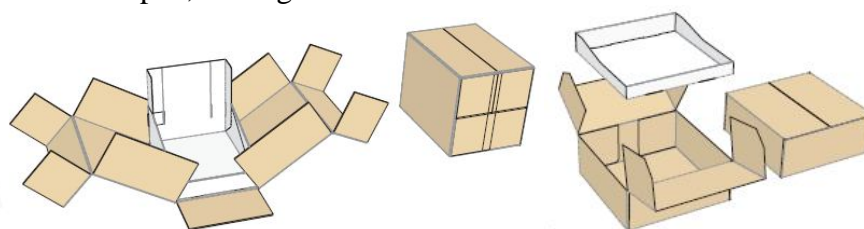


Figure 6.19 Collapse boxes represent the model used for textile and other model used for eating & cooking

6.5.2 Handle ability efficiency with Shelf Tray

Supplier

In general do the suppliers found Shelf Tray to be a good packaging solution and the overall impression is positive. Some suppliers mentioned they would prefer Regular packaging over Shelf Tray meanwhile other prefer the opposite.

Shelf Tray requires more material than Regular packages, one supplier stated the changed from Regular to Shelf Tray involved 20% higher material cost. By having two pieces of material; *Tray and Hood* or *Tray and Collapse*, also more capacity in stock space is required. Further do the suppliers find advantages in the higher product protection due to more material.

Some suppliers find the filling process more complex with Shelf Tray compared to Regular.

Warehouse

Warehouses in IKEAs supply chain all work with *neat & clean*, damaged goods should be rejected. Shelf Tray often consists of more material than Regular packages, this increase the stability and the Shelf Tray packaging withstands impacts of the supply chain better.

Shelf Trays *Tray and Hood* is more sensitive than Regular packages when picked. If the taping is unsatisfying the hood can fall of when picking them, a very common case when the concept was implemented and no tape were used affecting lots of damages. Today co-workers are more aware and observant and at the same time it's better taped.

Store

The overall satisfaction with Shelf Tray is quite low compared to the other Ready-To-Sell solutions. Co-workers find it hard to understand e.g. with the Tray and Hood concept co-workers open the package from top and start replenish, when half replenished they realize there is a tray in the bottom of the package. Co-workers suggest a label should be placed on Shelf Tray to indicate it's a sell solution. Co-workers also find it time consuming and a hassle to open over-taped collapse boxes.

Shelf Tray has the lowest utilization rate out of the packaging solutions being observed, 64%. This can be compared with an average of 79% for all products of the four different packaging solutions that have been observed. The three most common reasons why not to use Shelf Tray are presented in occurrence frequency below

- *Limited space on shelf*
Many stores have limited space and needs to optimize the space efficient and therefore aren't able to use the solution as intended. Also when planning the store space there is no consideration taken in the few extra millimetres required for the tray it self. This is sometimes the reason why it's not used, according co-workers.
- *Shelf are not adapted to tray size or vice versa*
The problems occur both in depth and height. The tray can not be used because the shelf is to shallow or it might be too deep or in height where it sometimes is impossible to get the products out of the tray because of the shelf above. It's hard to judge if the size of tray or shelf is wrong but it can be stated that it's sometimes a mismatch between the shelf and package.

- *A decision is taken in store not to use the Shelf Tray solution for a specific product*
The decision is probably related to the first reason or that the product is more attractive without the tray, e.g. has the thesis received comments from co-worker numerous times that product brings out more attractive when replenish them on shelf.

Shelf Trays are stable when unopened but when the supportive collapse box or hood is removed the instability increase. Some products demand divider to protect during transport and when the divider is removed it can be hard to handle the trays because of instability.

The comments given in survey and interviews are contradictory in many ways. The most frequent positive comment about Shelf Tray is that it's quick and easy to replenish while the same statement in the survey got the opposite result. The inconsequence in answers might be an effect of that the respondents think off different packages, e.g. *Tray and Hood* or *Tray and Collapse box*.

IKEA have different requirements that must be fulfilled for Ready-To-Sell packaging solutions. Considered Shelf Tray these are discussed in Table 6.10.

Table 6.10

IKEA Requirements	Comments
<i>Safe for customer at all times</i>	Safety for customers isn't considered in the thesis.
<i>Easily handled by one person in store</i>	Co-workers find it easy to open the Shelf Tray on their own.
<i>Pallet/Shelf/Bin size adapted</i>	It's an out spoken problem with size adaptation between shelf and tray both in depth and height.
<i>No need to manually cut cardboard</i>	Tape need to be cut in order to open the packages.
<i>The products are clearly visible for the customer</i>	In general are products clearly visible.
<i>Strong and stable in size and shape</i>	The packaging is in general stable.
<i>Enable flexible sale space management</i>	Trays are good for flexibility reasons. Even when the trays aren't used on the display shelf they are used on the flex shelf to make handling more efficient.
<i>Minimal waste handling during sell hours</i>	Most of the material is removed when opening the Shelf Tray. The time needed during selling hours is mainly to collect empty trays.

6.5.3 Conclusion concerning Shelf Tray

Investigations found the Shelf Tray solution to be cost inefficient. In general is only *Material* and *Replenish cost* affected when comparing Shelf Tray and Regular. In order to be cost efficient the gain in *Replenish cost* must overcome *Material cost* which it doesn't. It's also found that some products have both increased *Replenish-* and *Material cost*.

Shelf Tray is found to be the solution, compared to the other Ready-To-Sell, having the lowest level of utilization in store. Co-workers also affirm this by given the solution a lower level of satisfaction. They find it hard to understand if the box is a Shelf Tray or a Regular, by labelling the Shelf Tray with a symbol it can indicate how the package is intended to be used.

Co-workers find that Shelf Tray many times brings out the product unattractively, so instead of using the tray they replenish on shelf. Shelf Tray is also the category the thesis found being hard affected when suppliers deliver in different solutions. When visualising products in diverse solutions, e.g. brown material mixed with white and on shelf replenished mixed with tray, an unappealing impression can occur. Although co-workers many times choose to replenish a Shelf Tray they find the tray flexible and useful on the lower shelf level in store.

The suppliers are mainly affected by the increased *Material cost* and more complex filling procedure. Shelf Tray consists of two pieces and more storing space is required. Since more material is used it impacts the product protection in a positive manner. Even though most suppliers would prefer a Regular package in prior to Shelf Tray they don't find any major problem with Shelf Tray.

A Shelf Tray, *Tray and Hood*, is more complicated to handle in warehouse than a Regular package and co-workers need to be more careful when picking in order to avoid hood being removed.

6.6 Retail Ready Requirements according ECR

Efficient Customer Response describes five requirements; *Easy Identification*, *Easy Open*, *Easy Dispose*, *Easy Shelf* and *Easy Shop*, a retail ready package should meet to be successful and bring value within the supply chain. In order to compare how well IKEAs Ready-To-Sell packaging solution meets these requirements the thesis divided them into *Ready-To-Sell Pallet Solutions* and *Ready-To-Sell Shelf Solution*.

6.6.1 Ready-To-Sell Pallet Solutions

How well IKEAs Ready-To-Sell pallet solution; *Pallet Tray*, *Tear Away* and *Tray on Tray*, meet ECRs five requirements are discussed below.

Easy Identification

The labelling on IKEA packages follows many requirements and regulations. There are certain regulations about; what information it should contain, where to put it and how many it should be. The regulations are to be followed regardless of it is a Regular- or a Ready-To-Sell package.

Easy Open

The necessity of tool, e.g. knife, when opening packaging is discussed by ECR as something that shouldn't be mandatory. When open a Ready-To-Sell pallet a knife is necessary to remove transport package, stripes and plastic, but there is no need to cut corrugated cardboard, the package itself can easily be opened without knife.

Like all of IKEAs packages there are no instructions in how to open the package, but since IKEA works with only a few standard solutions it not considered as necessary. This is confirmed as observations found pallet Ready-To-Sell solutions are utilized to a level of 86%.

The refilling process is quick and only requires one person, like the ECR requirement. This is also something high evaluated by co-workers.

Easy Dispose

The time and effort to dispose the package should be less than the time saved within replenishing according ECR. For Ready-To-Sell pallet solutions this is the case, co-workers find it easy to separate the different packaging materials and in general are the corrugated cardboard easy to fold.

ECR have a desire, as little packaging material as possible should be used. All Ready-To-Sell pallet solution requires less material than a Regular. A Tray on Tray solution demand in general more material than Tear Away or Pallet Tray, but when comparing with a Regular solution it's less material.

Easy Shelf

A requirement from ECR is that products should remain stable in the retail ready package even after wrapping materials are removed to avoid waste caused by instability. The stability of the products packed in IKEA's Ready-To-Sell pallet solutions differ depending on the product. Some products are stable in their self while other easily falls out. But the stability is in general satisfying for all solutions.

Easy Shop

A package and its product should appear attractive to the customer. This is an issue closely related to the package type and appearance. Pallet Tray doesn't have any material supporting during sell time which leads to high visibility and on the other hand it's hard to preserve attractive during sell time (depending on the product and how supporting the product is). Tear Away isn't always satisfying, it's a lot of corrugated cardboard hiding the product so when half of the unit is sold it can be hard for customers to see the product. Tray on Tray is divided in two categories by the thesis, *Very Open Tray* which has high visibility of the products while *Open Tray* has a poorer since material covers the products.

6.6.2 Ready-To-Sell Shelf Solutions

How well IKEA's Ready-To-Sell shelf solution *Shelf Tray* meet ECRs five requirements are discussed below.

Easy Identification

The labelling on IKEA packages follows many requirements and regulations. There are certain regulations about; what information it should contain, where to put it and how many it should be. The regulations are to be followed regardless of it is a Regular- or a Ready-To-Sell package.

Easy Open

There are two kinds of Shelf Tray, *Tray and Hood* and *Tray and Collapse*. Collapse box is often hard to open, mostly because of lot of tape used. According packaging instructions for Shelf Tray these boxes are intended to be closed with just one tape that easily can be removed without usage of knife. During observation it has been seen that this isn't the case, instead the package is taped everywhere possible and up to seven cut needs to be done in order to open the box. This makes the opening more time consuming than opening a Regular package.

The other type of Shelf Tray is the one closed with just a hood. The hood is sometimes attached to the tray with tape. Co-workers find it hard to cut the tape since it's located under the box.

Easy Dispose

The time needed to collect and dispose the packaging material from a Shelf Tray is minimal. Some co-worker finds it hard to fold an open collapse box while other think it's easy.

The material consumption for a Shelf Tray, compared with a Regular is higher. A Shelf Tray consists of two pieces; *Tray and Hood* or *Tray and Collapse*, and the overlap constructions result in high material usage.

Easy Shelf

According ECR the product should remain stable in the Ready-To-Sell after wrapping materials are removed to avoid waste caused by instability. In general is Shelf Tray stable in its tray during sell.

ECR also require the dimension of package to be optimized for ISO modular. Instead IKEAs packages are adapted to the IKEA shelf modular standard. According co-workers it's not always successful. Bad adaptation between shelf and tray is one of the most common reasons why not to use Shelf Tray.

Easy Shop

Products are in general visible in a Shelf Tray. When shelf and tray have a good adaptation it's easy to pick products and replace them, as the requirement from ECR. The problems occur if the adaptation is insufficient.

7 Conclusions

This section will shortly discuss what the case study concluded based on the master thesis purposes presented in the introduction of the report. Results are based on comparison of Ready-To-Sell and Regular packages.

The main purpose of the thesis was to determine

How efficient are Ready-To-Sell packaging solutions through IKEAs supply chain?

Efficiency can be categorized differently and the thesis decided to focus on cost efficiency of a Ready-To-Sell through the logistic flow. The case study found all pallet solutions; *Pallet Tray*, *Tear Away* and *Tray on Tray* to be cost efficient at IKEA. Even though all products didn't give a significant saving a trend was found, *Picking cost* has the greatest impact and is the main factor for lower cost. Estimated MDQ and product quantity of the package decides if picking is necessary.

From the case study it's revealed that *Shelf Tray* isn't cost efficient. *Material-* and *Replenish cost* are the main factors affected, and in order to be cost efficient the savings from replenish must overcome the expenses of material.

The aim of Ready-To-Sell is to enable easy and quick replenishment in store. All pallet solutions contributes to quicker replenishment, but due to the small impact *Replenish cost* has on the overall supply chain cost it doesn't have any major influence on the savings. Easy and quick replenish is also the most frequent comment the thesis received from co-workers.

Investigations found Shelf Tray to be less time efficient than the pallet solutions, and for some Shelf Tray product it isn't time efficient at all. The aim of quick and easy replenish isn't fulfilled to the same extent for Shelf Tray, and is in many cases due over-taped boxes.

Although the *Replenish cost* doesn't have a great impact of the financial savings, co-workers are very satisfied with a quick replenishment and value the time saving high, it enable them to handle more article numbers during refill hours. Increased availability leads to more products in store which might impact total sales.

Also the time consumption is found to be spent differently, Regular package consume all time during refill hours meanwhile Ready-To-Sell is more time consuming during open hours. This implies possibility for increased availability, but also implies that it's essential to have co-workers maintaining during open hours to uphold an attractive sight of the products.

Efficiency can be measured in other ways as well e.g. *visibility efficiency* in order to display products well for customer, *flexibility efficiency* to enable quick and easy preparation previous a new delivery, *stability efficiency* so products remain stable and attractive during sell time, *time efficiency* in order to enable quick replenish and *material efficiency* meaning the usage of material should be kept to a minimum. When creating a package it's hard to fulfil all these demands to a high level and the different Ready-To-Sell solution meet these demands differently, but in general Table 7.1 sums up the efficiency factors.

Table 7.1

Efficiency Factors	Pallet Tray	Tear Away	Tray on Tray	Shelf Tray
Cost	High	High	High	Low
Visibility	High	Low	High	High
Flexibility	Low	Low	High	High
Stability	Product specific	Products specific	High	High
Time	High	High	High	Medium
Material	High	High	Medium	Low

Most suppliers find the Ready-To-Sell packaging more complex to handle and also the increased material cost were mentioned. But the overall impression is positive and even though most suppliers prefer a Regular package they don't see any big problems with handling Ready-To-Sell.

In general co-workers in warehouse aren't affected of a Ready-To-Sell packaging, all packages are treated carefully according to *neat and clean*. However a few aspects came up during the case study; Shelf Tray consisting of a *Tray and Hood* can, if not handled carefully, be separated and cause damage, and Tray on Tray are sometimes picked even though picking isn't allowed which can cause damage dirt and dust since the tray often has no lid.

The second purpose this master thesis discussed was

*To what level are Ready-To-Sell packaging solutions utilized at IKEA stores?
If the solutions aren't used as intended, what is the reason?*

Investigations found the pallet Ready-To-Sell solution to be most utilized, about 90%, meanwhile Shelf Tray only is utilized to a level of 65%, see Figure 7.1.

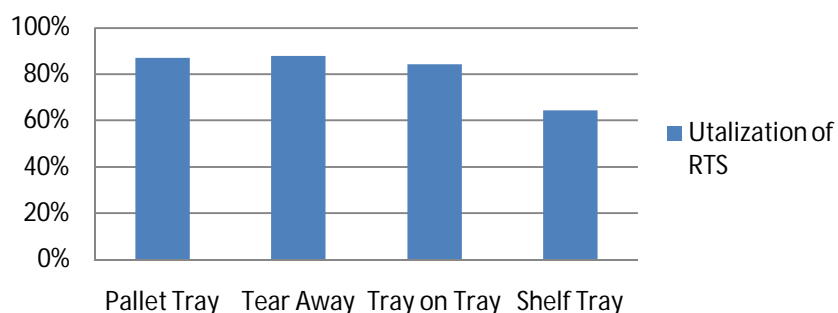


Figure 7.1 Level of utilization for the different Ready-To-Sell solutions

The main reason, according co-workers, for not using the solutions as intended are due to an oversized package, i.e. the package holds too many products in relation to estimated MDQ. Investigations also found connection between utilization and education, if co-workers have participated in an education/information about how and why to use the solutions it tends to increase the usage. Co-workers also consider a need for education, 59% agree instructions in Ready-To-Sell is necessary.

It's also revealed by the thesis that when products and product families doesn't have same kind of packaging solution the level of usage tend to decrease. In order to increase utilization it's therefore important to communicate an overall homogenous feeling by using both same construction and same colour of packages of a product and product family.

Based on the result from the case study the objective is to

Identify possible potentials with Ready-To-Sell packaging solutions at IKEA.

The thesis found there is a saving potential using Ready-To-Sell, especially in those cases when a Regular would have had picking in warehouse since it's the cost factor impacting savings the most. Figure 7.2 summarise the potential very generalised and should only be seen as a guideline.

<p><u>If Estimated MDQ ≥ Full pallet</u></p> <p>Picking not required</p> <p>→ Cost: RTS ≈ Reg</p>	<p><u>Ready-To-Sell</u></p> <p>Full pallet</p>	<p><u>Regular</u></p> <p>Full pallet</p>
<p><u>If Estimated MDQ < Full pallet</u></p> <p>Picking required for Reg</p> <p>RTS higher Handling cost WH</p> <p>RTS handling cost WH < Picking Reg</p> <p>→ Cost: RTS < Reg</p>	<p><u>Ready-To-Sell</u></p> <p>Half pallet</p>	<p><u>Regular</u></p> <p>Multi-pack</p>
<p><u>If Estimated MDQ < Half pallet</u></p> <p>Picking not required for Reg and RTS</p> <p>→ Cost: RTS ≈ Reg</p>	<p><u>Ready-To-Sell</u></p> <p>Multi-pack</p>	<p><u>Regular</u></p> <p>Multi-pack</p>

Figure 7.2 Saving potential

The thesis also found a great time saving potential using pallet Ready-To-Sell solutions. And by release time in stores availability can increase which leads to other benefits not directly linked to financial savings.

8 Recommendation and Further Research Areas

The authors of this thesis have during the investigations at IKEA found factors which will enable co-workers to work in a more efficient way. The chapter will discuss recommendations and areas which should be further researched in order to more exact determine how cost efficient the packaging concept Ready-To-Sell are.

Revision of packages

One of the most common remark from co-workers in store that is the size of a package is too big in relation to the selling quantity. Therefore it's important to, on regular basis, analyse how well estimated MDQ meet the quantity of products in the package. If the package holds more products than estimated MDQ the package should be redesigned.

Create a package holding fewer products than estimated MDQ

About 86% of IKEAs store find the area of market hall to be smaller than desired and co-worker find it hard to use all Ready-To-Sell packages due to lack of space in store. By designing the packages a bit smaller than estimated MDQ the risk to unpack them in store decreases.

Create universal packages

Markets and stores have different demands and a product on one market may sell less than on average. As a consequence, the thesis found, picking in warehouse takes part on all package-types. Ready-To-Sell packaging are created to be delivered all the way from supplier to stores and by dividing packages the products doesn't get same protection and damages may increase. By creating universal packages this behaviour can be avoided. E.g. Tray on Tray where each tray have a lid to avoid dust and dirt and a standardised module system to enable flexibility.

Symbol on Shelf Tray packages

Many Multipacks are hard to identify if it's a Regular Multipack or if it's a Self Tray, *Tray and Hood* solution. It's common that co-workers start to replenish from the box and when finished they realize it was a Shelf Tray package with a tray in the bottom. By having a symbol on the Shelf Tray packaging co-workers are able to use the solution as intended.

Increased information for co-worker in store

Co-workers tend to use the solution more if they have participated in education/information about Ready-To-Sell. By informing co-workers about possible potential, time savings in stores and that products can be commercial in a white tray as well as on the shelf, they may use the solutions to a higher level.

Design more Ready-To-Sell with the "need in store" as base

When stores see a need for a sell solution for a specific product and it comes in a Regular package they often create one on their own. These packages look unattractive and when cutting in the corrugated cardboard there is a risk for damaging the products. By having a better communication between IoS and stores the resources aimed for package improvements can focus on right products.

Use divider in Tear Away

The visibility of products sold from a Tear Away is quite low and in many cases co-workers also complain about low stability of products. By creating dividers for Tear Away solutions the stability increase and larger cut-cuts possible. Which enable higher product visibility.

Product families in same package concept

Investigation found products delivered by several suppliers (e.g. product families offered in many colours) tend to use different packages or colours on the corrugated cardboard. By overlooking products and families and apply same concept a more homogenous impression can be carried out.

Investigate more markets and products

In order to verify the Total Cost Model, created by the thesis, more markets and products should be investigated to see if same result is pointed out as the thesis found.

Extended usage of half pallets

Since the thesis found potential using Ready-To-Sell when the Regular would have had picking in warehouse, a recommendation is to use more half pallets, if the estimated MDQ approximately meets the quantity of a half pallet. Even if the MDQ is higher than half pallet quantity there are advantages using half pallets e.g. flexibility in store where stores depending on size and forecast can chose one, two or three half pallets, by having two half pallets it also enable high flexibility when preparing previous a new delivery.

One of the most common reason why not designing a half pallet solution is because of higher *Handling cost* in warehouse, but the thesis found this cost to be lower or the same as the alternative cost.

Suppliers are in general more satisfied with handling half pallets than full pallets. They find them more flexible and none of the suppliers which today handling half pallets would prefer full pallets to half pallets.

Co-workers in warehouse don't see the handling complex, but more resource-demanding. This as the equipment, fixture and forklifts, are more adapted to full pallets.

In store co-workers prefer half pallets to full pallets, they give a higher impression of product level. Half pallets are also more flexible and make it easier to have the correct quantity on the sales floor; one, two or three half pallets due to varying sales quantity in different stores. Having two half pallets instead of one full pallet enables easier handling preparing previous a delivery.

To take advantage of the potential in half pallets, warehouses need to adopt their fixture to a larger volume of half pallets. This can be done by invest in racks designed to hold half pallets and redesign automatic storage to enable half pallet storing.

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Cecilia Johansson *Manager Packaging Concept, IKEA of Sweden* 2009-01-21

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APPENDIX A – Assumptions and Total Cost Model

Appendix A defines assumptions taken into consideration in the thesis. Further are factors included in the supply chain Total Cost Model discussed.

Appendix A:I General Assumptions

- Costs occurred through the supply chain are in the thesis expressed as a total cost but aren't the real total cost. It disregards costs such as purchase price, duties, interest and environmental costs. Cost factors are further described in next section, Appendix A:II.
- Ready-To-Sell packaging solutions are applied for all selected products and therefore always chosen as base in cost calculations and comparisons.
- All costs are calculated and expressed in Euro per year, EUR/year.
- All calculations are based on one reference market, Germany. The German market (DE) is selected to represent the whole world but since costs vary depending on selected market the financial measures should be used more as a guideline than a rule.
- If a product chosen by the thesis is provided by more than one supplier only one of these is selected. In cost calculations this selected supplier represents all suppliers.
- Most of the cost factors are taken from IKEAs internal tool *Cost Simulation* to determine costs in different parts of the supply chain. When it's a cost difference between Ready-To-Sell and Regular but it shouldn't due to filling and size the thesis chosen to equal cost for Regular to cost for Ready-To-Sell.
- All selected products belong to BA 8, textile, and BA 9/50, eating and cooking/oasis.
- Estimated MDQ is based on amount stores worldwide.
- The Regular solutions aren't created in order to be a good or smart package, it's created easy using the Ready-To-Sell as base, e.g. if a product is packed in a Shelf Tray packaging the Regular packaging contain same number of items packed in the same way but using a traditional box.
- All Regular boxes are IKEA I201/FEFCO 201 boxes except for IRMA throw, the Regular packaging consists of a "pallet tray" since it's used for similar throws at IKEA.
- Distribution centres are in the thesis expressed as warehouses.
- If a package have deviation from the standard pallet size i.e. sizes larger than pallet measure, it's called overhang and are expressed in % in the thesis.

Appendix A:II Definitions of Total Cost Factors

Cost related to the thesis Total Cost Model are illustrated in Figure A.1.

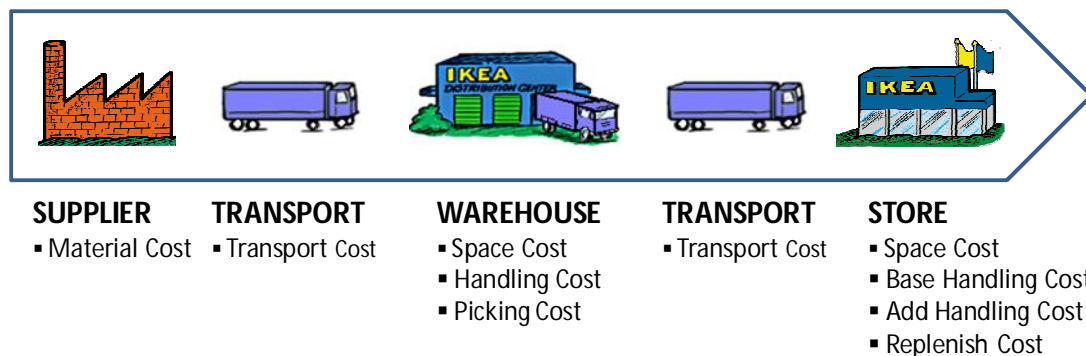


Figure A.1 Total cost model

Supplier

Material cost

Material cost refers to costs for package material for the secondary packaging and transport packaging. The cost only refers to corrugated cardboard and disregards primary packaging, plastic foil, shrinkage, straps and edge protectors. White package materials contribute to a higher *Material cost* of 10%.

Cost drivers: Usage of corrugated cardboard, Quality of package material, Brown or white package material, Pattern costs

Transport

Transport cost

Cost paid to service provider for goods transportation between supplier and IKEA stores including warehouse and consolidation points. The *Transport cost* is taken from Cost Simulation.

Cost drivers: Distance, Supplier volume, Filling rate %, Part load %, Number of pallets or m3 handled in consolidation point

Warehouse

Space cost

Space cost is all costs related to the storing of goods in warehouse such as rental of premises, line up-, maintenance-, oil-, electricity-, insurance- and racking cost. The *Space cost* in warehouse is taken from Cost Simulation.

Cost drivers: Distribution method, Service level, Supplier delivery quantity, Delivery frequency, Total lead time, Stock level, Number of stock weeks, Wholesaler cost level

Handling cost

Total cost for handling one full pallet from unloading to loading. Cost include staff costs including social-, external handling-, IT-, internal transport-, equipment- repair- and maintenance of equipment cost, forklift costs and trucking costs. The *Handling cost* in warehouse is taken from Cost Simulation.

Cost drivers: Type of pallet, Distribution method, Time consumed, Size of goods flow, Cost level, Pallet quantity

Picking cost

The cost at warehouse to deliver a lower quantity than a full pallet according to the sales of the store. Cost include staff costs including social costs, external handling cost, IT costs, transport cost for internal flow, equipment cost - repair and maintenance of equipment cost, forklift and racking costs, wrapping costs and picking space costs. The *Picking cost* in warehouse is taken from Cost Simulation.

Cost drivers: Distribution method, Sales forecast, Healthy volume rule, Time consumed, Picking order lines, Delivery quantity

Store

Space cost

Total costs related to the storage of goods in the store. Cost include rental of premises, line up costs, maintenance costs, cost for oil, electricity and insurance, racking cost. The *Space cost* in store is taken from Cost Simulation.

Cost drivers: Total lead time, Service level, Delivery quantity, Delivery frequency, Size of goods flow, Stock level, Number of stock weeks, Local retail cost level

Base handling cost

Total costs for handling goods receiving area in the store to the sale place directly. The *Base handling cost* in store is taken from Cost Simulation.

Cost drivers: Size of goods flow, Local retail cost level

Additional handling cost

The cost for taking the goods via store warehouse to sale space in an indirect goods flow. The *Additional handling cost* is taken from Cost Simulation.

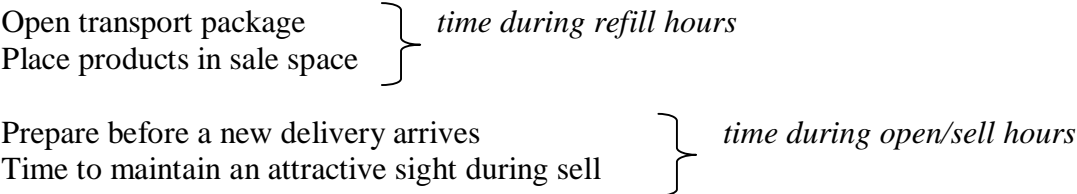
Cost drivers: Size of goods flow, Lead time, Local retail cost level

Replenish cost

The *Replenish cost* is express the cost for replenish a product in store excluding the in-store transportations, e.g. from loading platform to sale space. The replenish cost in store is calculated according to time and pattern costs.

Cost drivers: Time it takes to replenish, Pattern cost per hour in store

The replenish time is divided into either *time during refill hours* or *time during open/sell hours* and each containing parameters as following:



The time to prepare before a new delivery arrives may not always be done during open hours but in the thesis visited stores works with preparation in the evening and are therefore an assumption.

For the Ready-To-Sell pallet solutions (Pallet Tray, Tear Away and Tray on Tray) is the time to *open transport package* and *place products in sale space* put together. Approximately 10 measurements from each Ready-To-Sell solution are made in order to define pattern times for the time it takes to open transport packages and place in sale space. Table A.1 illustrate the pattern time for each solution.

Table A.1

Pattern times	Seconds
Pallet Tray	42
Tear Away	45
Tray on Tray	38
Shelf Tray	24

The other times are product specific decided based on measures and assumptions. The time assumptions for Ready-To-Sell and Regular are summarized in Table A.2.

Table A.2

	Ready-To-Sell	Regular
Prepare previous a new delivery	Assume 30% is remaining when a new package arrives	Assumed to be 0s since there aren't any preparation
Open transport package	Put together with next parameter	Assumed to be 30s irrespective of size when compared with a Pallet Tray, Tear Away and Tray on Tray, otherwise 0s
Place products on sale space	Pattern times	Measures assumed for each product
Maintain during sell	Measures assumed for each products	Assumed to be 0s since there aren't any maintaining

APPENDIX B – Tools for Case Study

Tools used in order to fulfil the purposes of the thesis are presented in Appendix B. First interview guides used for supplier, warehouse and store, further are the survey performed in stores presented and last a protocol over observed products.

Appendix B:I Interview guide Supplier

1. How many different kind of products do you produce in your plant?
2. What kind of plant is it? Automated or mostly manual?
3. What kind of packaging establishment is it? Automated or mostly manual?
4. Is IKEA your only customer or do you produce for someone else?
5. If yes, do you have different packaging solutions for the same kind of products, because different customers want to have different packaging?
6. For how long have you been producing xxx¹³³ for IKEA?
7. At the moment you produce the xxx in a Ready-To-Sell packaging. Have you always delivered the xxx in this packaging solution?

If Yes

8. If IKEA would ask you to pack xxx in a regular box packaging, would you accept it?
9. If yes, how do you think it would affect you?
 - Costs, for example material and labour hours
 - Regarding handling
 - Regarding storing
 - Regarding time consumption
 - Regarding folding and blank cutting
 - Regarding logistic time
 - Other comments
10. Do you find any problems with the Ready-To-Sell packaging? For example hard to fold, time-consuming, hard to pack, long logistics time and so on.
11. Do you find any positive aspects with the Ready-To-Sell packaging used for xxx?

If No

12. How did you deliver xxx before the Ready-To-Sell packaging? Was it in a regular box packaging?
13. Did IKEA wanted you to change the packaging or why did you change?
14. If IKEA wanted you to change did you get any explanations why a change was necessary?
15. How did the change affect you?
 - Costs, for example material and labour hours
 - Regarding handling
 - Regarding storing
 - Regarding time consumption
 - Regarding folding and blank cutting
 - Regarding logistic time
 - Other comments
16. Did the change of packaging mean any investment costs for you? If yes, who paid for these investments?

¹³³ xxx stands for a product and differ depending on respondent

17. Do you find the Ready-To-Sell packaging more complex to work with compared to the other old packaging solution? And if yes, how and why?
18. Is the Ready-To-Sell packaging more expensive compared to the old packaging?
19. Do you find any positive aspects with Ready-To-Sell packaging compared to the old packaging?
20. Do you find any problems with the Ready-To-Sell packaging?

In general, is it more complex to handle a half pallet compared to a full pallet? Describe why or why not.

If you have other comments of the packaging xxx you are more than welcome to let us know.

Appendix B:II Interview guide Warehouse

1. Ser de någon skillnad på en Ready-To-Sell förpackning och en icke Ready-To-Sell Ready-To-Sell?
2. Är det i så fall någon skillnad i hanteringen, t.ex. mer försiktig hantering vid plockning etc?
3. Upplever de mer eller mindre skador?
4. Åtgången av förpackningsmaterial, för lite eller för mycket?
5. Fungerar bättre eller sämre än en vanlig förpackning?
6. Hanteras vitt förpackningsmaterial mer försiktigt?
7. Vad tycker de om **helpall vs halvpall**?
8. Hur hanteras halvpallar, 2 på helpall, om överhäng på halvpall?
9. Är det stor skillnad i hanteringen?
10. Skillnad i lagring?
11. Hur ser kostnaderna ut för de olika?
12. Hur upplever de pall med överhäng/oversize/undersize?
13. Finns det möjlighet till automatlager för halvpallar?
14. Samma artikelnummer har olika leverantörer och därmed olika förpackningar, påverkar det arbetet under t.ex. plockning?

Appendix B:III Interview guide Store

Hur många års erfarenhet på IKEA

Arbetsuppgifter

Vilka BA

1. Har du hört talas om Ready-To-Sell -begreppet? Vet du bakgrunden till Ready-To-Sell?
2. Har ni fått någon utbildning eller vägledning i hur Ready-To-Sell är tänkt att användas?
3. Vem höll i utbildningen?
4. Vad fick ni lära er?
5. Tillämpas de kunskaperna idag?
6. Tycker du det finns behov av genomgång av hur Ready-To-Sell ska användas? Du eller dina medarbetare, t.ex. nyanställda.
7. Finns nämligen 4 Ready-To-Sell lösningar som IKEA tagit fram, BILD! Tanken är att arbetet ska underlätta i varuhuset med kortare tid för uppackning.

Allmänt om Ready-To-Sell ...

8. Spontant, vad tycker du allmänt om förpackningslösningen? Har du en positiv bild av Ready-To-Sell?
9. Används de?
10. Varför används de inte? Beror det på bristande kunskap, fel lösning typ för stor eller för liten, den är inte anpassad för varuhuset...
11. Hur många säljveckor räknar ni med att en produkt får stå på säljgolvet innan den packas upp?
12. Kan du säga om det är någon av dessa som nästan aldrig eller nästan alltid används? Varför?
13. För var och en av lösningarna, vad är det bästa resp. sämsta?
 - Pallet Tray
 - Tear Away
 - Tray on Tray
 - Shelf Tray

I vårt exjobb utgår vi från dessa 4 Ready-To-Sell lösningar och har valt 1-2 produkter som idag tillämpar lösningen och i ditt arbete kommer du i kontakt xxx.

14. Minns du den gamla förpackningen? Hur var den? Packade ni då upp produkterna ur förpackningen / happy box / annan säljlösning?
15. Händer det ofta att förpackningen till xxx är skadad när den anländer till varuhuset?
16. Händer det att du stöter på problem när du ska öppna och ska göra xxx säljfärdig? Vad är det för problem?
17. Upplever du att det går snabbt och enkelt att göra xxx säljfärdig?
18. Tycker du förpackningen "talar för sig själv" hur den ska användas / öppnas?
19. Klarar du av att göra produkten säljklar själv?
20. Behöver du använda "verktyg" för att öppna förpackningen?
21. Upplever du att onödigt mycket eller lite förpackningsmaterial används?
22. Upplever du att det är lätt att samla ihop materialet för återvinning?
23. Behöver du använda verktyg för att samla ihop återvinningsmaterialet?
24. Tycker du xxx står bra i förpackningen då emballaget är borttaget?
25. Hur ofta packar du upp xxx på hyllan, bingen eller dyl. alltså inte använder som den är tänkt?
26. Varför packar du upp xxx?
27. Är säljlösningen för xxx bra anpassad till varuhuset? Höjd och bredd på tray m.m.
28. Kräver xxx mycket underhåll under säljtiden, typ plocka skräp, ta upp produkter som trillat av eller dyl.? Trillar produkterna ofta av? Instabil...
29. Hur fungerar det då du ska fylla på xxx, plockar du då om de kvarvarande produkterna? Är det svårt / tidskrävande / instabilt?
30. Är det något som du tycker ska förbättras med förpackningen? Har du några idéer för att göra den bättre / mer lätthanterlig?
31. Om du jämför med den tidigare / alternativa förpackningen, tycker du Ready-To-Sell är bättre?
32. Finns det något som var bättre med den gamla förpackningen?

Allmänt

33. Har du hört någon kommentar från kunderna om Ready-To-Sell lösningen, smart / skräpig?
34. Hur tror du Ready-To-Sell påverkar säljet?
35. Vet du vad dina arbetskamrater tycker om Ready-To-Sell förpackningar?
36. Anser du att det finns vissa produkter som lämpar sig bättre eller sämre för Ready-To-Sell? Vilka då och varför?



PALLET TRAY

Markera hur väl påståendet passar in på dig

Tar helt
avstånd
från
påståendet

Instämmer
helt
i
påståendet

		1	2	3	4
1	PALLET TRAY förpackningen är sällan skadad när den anländer till varuhuset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Det är lätt att förstå hur man gör produkten säljfärdig, tar bort transportskydd m.m.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Det går fort att göra produkten säljfärdig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Jag stöter aldrig på problem då jag öppnar förpackningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Då produkten är säljklar går det snabbt att samla ihop transportskyddet för återvinning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Jag tycker produkten framhävs attraktivt i sin displayförpackning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Produkten ser säljande ut även då halva förpackningen är tom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Produkten står stabilt i förpackningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Jag plockar ofta upp produkter från golvet som ramlat av	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Produkten kräver lite underhåll under säljtiden (skräp mm)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Då jag ska fylla på med en ny PALLET TRAY går det snabbt att hantera de kvarvarande produkterna i den gamla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Jag är överlag nöjd med förpackningslösningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Hur ofta packar du upp produkterna ur förpackningen PALLET TRAY? Exempelvis packa upp på hylla, hälla i bingea etc. Sätt ett kryss på skalan som stämmer in på dig

0 av 10 gånger

hälften av gångerna

10 av 10 gånger

Om du packar upp produkten ur PALLET TRAY, vad beror det på?

.....

Vad är det bästa med denna typ av förpackningslösningen?

.....

Vad är det sämsta med denna typ av förpackningslösning?

.....



TEAR AWAY

Markera hur väl påståendet passar in på dig

Tar helt
avstånd
från
påståendet

Instämmer
helt
i
påståendet

		1	2	3	4
1	TEAR AWAY förpackningen är sällan skadad när den anländer till varuhuset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Det är lätt att förstå hur man gör produkten säljfärdig, tar bort transportskydd m.m.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Det går fort att göra produkten säljfärdig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Jag stöter aldrig på problem med att öppna förpackningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Då produkten är säljklar går det snabbt att samla ihop transportskyddet för återvinning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Jag tycker produkten framhävs attraktivt i sin displayförpackning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Produkten ser säljande ut även då halva förpackningen är tom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Produkten står stabilt i förpackningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Jag plockar ofta upp produkter från golvet som ramlat av	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Produkten kräver lite underhåll under säljtiden (skräp mm)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Då jag ska fylla på med en ny TEAR AWAY går det snabbt att hantera de kvarvarande produkterna i den gamla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Jag är överlag nöjd med förpackningslösningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Hur ofta packar du upp produkterna ur förpackningen TEAR AWAY? Exempelvis packa upp på hylla, hälla i bing e etc. Sätt ett kryss på skalan som stämmer in på dig

0 av 10 gånger

hälften av gångerna

10 av 10 gånger

Om du packar upp produkten ur TEAR AWAY, vad beror det på?

.....

Vad är det bästa med denna typ av förpackningslösning?

.....

Vad är det sämsta med denna typ av förpackningslösning?

.....



TRAY ON TRAY

Markera hur väl påståendet passar in på dig

Tar helt
avstånd
från
påståendet

Instämmer
helt i
påståendet

		1	2	3	4
1	TRAY ON TRAY förpackningen är sällan skadad när den anländer till varuhuset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Det är lätt att förstå hur man gör produkten säljfärdig, tar bort transportskydd m.m.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Det går fort att göra produkten säljfärdig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Jag stöter aldrig på problem med att öppna förpackningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Då produkten är säljklar går det snabbt att samla ihop transportskyddet för återvinning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Jag tycker produkten framhävs attraktivt i sin displayförpackning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Produkten ser säljande ut även då halva förpackningen är tom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Produkten står stabilt i förpackningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Jag plockar ofta upp produkter från golvet som ramlat av	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Produkten kräver lite underhåll under säljtiden (skräp mm)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Då jag ska fylla på med en ny TRAY ON TRAY går det snabbt att hantera de kvarvarande produkterna i den gamla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Jag är överlag nöjd med förpackningslösningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Hur ofta packar du upp produkterna ur förpackningen TRAY ON TRAY? Exempelvis packa upp på hylla, hälla i bingec etc. Sätt ett kryss på skalan som stämmer in på dig

0 av 10 gånger

hälften av gångerna

10 av 10 gånger

Om du packar upp produkten ur TRAY ON TRAY, vad beror det på?

.....

Vad är det bästa med denna typ av förpackningslösningen?

.....

Vad är det sämsta med denna typ av förpackningslösning?

.....



SHELF TRAY

Markera hur väl påståendet passar in på dig

		Tar helt avstånd från påståendet		Instämmer helt i påståendet	
		1	2	3	4
1	TRAY ON TRAY förpackningen är sällan skadad när den anländer till varuhuset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Det är lätt att förstå hur man gör produkten säljfärdig, tar bort transportskydd m.m.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Det går fort att göra produkten säljfärdig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Jag stöter aldrig på problem med att öppna förpackningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Då produkten är säljklar går det snabbt att samla ihop transportskyddet för återvinning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Jag tycker produkten framhävs attraktivt i sin displayförpackning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Produkten ser säljande ut även då halva förpackningen är tom	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Produkten står stabilt i förpackningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Jag plockar ofta upp produkter från golvet som ramlat av	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Produkten kräver lite underhåll under säljtiden (skräp mm)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Då jag ska fylla på med en ny SHELF TRAY går det snabbt att hantera de kvarvarande produkterna i den gamla	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Jag är överlag nöjd med förpackningslösningen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Hur ofta packar du upp produkterna ur förpackningen SHELF TRAY? Exempelvis packa upp på hylla, hälla i bing e etc. Sätt ett kryss på skalan som stämmer in på dig

0 av 10 gånger

hälften av gångerna

10 av 10 gånger

Om du packar upp produkten ur SHELF TRAY, vad beror det på?

.....

Vad är det bästa med denna typ av förpackningslösningen?

.....

Vad är det sämsta med denna typ av förpackningslösning?

.....

Appendix B:V Protocol for Observation

PALLET TRAY		BA	Kommentar
TOFTBO	badrumsmatta	8	
SAXÅN RUND	badrumsmatta	8	
LUSY	matta	8	
KARBY	matta, brun	8	
NÄCKTEN	handduk liten	8	
TRYGG	serveringsskål	9	
LEGITIM	skärbräda	9	
MOTORP	tidskriftsaml brun	10	
KAXIG	barnlampa	40	
GLIS	lådan	40	
VESSLA	Plastlåda	40	
HEMSJÖ	ljus	50	
TINDRA	luktglimma	50	
BÄSTIS	Matskål	djur	
RATIONELL	källsortering	kök	

TEAR AWAY		BA	Kommentar
FYRKLÖVER	påslakan	8	
BLÅHÄGG	Flecefilt	8	
IRMA	Flecefilt	8	
PRUTA	Plastburk	9	
FLÄCKIG	skålkitt	9	
FANTASTISK	servetter	9	
LINGO	lådan	10	
KASSETT	tidskriftsamlare	10	
HEMLIS	galge	10	
SMILA BAGGE	barnlampa	40	
SMILA BLOMMA	barnlampa	40	
SMILA STJÄRNA	Lampa	40	
BÄSTIS	klädrulle	djur	
BÄSTIS	Hundsäng	djur	
RATIONELL	Trälåda	kök	
RATIONELL	källsortering	kök	
BYGEL	burk	kök	

TRAY ON TRAY		BA	Kommentar
KNUBBIG	lampa	6	
SPARSAM	energilampa	6	
GRÖNÖ	lampa	6	
INDRA	överkast	8	
GODIS MIX	glas	9	
IMPULS	bringare	9	
IRIS	grytlapp	9	

CELEBER	burk mellan	9	
SLOM	glasburk	9	
50 x OÄNDLIG	servetter	9	
30 x SNÄLL	servetter	9	
RÄTTVIK	vinglas	9	
BUSIG	servetter	9	
KASTRULL 365	kastrull	9	
KASSETT	låda	10	
KRYP	lampa	40	
VÄGHULT	ljuslykta	50	
BAREN	toalettborste	bad	
NYTTJA	ram 13x18	ram	

SHELF TRAY		BA	Kommentar
SUNNAN	solcelllampa	6	
GLOBAL	arbetslampa	6	
IKEA 365 SÄNDA	lampa	6	
GRUNDTAL	spotlight	6	
SY	sytråd	8	
VILA	drapålakan	8	
IKEA 365 RISP	rutigt örngott	8	
OFELIA TÅNG	påslakan	8	
365 Bestick	tesked	9	
LJUVLIG	mugg	9	
CHARMÖR	mugg	9	
CELEBER	burk liten	9	
HOJTA	underlägg	9	
SYNTES KONST	prickskålar	9	
4 x VAKEN	plastglas	9	
EPISTEL	kaffekopp	9	
DIOD	Vitt glas	9	
RARA	vinglas	9	
RARA	dessertglas	9	
RARA	glas 30ml	9	
RARA	glas 15ml	9	
FABLER	lådan	40	
STOCKHOLM	värmeljushållare	50	
TINDRA	ljusdekoration	50	
SAXÅN	duschdraperi	bad	
BÄSTIS	underlägg hund	djur	
GRUNDTAL	magnetlist	kök	
RIBBA 30 x 40	ram	ram	
RIBBA 18x24	ram	ram	

APPENDIX C – Pallet Tray

This appendix describes factors affected for NÄCKTEN and TOFTBO, the selected products for Pallet Tray, according the Total cost model used for the thesis. Further is the result from survey preformed in stores presented.

Appendix C:I NÄCKTEN – Hand towel 40x60cm

NÄCKTEN is a white hand towel with more than one supplier, the selected for the thesis is located in India. NÄCKTEN is sold in a half pallet, Pallet Tray containing 950 towels. This package solution has 12 % overhang relative the pallet size of a BO-pallet. The Regular package solution holds 12 Multipacks positioned on a full pallet containing totally 1728 towels. Further information regarding the solutions is described in Figure C.1 and Table C.1.

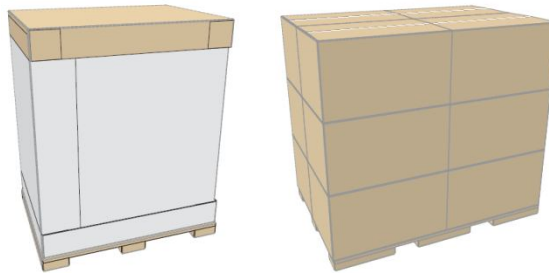


Figure C.1 Pallet Tray package and Regular package for NÄCKTEN

Table C.1

SELL	Sell Solution	Ready-To-Sell Pallet Tray	Regular Basket
FILLING	Estimated MDQ : 1765		
	Unit load type	BO	AO
	Pcs/Multi	-	144
	Multi/Unit load	-	12
	Pcs/Unit load	950	1728
	Picking in warehouse	No	No
	Overhang	12%	-

A package should be created to meet a demand of 2 weeks in store, or in other words have a delivery frequency of 2 week. According estimated MDQ is the delivery frequency for NÄCKTEN in Pallet Tray every 1,1 week. The selected reference market Germany sells less than on average and are replenished every 1,5 weeks, see Table C.2.

Table C.2

	Frequency of deliveries	Frequency of deliveries DE
NÄCKTEN	1,1 weeks	1,5 weeks

Through the supply chain costs occur at different stages expressed in factors underline material, transport, warehouse or store. These raised costs are divided into shares of total cost described in Table C.3.

Table C.3

		Pallet Tray	Regular
MATERIAL	Material cost	6%	5%
TRANSPORT	Transport cost	36%	36%
WAREHOUSE	Space cost	29%	28%
	Handling cost	11%	8%
	Picking cost	-	-
STORE	Space cost	6%	7%
	Base handling cost	11%	11%
	Additional handling cost	-	-
	Replenish cost	1%	5%
TOTAL COST based on Pallet Tray		100%	100%

The table shows there are neither savings using a Pallet Tray for this product, nor any losses. But the costs are distributed differently. *Handling cost* in warehouse is the factor contributes greatest to increased cost using a Pallet Tray package for NÄCKTEN. This is due to higher handling cost per m³ in warehouse when handle a half pallet instead of a full pallet.

The greatest potential for cost saving arise in replenish since the time for replenish to a large extent is quicker using a Pallet Tray package for NÄCKTEN, about 4 times quicker and are further described in Table C.4. Even though the time savings are 4 times the impact on overall supply chain cost is little and in the end increased and decreased cost cancels each other out. But by having a quick replenish, other benefits may occur in stores since time is set free, see Figure C.2.

Table C.4

	Pallet Tray	Regular
Prepare previous a delivery	50	0
Open the transport package	-	17
Open the package and place in sale space	44	417
Maintain during open hours	0	0
TOTAL Time for 1000 pcs (sec)	94	434

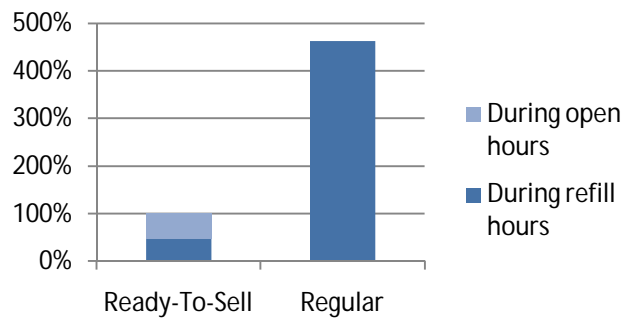


Figure C.2 Time consumption for NÄCKTEN in Pallet Tray and Regular package

Appendix C:II TOFTBO – Bathmat 65x100 cm

TOFTBO is a bathmat offered in approximately 10 different colours provided by several suppliers. The selected mat is white and delivered from a supplier in India. TOFTBO is sold on half pallet, Pallet Tray solution containing 72 products. This solution is compared with a Regular package consisting of 12 Multipacks on a full pallet holding totally 144 products. These compared packages are visualised and explained in Figure C.3 and Table C.5.

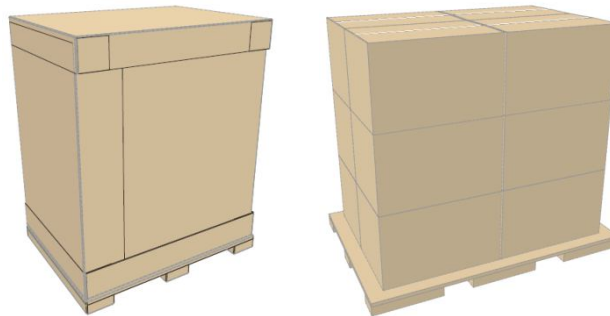


Figure C.3 Pallet Tray package and Regular package for TOFTBO

Table C.5

		Ready-To-Sell	Regular
SELL	Sell Solution	Pallet Tray	On shelf
FILLING	Estimated MDQ : 68		
	Unit load type	BO	AO
	Pcs/Multi	-	12
	Multi/Unit load	-	12
	Pcs/Unit load	72	144
	Picking in warehouse	No	Yes
	Overhang	-	-

The estimated MDQ is 68 products and the Pallet Tray meets this demand well by providing 72 mats on the solution. The pallet is sold in 2,1 week on average and selected reference market sell the pallet in 2,2 weeks, see Table C.6.

Table C.6

	Frequency of deliveries	Frequency of deliveries DE
TOFTBO	2,1 weeks	2,2 weeks

Cost occurred in the supply chain are divided into shares of the total cost. These shares of total cost, all based on the costs of Pallet Tray package, are shown in Table C.7.

Table C.7

		Pallet Tray	Regular
MATERIAL	Material cost	7%	6%
TRANSPORT	Transport cost	39%	42%
WAREHOUSE	Space cost	19%	17%
	Handling cost	17%	11%
	Picking cost	-	12%
STORE	Space cost	5%	5%
	Base handling cost	12%	12%
	Additional handling cost	-	3%
	Replenish cost	1%	4%
TOTAL COST based on Pallet Tray		100%	112%

As shown in the table above, Pallet Tray contributes with a cost saving compared to a Regular package, in financial dimension it means a Regular solution have a higher cost of 30 000 EUR/year. The major saving with a Pallet Tray occurs in warehouse since the solution doesn't require picking as the Regular solution does. And the greatest cost increase using a Pallet Tray is due to the higher handling cost per m³ at the warehouse, since the products are packed on a half pallet, while the Regular solution is packed on a full pallet. For further information of where in the supply chain costs are decreased and increased with a TOFTBO in a Pallet Tray, see Table C.8.

Table C.8

		Cost decrease	Cost increase
MATERIAL	Material cost		7%
TRANSPORT	Transport cost	15%	
WAREHOUSE	Space cost		18%
	Handling cost		65%
	Picking cost	60%	
STORE	Space cost		
	Base handling cost		11%
	Additional handling cost	15%	
	Replenish cost	10%	
TOTAL EUR/year		50 000	20 000

It's about 1,5 times quicker to replenish the products from a Pallet Tray solution compared to a Regular, the saving contribute with 10% of the total cost decrease. In Table C.8 it can also be seen that the *Replenish cost* only has a small impact of the total saving. Table C.9 shows the time for replenish, and Figure C.4 illustrates how the time consumption is divided into open hours and refill hours.

Table C.9

	Pallet Tray	Regular
Prepare previous a delivery	579	0
Open the transport package	-	208
Open the package and place in sale space	583	2583
Maintain during open hours	0	0
TOTAL Time for 1000 pcs (sec)	1162	2791

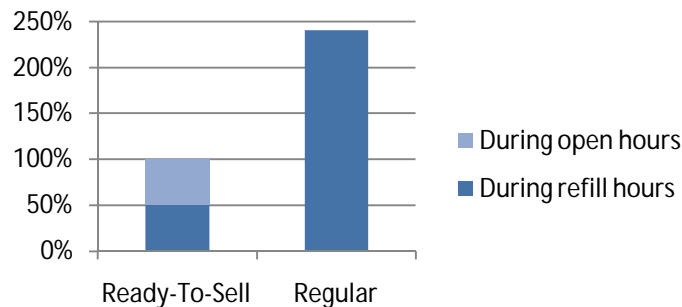


Figure C.4 Time consumption for TOFTBO in Pallet Tray and Regular package

The Pallet Tray solution has a direct flow to sale space of 100% and therefore no cost in *Additional handling cost*. At same time the Regular solution contribute with a direct flow of 79% to sale space and consequently have an *Additional handling cost* in store.

TOFTBO exists in several colours delivered from numerous suppliers, and all colours don't come in the same package solution, some are delivered on a Pallet Tray and other comes in Multipack.

62% of observed stores use the Pallet Tray solution for TOFTBO and 38% have chosen to replenish the product either in a basket or on a shelf. But since the *Replenish cost* only stands for a very small part of the total cost it doesn't impact the financial result significant.

Appendix C:III Result from Survey

Approximately 50 co-workers conducted a survey containing statements concerning the Pallet Tray solution. For survey, see Appendix B:IV. Figure C.5 show the result where the piles illustrate the grade out of 10. A high pile implies a good grade for all statements except for number 9 which is used for reliability matters, 8 and 9 should according to good reliability have opposite results, i.e. if result from statement 8 is high than result from 9 should be low.

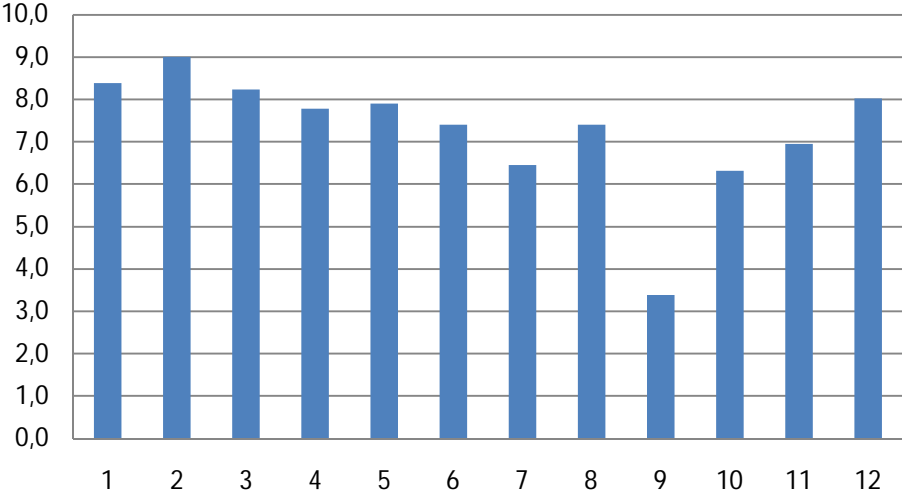


Figure C.5 Result from survey in store regarding Pallet Tray

Since statement 8 and 9 have received opposite grade (7.4 and 3.4), the reliability is considered high for the Pallet Tray survey.

APPENDIX D – Tear Away

Appendix D presents detailed information about costs and other factors affected when comparing Tear Away and Regular package. Selected products in the Tear Away solution are IRMA, FLÄCKIG and FANTASTISK. The chapter ends with result from survey performed in stores.

Appendix D:I IRMA – Throw 130x170cm

IRMA is a light blue throw made out of fleece. There is only one supplier and it's located in China. IRMA is delivered in a Tear Away with the size of a full pallet, AO. The Tear Away contains 186 throws, the same amount as in the alternative Regular package consisting of a “pallet tray”¹³⁴, see Figure D.1. Table D.1 shows information for the two different packages for IRMA that is compared.

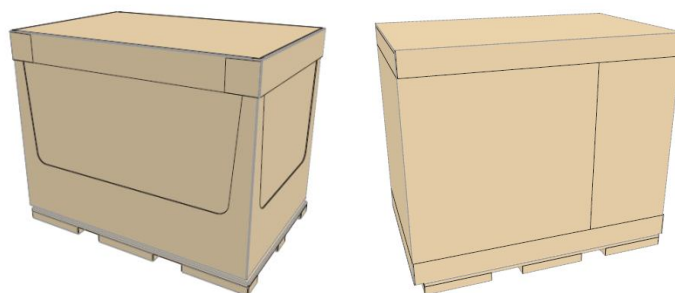


Figure D.1 Tear Away package and Regular package for IRMA

Table D.1

SELL	Sell Solution	Ready-To-Sell Tear Away	Regular Basket
FILLING	Estimated MDQ: 271		
	Unit load type	AO	AO
	Pcs/Multi	-	-
	Multi/Unit load	-	-
	Pcs/Unit load	186	186
	Picking needed	No	No
	Overhang	5%	5%

Estimated MDQ is 271 throws, the Tear Away holds 186. The solution is in general replenished every 1,4 weeks instead of every 2 week as the guideline suggest. In Germany, reference market for the thesies, IRMA is replenished every 1,7 weeks, see Table D.2.

Table D.2

	Frequency of deliveries	Frequency of deliveries DE
IRMA throw	1,4	1,7

Costs occurred in supply chain for the two solutions are quite similar, the only costs differing are *Material-* and *Replenish cost*. Table D.3 below shows shares of total cost.

¹³⁴ The Regular package chosen for IRMA is a construction used for other throws at IKEA and has the same appearances as a Pallet tray.

Table D.3

		Tear Away	Regular
MATERIAL	Material cost	5%	4%
TRANSPORT	Transport cost	39%	39%
WAREHOUSE	Space cost	28%	28%
	Handling cost	9%	9%
	Picking cost	-	-
STORE	Space cost	6%	6%
	Base handling cost	11%	11%
	Additional handling cost	-	-
	Replenish cost	1%	3%
TOTAL COST based on Tear Away		100%	101%

As can be seen in the table there are no significant savings using a Tear Away instead of a Regular package. The material consumption is a bit higher with Pallet Tray than the Regular.

The difference in *Replenish cost* is because of the quicker replenishing time with Tear Away. Replenish time of throws packed in a Tear Away, compared to the time replenish the throws in to a basket is approximately 3 times shorter.

In Table D.4 it can be seen that even though the *Material cost* increases, the total cost saving is still positive due to the timesaving in the replenishing.

Table D.4

		Cost decrease	Cost increase
MATERIAL	Material cost		100%
TRANSPORT	Transport cost		
WAREHOUSE	Space cost		
	Handling cost		
	Picking cost		
STORE	Space cost		
	Base handling cost		
	Additional handling cost		
	Replenish cost	100%	
TOTAL EUR/year		17 000	7 000

The cost saved within the shorter replenish time is noteworthy. Replenishing time for a Regular package is more than double the time for a Tear Away package, see Table D.5. Figure D.2 illustrate half of the time needed to maintain and replenish IRMA in a Tear Away is addressed to the open hours. The release of hours in the refill hours in the morning make it feasible to replenish more products and make more articles available.

Table D. 5

	Tear Away	Regular
Prepare previous a delivery	667	0
Open transport package	-	226
Open the packaging and place in sale space	242	2000
Maintain during open hours	0	0
TOTAL Time for 1000 pcs (sec)	909	2226

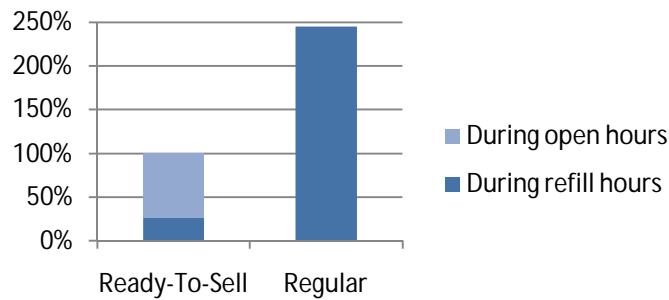


Figure D.2 Time consumption for IRMA in Tear Away and Regular package

Appendix D:II FLÄCKIG – Mixing bowl

FLÄCKIG is a set of two mixing bowls in two sizes. The supplier chosen for the thesis is located in Latvia. FLÄCKIG is delivered in a Tear Away solution containing of 72 sets of bowls on a half pallet. FLÄCKIG in Tear Away is compared with a Regular package consisting of 4 Multipack on a full pallet. The Regular package holds 120 sets of bowls, i.e. 30 sets in each Multipack, see Figure D.3 and Table D.6.

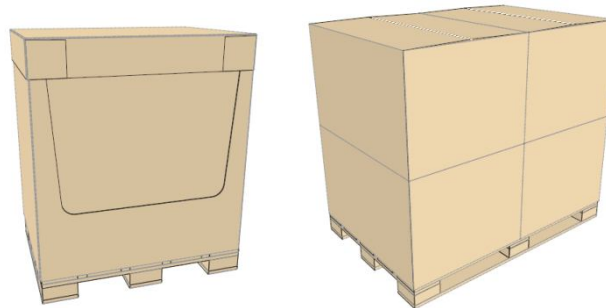


Figure D.3 Tear Away package and Regular package for FLÄCKIG

Table D.6

		Ready-To-Sell	Regular
SELL	Sell Solution	Tear Away	Basket
FILLING	Estimated MDQ: 70		
	Unit load type	B	A
	Pcs/Multi	-	30
	Multi/Unit load	-	4
	Pcs/Unit load	72	120
	Picking needed	No	Yes
	Overhang	-	-

Estimated MDQ is 70 sets, close to the actual number of bowls on the Tear Away solution. The Regular package holds 120 sets divided in to 4 Multipacks, to better correlate to the estimated MDQ the product is picked in the warehouse.

The delivery quantity for a product is expected to meet 2 weeks demand in the store. As can be seen in Table D.7 this is well met for FLÄCKIG.

Table D.7

	Frequency of deliveries	Frequency of deliveries DE
FLÄCKIG bowl	2,1	2

In Table D.8 the shares of cost occurring in different parts of the supply chain are shown.

Table D.8

		Tear Away	Regular
MATERIAL	Material cost	12%	9%
TRANSPORT	Transport cost	34%	40%
WAREHOUSE	Space cost	1%	1%
	Handling cost	22%	18%
	Picking cost	-	30%
STORE	Space cost	7%	12%
	Base handling cost	22%	26%
	Additional handling cost	-	18%
	Replenish cost	2%	3%
TOTAL COST based on Tear Away		100%	157%

In the table it's shown that Regular package have 57% higher cost than Tear Away, this difference means approximately 112 000 EUR/year.

In Table D.9 it can be seen *Picking-* and *Additional handling cost* have the greatest impact on total cost decrease. The two contributors for cost increase are *Material-* and *Handling cost* in warehouse.

Material cost increase due to double corrugated cardboard is needed to support the big surfaces of Tear Away. The actual m² corrugated cardboard needed for Tear Away is less than for the regular solution.

The increased *Handling cost* comes out of half pallet handling which is more expensive in warehouse compared to full pallet handling. If comparing the total cost in warehouse for the two different solutions it can be seen that the cost for the Regular is more than the double.

Table D.9

		Cost decrease	Cost increase
MATERIAL	Material cost		39%
TRANSPORT	Transport cost	10%	
WAREHOUSE	Space cost	0%	
	Handling cost		61%
	Picking cost	47%	
STORE	Space cost	7%	
	Base handling cost	7%	
	Additional handling cost	28%	
	Replenish cost	1%	
TOTAL EUR/year		126 000	14 000

The total time saving using Tear Away instead of Regular package for FLÄCKIG is notable, see Table D.10 and Figure D.4. An even more interesting issue is that most of the time needed to make FLÄCKIG attractive for customers is needed during open hours.

Table D.10

	Tear Away	Regular
Prepare previous a delivery	569	0
Open transport package	-	250
Open the packaging and place in sale space	625	1700
Maintain during open hours	278	0
TOTAL Time for 1000 pcs (sec)	1472	1950

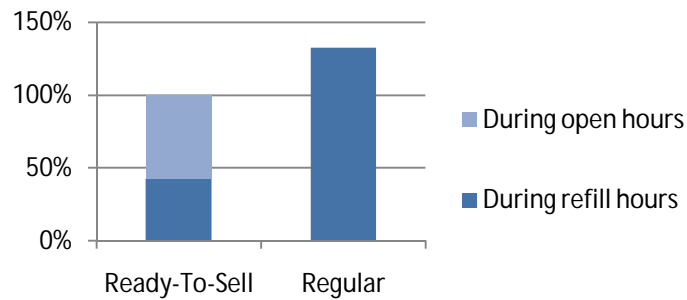


Figure D.4 Time consumption for FLÄCKIG in Tear Away and Regular package

Appendix D:III FANTASTISK – Napkin

FANTASTISK is a napkin offered in several colours and sizes. The napkin is produced by several suppliers but the supplier considered in the thesis is located in Poland. The napkin chosen is white, in measures 40x40 cm and the consumer package consists of 100 napkins. It's sold in a Tear Away with 108 customer packages on a half pallet, see Figure D.5 and Table D.11 for further information.

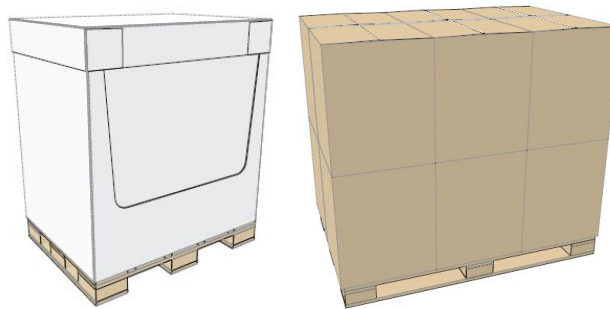


Figure D.5 Tear Away package and Regular package for FANTASTISK

Table D.11

SELL	Sell Solution	Ready-To-Sell Tear Away	Regular Basket
FILLING	Estimated MDQ: 1391		
	Unit load type	B	A
	Pcs/Multi	-	16
	Multi/Unit load	-	12
	Pcs/Unit load	108	192
	Picking needed	No	No
	Overhang	3%	8%

The Regular package consists of 12 Multipacks placed on a full pallet, each box contains 16 packages of napkins, i.e. 192 packages on each pallet. A Tear Away holds 108 pieces but in relation with the estimated MDQ of 1391 it seems very low. Frequency of delivery is approximately five times a week. In Germany, reference market, one delivery lasts for 0,4 weeks, see Table D.12.

Table D.12

	Frequency of deliveries	Frequency of deliveries DE
FANTASTISK	0,2	0,4

The high MDQ can be an effect of the different colours for the napkin since all FANTASTISK napkins strive for the same solution.

FANTASTISK has direct flow from supplier to store, i.e. the napkins never pass the warehouse. Table D.13 shows shares of total cost for FANTASTISK.

Table D.13

		Tear Away	Regular
MATERIAL	Material cost	16%	16%
TRANSPORT	Transport cost	27%	28%
WAREHOUSE	Space cost	-	-
	Handling cost	-	-
	Picking cost	-	-
STORE	Space cost	22%	23%
	Base handling cost	29%	31%
	Additional handling cost	4%	4 %
	Replenish cost	3%	6%
TOTAL COST based on Tear Away		100%	109%

The total cost, based on Tear Away is 9% higher when the napkins are sold in a Regular package. The 9% can be translated into approximately 180 000 EUR/year.

Replenish cost contributes the most to the positive result for Tear Away, 41% out of 180 000 EUR/year. The second largest contributor is *Base handling cost*. In Table D.14 it can be seen the Regular package has no advantages for FANTASTISK.

Table D.14

		Cost decrease	Cost increase
MATERIAL	Material cost	0%	
TRANSPORT	Transport cost	14%	
WAREHOUSE	Space cost		
	Handling cost		
	Picking cost		
STORE	Space cost	18%	
	Base handling cost	24%	
	Additional handling cost	3%	
	Replenish cost	41%	
TOTAL EUR/year		180 000	0

Some costs are more related to the package, e.g. *Replenish cost*, and some are more a consequence of the pallet size, e.g. *Transport-* and *Space cost* due to the higher filling rate.

As can be seen in Table D.15 and Figure D.6 the replenish time is decreased with Tear Away.

Table D.15

	Tear Away	Regular
Prepare previous a delivery	495	0
Open the transport package	-	156
Open the packaging and place in sale space	417	1875
Maintain during open hours	0	0
TOTAL Time for 1000 pcs (sec)	912	2031

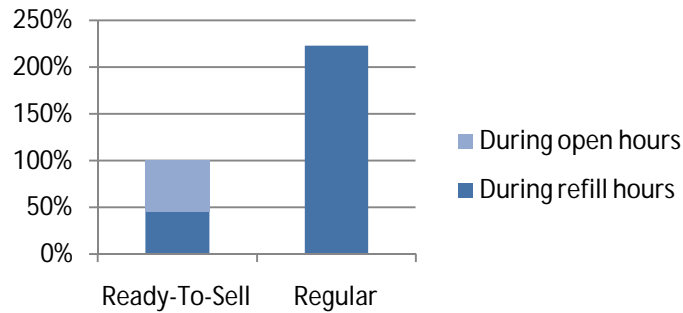


Figure D.6 Time consumption for FANTASTISK in Tear Away and Regular package

The time needed for maintaining FANTASTISK in Tear Away is moved to the open hours which imply the possibility to utilize the refilling time in the morning to make more products sellable.

Appendix D:III Result from Survey

The survey is conducted with approximately 50 co-workers in IKEA stores in southern Sweden and is presented in Figure D.7.

The piles in the figures presents what grade the different statements got, a high pile represent something positive and a low something negative, except from pile 9 that is a reverse statement used for reliability of the survey, i.e. if result from statement 8 is high the result from statement 9 should be low. Pile 8 and 9 are not exactly the opposite (7,14 and 4,48) but still is the result considered to shows good reliability of the survey.

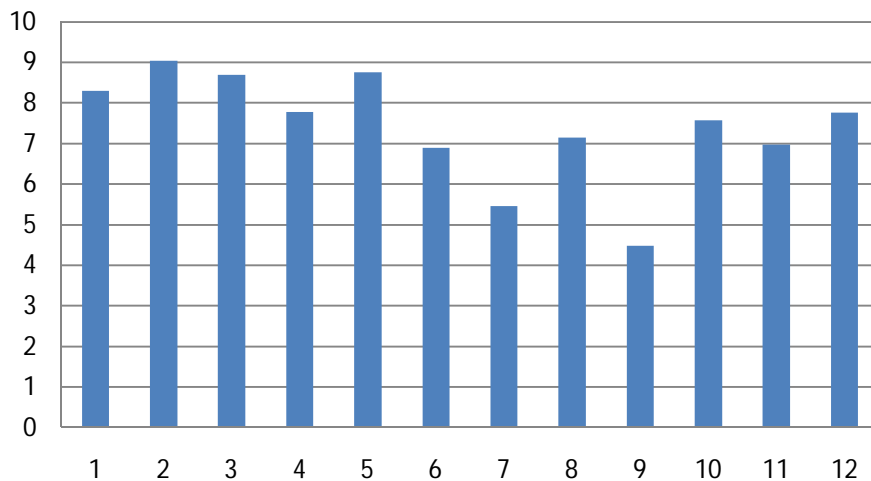


Figure D.7 Result from survey in store regarding Tear Away

APPENDIX E – Tray on Tray

This Appendix presents and discuss costs according the thesis total cost model for selected products representing Tray on Tray; IKEA 365+ Pot, BUSIG drinking glass, BUSIG napkin and VÄGHULT tea-light holder. Further is result from survey presented.

Appendix E:I IKEA 365+ – Pot with lid 3l

IKEA 365+ is a pot containing 3l provided by more than one supplier and the selected supplier is located in China. IKEA 365+ is sold from a full pallet Tray on Tray solution containing 144 pots. The Regular package consists of 12 Multipack located on a full pallet also carrying 144 pots. Both solutions have 13% overhang relative the size of an AO-pallet. The packages are describes in Figure E.1 and Table E.1.

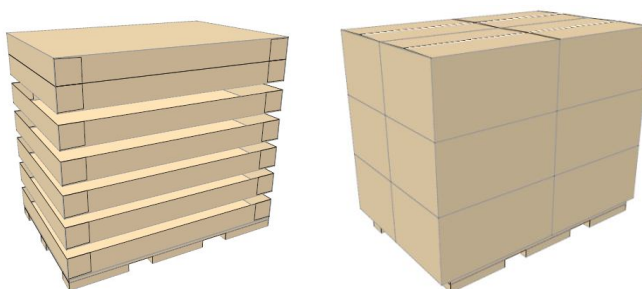


Figure E.1 Tray on Tray package and Regular package for IKEA 365+

Table E.1

SELL	Sell solution	Ready-To-Sell Tray on Tray	Regular Basket
FILLING	Estimated MDQ : 49		
	Unit load type	AO	AO
	Pcs/Multi	-	12
	Multi/Unit load	-	12
	Pcs/Unit load	144	144
	Picking in warehouse	No	Yes
	Overhang	13%	13%

The target is to have delivery frequency every second week for a product. Estimated MDQ for IKEA 365+ is 49 products while the Tray on Tray solution holds 144 products. In general is the solution sold for 5,9 weeks, almost three times the target. The selected market Germany sells less than on average and the time to sell the pallet there is 6,8 weeks, see Table E.2.

Table E.2

	Frequency of deliveries	Frequency of deliveries DE
IKEA 365+	5,9 weeks	6,8 weeks

Costs occurred at different stages in the supply chain are divided into usage of material, transport from supplier to store, costs related to warehouse and costs related to store. These costs are divided into shares of total cost for Tray on Tray and can be found in Table E.3.

Table E.3

		Tray on Tray	Regular
MATERIAL	Material cost	3%	6%
TRANSPORT	Transport cost	41%	41%
WAREHOUSE	Space cost	20%	20%
	Handling cost	9%	9%
	Picking cost	-	14%
STORE	Space cost	12%	7%
	Base handling cost	13%	13%
	Additional handling cost	-	6%
	Replenish cost	2%	5%
TOTAL COST based on Tray on Tray		100%	120%

Applying a Regular solution for IKEA365+ would contribute to 20% higher cost. Translated to financial savings it can be expressed as approximately 50 000 EUR/year. The major saving with this solution is due to picking isn't required with a Tray on Tray solution as it is with the Regular package, almost 60% of total decreased cost.

There are hardly any increased costs by using a Tray on Tray package compared to a Regular, *Space cost* in store stands for 99% of the total increased cost. The reason is the delivered quantity is three times larger than estimated MDQ and the Tray on Tray solution will be standing at the sell space for approximately six weeks instead of two.

Table E.4 shows how, in what direction costs in the supply chain affects, i.e. if a Tray on Tray solution contributes to increased cost or decreased cost.

Table E.4

		Cost decrease	Cost increase
MATERIAL	Material cost	12%	
TRANSPORT	Transport cost		
WAREHOUSE	Space cost		1%
	Handling cost		
	Picking cost	56%	
STORE	Space cost		99%
	Base handling cost		
	Additional handling cost	22%	
	Replenish cost	10%	
TOTAL EUR/year		60 000	10 000

Time to replenish IKEA 365+ from a Regular package to a basket is about double the time it takes to replenish a Tray on Tray¹³⁵. Even though a lot of time is saved it only contributes with 10% of total cost saving i.e. the *Replenish cost* has a very small impact of overall supply chain cost. Table E.5 shows the replenish time in seconds per 1000 pieces and Figure E.5 present how the time is consumed between open hours and refill hours.

¹³⁵ The time is based on the Ready-To-Sell criteria that *the packaging can easily be handed by one person in the shop*. The tray, holding 24 pots, is too big to handle by one person and therefore need to handle 30% of remaining products previous a new delivery manually item by item instead of flex the whole tray. If two persons handle the whole tray instead of 24 pots manually even more time and cost can be saved.

Table E.5

	Tray on Tray	Regular
Prepare previous a delivery	1250	0
Open the transport package	-	174
Open the package and place in sale space	264	4375
Maintain during open hours	556	0
TOTAL Time for 1000 pcs (sec)	2070	4549

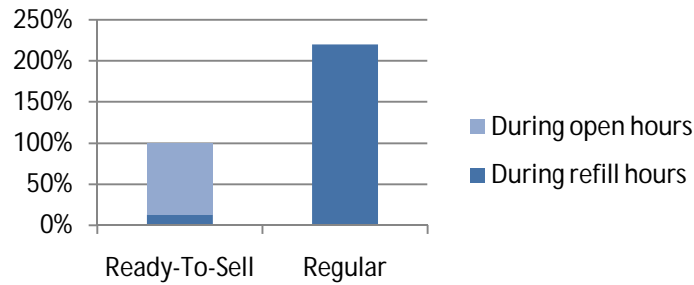


Figure E.2 Time consumption for IKEA 365+ in Tray on Tray and Regular package

The reason for *Additional handling cost* in store for Regular is due to Tray on Tray solution have a direct flow to sale space in store meanwhile the Regular solution have a flow of 66% direct to sale space in store.

All stores the thesis visited have used the Tray on Tray for IKEA 365+ pot. Even though the package is way too big to meet selling quantity in two weeks the solution seems to be good.

Appendix E:II BUSIG - Drinking glass 6 pcs

BUSIG is a drinking glass, one article number consists of 6 glasses packed in a consumer package. The model of glass is offered in many patterns and colours packed in slightly different ways. BUSIG is sold from a half pallet, Tray on Tray solution containing 99 primary packages. The Tray on Tray package is compared with a Regular solution consisting 30 Multipacks on a full pallet. The pallet holds 180 consumer packages. Reasons for the large number of Multipacks are due to weight limitations of maximum 15 kg. The solutions are further described in Figure E.3 and Table E.6.

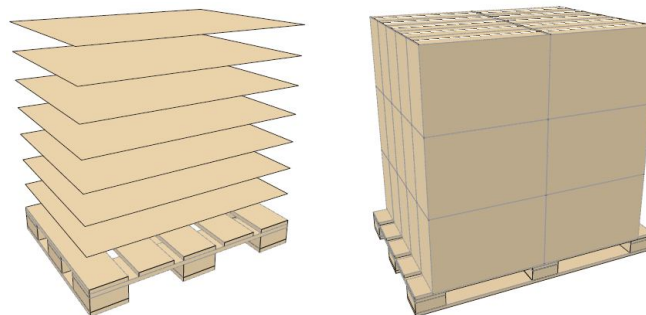


Figure E.3 Tray on Tray package and Regular package for BUSIG drinking glass

B4B4Table E.6

SELL	Sell solution	Ready-To-Sell Tray on Tray	Regular Shelf
FILLING	Estimated MDQ: 118		
	Unit load type	B	A
	Pcs/Multi (artno)	-	6
	Multi/Unit load	-	30
	Pcs/Unit load (artno)	99	180
	Picking in warehouse	No	Yes
	Overhang	-	-

Estimated MDQ is 118 set of glass which the Tray on Tray solution meet quite well with 99. The solution is in general replenished every 1,7 weeks instead of the goal of 2 weeks but vary for markets and stores. On selcted reference market Germany is the Tray on Tray solution replenished every 1,9 weeks, see Table E.7.

Table E.7

	Frequency of deliveries	Frequency of deliveries DE
BUSIG glass	1,7 weeks	1,9 weeks

Costs occur at different stages in the supply. These costs are divided into shares of total cost for Tray on Tray in order to get an idea how costs impact the overall cost, see Table E.8.

Table E.8

		Tray on Tray	Regular
MATERIAL	Material cost	4%	11%
TRANSPORT	Transport cost	51%	54%
WAREHOUSE	Space cost	0%	0%
	Handling cost	18%	14%
	Picking cost	-	20%
STORE	Space cost	5%	7%
	Base handling cost	18%	19%
	Additional handling cost	-	6%
	Replenish cost	3%	11%
TOTAL COST based on Tray on Tray		100%	144%

As we can see in the table, it's 44% more costly to sell BUSIG glass in a Regular package than in a Tray on Tray. There are lower costs in all parts of the supply chain except for handling in warehouse. This is due to the Tray on Tray solution is a half pallet and the cost for handle a half pallet is higher per m³. The cost difference means approximately 130 000.

Picking cost is the factor impacts the decreased cost most, and thereafter all factors are about the same. See Table E.9 for a closer description of how the Tray on Tray impacts the increased and decreased costs.

Table E.9

		Cost decrease	Cost increase
MATERIAL	Material cost	15%	
TRANSPORT	Transport cost	6%	
WAREHOUSE	Space cost		
	Handling cost		100%
	Picking cost	41%	
STORE	Space cost	4%	
	Base handling cost	4%	
	Additional handling cost	13%	
	Replenish cost	17%	
TOTAL EUR/year		145 000	15 000

It's roughly 2,5 quicker to replenish a Tray on Tray compare to Regular. For a detailed view of replenish time, see Table E.10 and Figure E.4.

Table E.10

	Tray on Tray	Regular
Prepare previous a delivery	657	0
Open the transport package	-	167
Open the package and place in sale space	384	5833
Maintain during open hours	606	0
TOTAL Time for 1000 pcs (sec)	1646	6000

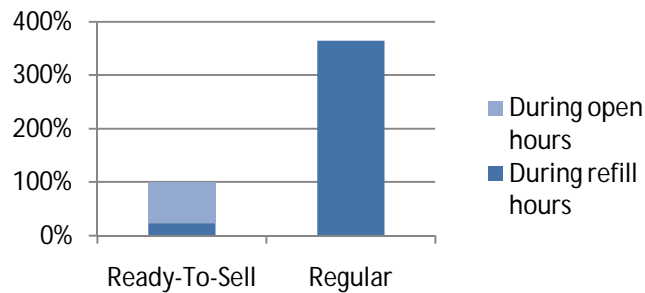


Figure E.4 Time consumption for BUSIG glass in Tray on Tray and Regular package

Appendix E:III BUSIG – Napkin 50 pcs

BUSIG is a paper napkin available in assorted patterns with same article number. The product is packed as a Tray on Tray full pallet, 12 trays each holding 50 products so the pallet holds totally 600 products. The product is provided by two suppliers, the selected is located in Slovakia. The Regular package is organized in the same way, holding same amount products but boxes are closed traditional boxes intended to be sold from a basket. For more detailed description, see Figure E.5 and Table E.11.

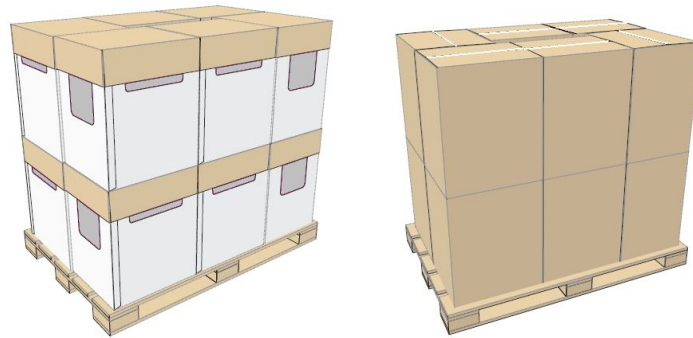


Figure E.5 Tray on Tray package and Regular package for BUSIG napkin

Table E.11

SELL	Sell solution	Ready-To-Sell Tray on Tray	Regular Basket
FILLING	Estimated MDQ: 425		
	Unit load type	A	A
	Pcs/Multi (artno)	-	50
	Multi/Unit load	-	12
	Pcs/Unit load (artno)	600	600
	Picking in warehouse	No	No ¹³⁶
	Overhang	-	-

Estimated MDQ for BUSIG napkin is calculated to 425. The Tray on Tray solution holds 600 products which mean an on average replenish frequency of 2,8 weeks, a bit over target value of 2 weeks. For selected market Germany the product is replenished every 4,4 weeks, see Table E.13.

Table E.12

BUSIG napkin	Frequency of deliveries 2,8 weeks	Frequency of deliveries DE 4,4 weeks

In order to understand how costs impact the total supply chain cost these are divided into shares where the Tray on Tray solution is selected as a base, i.e. the total cost are selected to 100%. Table E.13 describe share of costs for BUSIG napkin.

Table E.13

		Tray on Tray	Regular
MATERIAL	Material cost	9%	8%
TRANSPORT	Transport cost	27%	27%
WAREHOUSE	Space cost	24%	24%
	Handling cost	12%	12%
	Picking cost	-	-
STORE	Space cost	8%	8%
	Base handling cost	18%	18%
	Additional handling cost	-	-
	Replenish cost	2%	2%
TOTAL COST based on Tray on Tray		100%	99%

¹³⁶ The MDQ for BUSIG napkin is larger than estimated MDQ and the Regular solution should be picked in warehouse. But since there are four patterns mixed on same pallet it would be too complex to pick the napkin in order to give all stores the same range of patterns and therefore are all calculations based on no picking in warehouse.

As the quantity and unit load size are the same for both solutions the only differences are – *Material-* and *Replenish cost* as the table shows. It also shows there are no financial savings with a Tray on Tray for this product, it’s rather the opposite, the total costs are lower for a Regular solution. But it should be noticed that the difference between Tray on Tray and Regular for BUSIG napkin are very small so from an economic perspective it doesn’t really matter.

From a time saving perspective there are basically no savings with a Tray on Tray solution. The refilling process is quicker but maintenance is longer, see Table E.14 and Figure E.6 for more details.

Table E.14

	Tray on Tray	Regular
Prepare previous a delivery	67	0
Open the transport package	-	50
Open the package and place in sale space	63	291
Maintain during open hours	200	0
TOTAL Time for 1000 pcs (sec)	330	341

The difference in replenish a Tray on Tray solution compared to a Regular solution is that the Regular consume all time during refill hours meanwhile Tray on Tray mostly consume the time during open hours, it’s just a transfer of time.

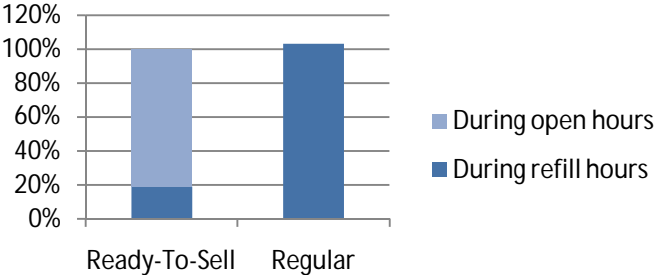


Figure E.6 Time consumption for BUSIG napkin in Tray on Tray and Regular package

Observations explored a level of utilization of 50% for BUSIG napkin. And co-workers most frequent comment for not use the solution is due to an unattractive seen and time consuming maintenance during open hours, many trays to remove during sell. According to co-workers in store it’s also proven to contribute to better sale figures when having the napkins in a basket instead of the Tray on Tray solution. As Figure E.7 shows the products are more displayed in a basket.



Figure E.7 BUSIG napkin in basket and in Tray on Tray

Appendix E:IV VÄGHULT – tea light holder

VÄGHULT is a tea light holder delivered from one supplier located in China. The article is available in 4 different colours all having the same article number. The product is packed on a Tray on Tray solution holding 1152 products. The Regular solution holds 2304 products packed in 48 Multipacks each containing 48 tea light holders, see Figure E.8 and Table E.15.

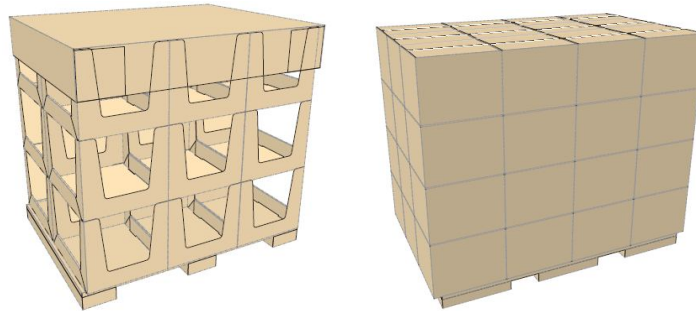


Figure E.8 Tray on Tray package and Regular package for VÄGHULT

Table E.15

SELL	Sell solution	Ready-To-Sell Tray on Tray	Regular Shelf
FILLING	Estimated MDQ: 254		
	Unit load type	BO	AO
	Pcs/Multi (artno)	-	48
	Multi/Unit load	-	48
	Pcs/Unit load (artno)	1152	2304
	Picking in warehouse	No	Yes
	Overhang	5%	5%

The estimated MDQ is 254 but the solution contains about 4 times this estimate. It means the package is replenished on average every 9,1 weeks instead of target replenish frequency of every 2 weeks. The selected reference market Germany has a delivery frequency of every 9,7 weeks see Table E.16.

Table E.16

VÄGHULT	Frequency of deliveries 9,1 weeks	Frequency of deliveries DE 9,7 weeks

In order to understand how costs affect the total supply chain cost these are divided into shares. The Tray on Tray solution for VÄGHULT tea light holder is selected as base and total cost is therefore selected as 100%, see Table E.17 for details.

Table E.17

		Tray on Tray	Regular
MATERIAL	Material cost	9%	11%
TRANSPORT	Transport cost	47%	47%
WAREHOUSE	Space cost	0%	1%
	Handling cost	12%	8%
	Picking cost	-	12%
STORE	Space cost	12%	4%
	Base handling cost	11%	11%
	Additional handling cost	-	5%
	Replenish cost	9%	15%
TOTAL COST based on Tray on Tray		100%	114%

As seen in the table, the Regular solution would have contribute to 14% higher cost, in financial measures it's a bit more than 10 000 EUR/year. The Regular package has picking in warehouse and this element contribute to the largest cost saving when using a Tray on Tray.

Since MDQ for the Tray on Tray solution is larger than estimated MDQ (1152 vs. 254) the package has a large *Space cost* in store and this factor contributes to the largest increased cost. The Tray on Tray solution is packed on a half pallet and due to higher handling cost per m³ in warehouse this factor also increases the cost. See Table E.18 for a closer description of how the Tray on Tray solution impacts the increased and decreased cost.

Table E.18

		Cost decrease	Cost increase
MATERIAL	Material cost	8%	
TRANSPORT	Transport cost		
WAREHOUSE	Space cost	1%	
	Handling cost		36%
	Picking cost	47%	
STORE	Space cost		64%
	Base handling cost	1%	
	Additional handling cost	19%	
	Replenish cost	25%	
TOTAL EUR/year		20 000	10 000

For VÄGHULT the *Replenish cost* has a high impact of decreased cost relative the total cost decreases, 25%. Table E.19 shows the total replenish time expressed in seconds per 1000 pieces and Figure E.9 shows how the time is distributed.

Table E.19

	Tray on Tray	Regular
Prepare previous a delivery	69	0
Open the transport package	-	13
Open the package and place in sale space	33	1042
Maintain during open hours	507	0
TOTAL Time for 1000 pcs (sec)	609	1055

Most of the time consumption with the Tray on Tray package occurs during open hours meanwhile the Regular package use all time during refill hours.

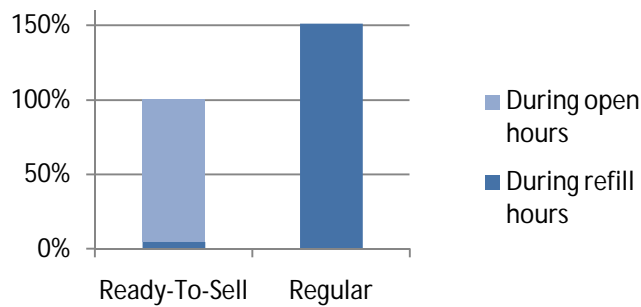


Figure E.9 Time consumption for VÄGHULT in Tray on Tray and Regular package

The Tray on Tray solution for VÄGHULT is utilized to a level of 100% and is considered as a good packaging solution for this product according to IKEAs co-worker in store.

Appendix E:V Result from Survey

A survey was conducted with approximately 50 co-workers in IKEA stores in southern Sweden, the result is presented in Figure E.10. The survey contains statements about how the co-workers perceive the packaging solution Tray on Tray.

In the figure the pile represents what grade the different statements got, a high pile represent something positive and a low something negative, except from pile 9 that is a reverse statement used for reliability of the survey. I.e. if result from statement 8 is high the result from statement 9 should be low. As can be seen in Figure E.10 it's a major difference in the result of 8 and 9. It's almost exactly the opposite (7,69 and 2,91) which shows good reliability of the survey.

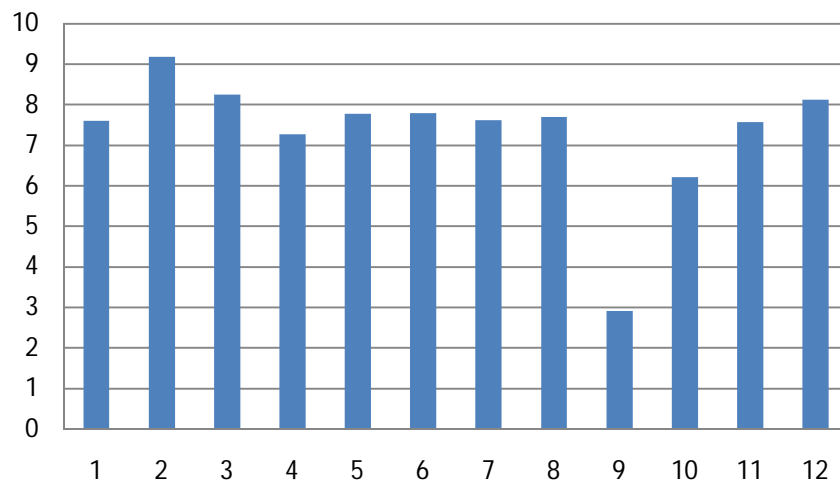


Figure E.10 Result from survey in store regarding Tray on Tray

APPENDIX F – Shelf Tray

Total cost factors affected for RIBBA, DIOD, ALVINE BÄR and SAXÅN, selected products for Shelf Tray, are described in this Appendix. Further is the result from presented.

Appendix F:1 RIBBA – Photo frame 18x24 cm

RIBBA Photo frame is a product that has been sold in Shelf Tray for many years but still there are suppliers using the old type of package, Regular Multipack. Selected supplier for calculations is located in Poland. Some characteristics for the two packaging types compared are described in Figure F.1 and Table F.1 below.

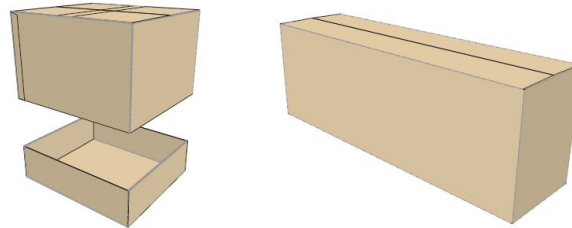


Figure F.1 Shelf Tray package and Regular package for RIBBA

Table F.1

		Ready-To-Sell	Regular
SELL	Sell solution	Shelf Tray <i>Hood and tray</i>	Shelf
FILLING	Estimated MDQ: 101		
	Unit load type	A	A
	Pcs/Multi (artno)	20	22
	Multi/Unit load	18	18
	Pcs/Unit load (artno)	360	396
	Picking in warehouse	Yes	Yes
	Overhang	9%	-

As can be seen in the table does the filling rate decrease with the Shelf Tray package, there are 360 frames on one pallet with Shelf Tray compared to 396 frames on a pallet with Regular.

In Table F.2 are shares of the cost occurring at different stages in the supply chain displayed. All costs are based on the Shelf Tray solution.

Table F.2

		Shelf Tray	Regular
MATERIAL	Material cost	11%	6%
TRANSPORT	Transport cost	18%	15%
WAREHOUSE	Space cost	7%	6%
	Handling cost	10%	9%
	Picking cost	14%	13%
STORE	Space cost	9%	7%
	Base handling cost	16%	13%
	Additional handling cost	11%	11%
	Replenish cost	5%	8%
TOTAL COST based on Shelf Tray		100%	88%

It's 12% more expensive to deliver RIBBA in a Shelf Tray than in a Regular package. The increased cost for Shelf Tray is related to the lower filling rate which impacts, among others,

Material-, Transport and Picking cost. See Table F.3 for a closer description of how the Shelf Tray impacts the increased and decreased costs.

Table F.3

		Cost decrease	Cost increase
MATERIAL	Material cost		30%
TRANSPORT	Transport cost		19%
WAREHOUSE	Space cost		8%
	Handling cost		6%
	Picking cost		10%
STORE	Space cost		8%
	Base handling cost		19%
	Additional handling cost	7%	
	Replenish cost	93%	
TOTAL EUR/year		6 000	25 000

The increased cost is almost five times higher than the decreased cost. The *Replenish cost* stands for almost all of the decreases but still the total cost raises with Shelf Tray. The aim with Ready-To-Sell is to make the replenish procedure more efficient and this is achieved with RIBBA but the tradeoffs are too big to make the package profitable.

A closer study of the time needed to replenish and maintain RIBBA in the store can be seen in Table F.4.

Table F.4

	Shelf Tray	Regular
Prepare previous a delivery	400	0
Open the package and place in sale space	1250	2227
Maintain during open hours	0	500
TOTAL Time for 1000 pcs (sec)	1650	2727

The table show the replenish time for Shelf Tray is significantly lower than the replenish time for Regular, this is also illustrated in Figure F.2.

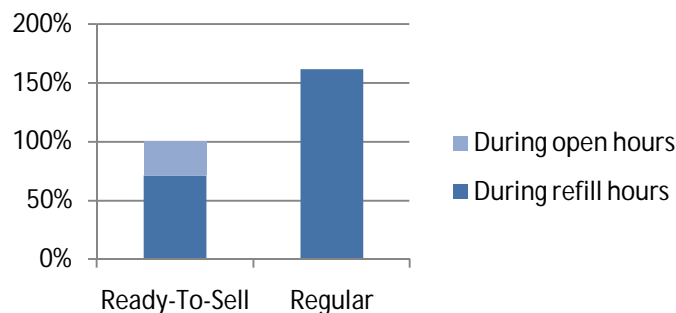
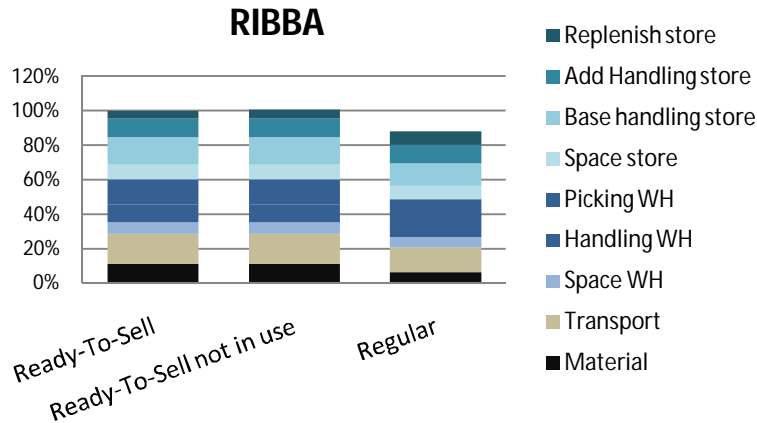


Figure F.2 Time consumption for RIBBA in Shelf Tray and Regular package

Because of the stacking method in the Regular package an additional handling is necessary, the frames are stacked every other facing inward and frames are turned to face the customer in an attractive way and can explain the Maintain during open hours for Regular.

It has been observed that the Shelf Tray seldom are used, instead the frames are unpacked on the shelf. This means that the more expensive package not even is in use. When this occurs the total cost is slightly higher than when using Shelf Tray, Figure F.3.



n

Figure F.3 Shares of total cost for RIBBA including the case when Shelf Tray isn't utilized

The black RIBBA frame 18x24 is delivered in a Regular package, but most of the other colours are delivered in Shelf Tray. The inconsequence in packages for the frames is one of the most common reasons why not to use the Shelf Tray.

Appendix F:II DIOD – Drinking glass

DIOD drinking glass is delivered from China in a Shelf Tray consisting of a white tray and a brown collapse box. In each box there are 48 glasses stapled in 16 piles, each pile with three glasses. The unit load contains 36 Shelf Tray packages. The Regular package used for the comparison has the same measurement and the glasses are arranged in the same way as in the Shelf Tray. For further information considering the packages, see Figure F.4 and Table F.5.

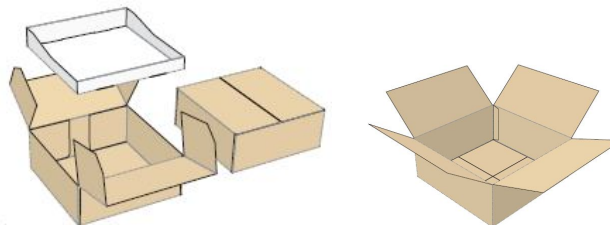


Figure F.4 Shelf Tray package and Regular package for DIOD

Table F.5

		Ready-To-Sell	Regular
SELL	Sell solution	Shelf Tray	Shelf
		Tray and Collapse box	
FILLING	Estimated MDQ: 101		
	Unit load type	AO	AO
	Pcs/Multi (artno)	48	48
	Multi/Unit load	36	36
	Pcs/Unit load (artno)	1728	1728
	Picking in warehouse	Yes	Yes
	Overhang	-	-

The only factors varying for the two package types are *Material-* and *Replenish cost*, see Table F.6. The percentage represents the share of the total for the Shelf Tray package.

Table F.6

		Shelf Tray	Regular
MATERIAL	Material cost	11%	10%
TRANSPORT	Transport cost	30%	30%
WAREHOUSE	Space cost	8%	8%
	Handling cost	16%	16%
	Picking cost	9%	9%
STORE	Space cost	5%	5%
	Base handling cost	8%	8%
	Additional handling cost	8%	8%
	Replenish cost	6%	10%
TOTAL COST based on Shelf Tray		100%	103%

More package material is needed to the Shelf Tray than the Regular, the package material itself is also more expensive due to white corrugated cardboard is used on both sides of the tray. But the saving due to quicker replenish with Shelf Tray overcomes the expenses for increased *Material cost* and total cost for Shelf Tray is lower compared to Regular. Table F.7 shows the differences in replenish time.

Table F.7

	Shelf Tray	Regular
Prepare previous a delivery	208	0
Open the package and place in sale space	521	1181
Maintain during open hours	0	0
TOTAL Time for 1000 pcs (sec)	729	1181

Another aspect is that the time consumption is moved from refill hours to open hours for Shelf Tray, see Figure F.5.

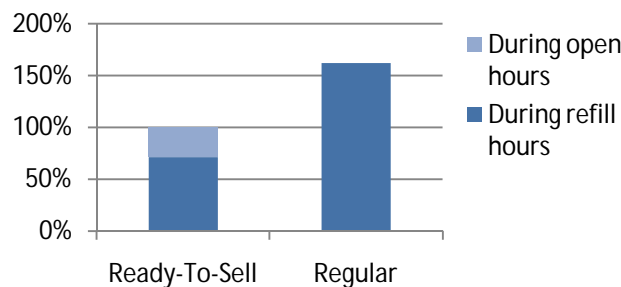


Figure F.5 Time consumption for DIOD in Shelf Tray and Regular package

The total time for Replenish is 62% longer for Regular package.

Appendix F:III ALVINE BÄR – Quilt cover and pillowcase

ALVINE BÄR is a quilt cover delivered in a Shelf Tray, *Tray and Collapse box*. Each tray holds 8 pieces, this is the same as for the Regular package used for the comparison, more details is presented in Figure F.6 and Table F.8.

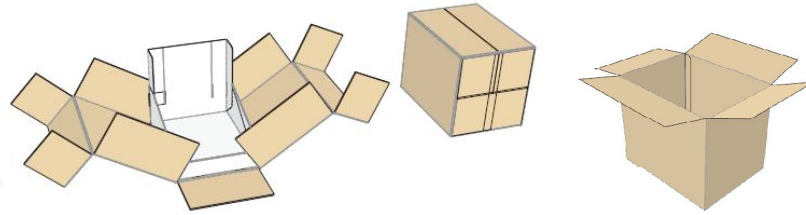


Figure F.6 Shelf Tray package and Regular package for ALVINE BÄR

Table F.8

SELL	Sell solution	Ready-To-Sell	
		Shelf Tray <i>Tray and Collapse box</i>	Shelf
FILLING	Estimated MDQ: 101		
	Unit load type	AO	AO
	Pcs/Multi (artno)	8	8
	Multi/Unit load	24	24
	Pcs/Unit load (artno)	192	192
	Picking in warehouse	No	No
	Overhang	-	-

The total cost for the Shelf Tray solution ends up with higher total cost than for the Regular. As seen in Table F.9 the cost related to material have a greater share of the total cost for Shelf Tray than for the Regular package. The Shelf Tray consists of tray made out of white cardboard and a collapse box. The amount of material used for the Shelf Tray is more than one and a half time the amount used for the Regular package.

Table F.9

		Shelf Tray	Regular
MATERIAL	Material cost	16%	9%
TRANSPORT	Transport cost	47%	47%
WAREHOUSE	Space cost	0%	0%
	Handling cost	12%	12%
	Picking cost	-	-
STORE	Space cost	4%	4%
	Base handling cost	8%	8%
	Additional handling cost	-	-
	Replenish cost	6%	4%
TOTAL COST based on Shelf Tray		100%	91%

Quilt cover have varying measure depending on the markets. The calculations in the thesis are all based on the German market that has a size only existing in Germany. In Table F.10 the increases of the total cost is shown, this might seem insignificant but the same package solution are used for all different quilt cover measures and than the total amount of quilt cover increases dramatically as the consequences of the package solution.

Table F.10

		Cost decrease	Cost increase
MATERIAL	Material cost		72%
TRANSPORT	Transport cost		
WAREHOUSE	Space cost		
	Handling cost		
	Picking cost		
STORE	Space cost		
	Base handling cost		
	Additional handling cost		
	Replenish cost		28%
TOTAL EUR/year		0	1000

It's notable that the *Replenish cost* for Shelf Tray increase instead of decreasing as intended. The replenish time is displayed in Table F.11 below.

Table F.11

	Shelf Tray	Regular
Prepare previous a delivery	375	0
Open the package and place in sale space	3125	2042
Maintain during open hours	0	0
TOTAL Time for 1000 pcs (sec)	3500	2042

According co-workers, replenishing quilt covers from a Regular package is easier since the collapse boxes are often over taped and they need to cut tape in at least five different places to open the package. With a Regular there is only one cutting needed to open it, this affect the time consumption, see Figure F.7.

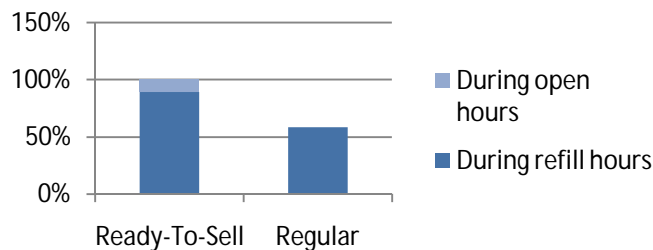


Figure F.7 Time consumption for ALVINE BÄR in Shelf Tray and Regular package

In the figure it can be seen that the total time consumption is almost the double for replenishing with a Shelf Tray instead of from a Regular package, not as intended.

Appendix F:IV SAXÅN – Shower curtain

SAXÅN shower curtain is packed in a Shelf Tray, *Tray and Collapse box*. Each box contains 32 shower curtains and is packed on a full pallet, 768 shower curtains in total. The Regular package used for the comparison has the same measurement and filling rate, see Figure F.8 and Table F.12 for more information.

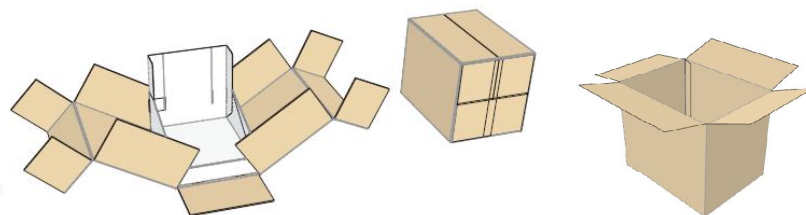


Figure F.8 Shelf Tray package and Regular package for SAXÅN

Table F.12

		Shelf Tray	Regular
SELL	Sell solution	Shelf Tray	Shelf
		Collapsbox and tray	
FILLING	Estimated MDQ: 101		
	Unit load type	AO	AO
	Pcs/Multi (artno)	32	32
	Multi/Unit load	24	24
	Pcs/Unit load (artno)	768	768
	Picking in warehouse	Yes	Yes
	Overhang	-	-

Costs occurring in supply chain are divided in shares of the total cost, displayed in Table F.13. It can be seen that the cost are alike. The factors affected are *Material-* and *Replenish cost*. The *Material cost* increases with the Shelf Tray but the *Replenish cost* decreases, unfortunately the increase is more than 10 times higher than the decrease, this gives a negative result on the total cost.

Table F.13

		Shelf Tray	Regular
MATERIAL	Material cost	10%	7%
TRANSPORT	Transport cost	33%	33%
WAREHOUSE	Space cost	3%	3%
	Handling cost	20%	20%
	Picking cost	12%	12%
STORE	Space cost	4%	4%
	Base handling cost	8%	8%
	Additional handling cost	4%	4%
	Replenish cost	5%	6%
TOTAL COST based on Shelf Tray		100%	96%

The difference in *Material cost* comes out of more material and more expensive material used for Shelf Tray than Regular package. The time to replenish SAXÅN is shortened with Shelf Tray but the savings isn't big enough to justify the increased cost for material.

Below Table F.14 presents the time used for replenish and maintain 1000 shower curtains.

Table F.14

	Shelf Tray	Regular
Prepare previous a delivery	344	0
Open the package and place in sale space	781	1188
Maintain during open hours	0	0
TOTAL Time for 1000 pcs (sec)	1125	1188

The time difference in total isn't significant but where the time appears can be seen, see Figure F.9.

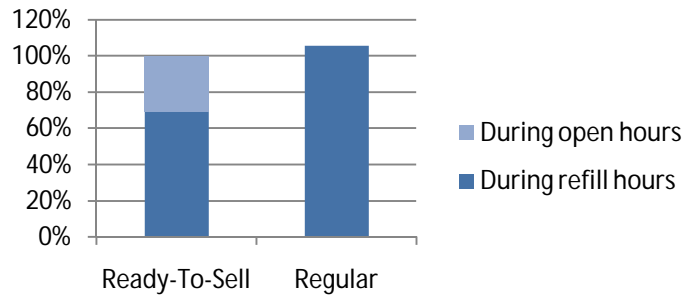


Figure F.9 Time consumption for SAXÅN in Shelf Tray and Regular package

Even though the total time for replenishment is almost the same it's possible to release labour hours during refill hours in the morning and move them to open hours. By moving the tasks to open hours it might be possible to increase the availability of the product range, since time is released and co-workers are able to handle more products.

Appendix F:V Result from Survey

Approximately 50 co-workers from IKEA stores in southern Sweden participated in the survey, presented in Appendix B. The result is presented below in Figure F.10.

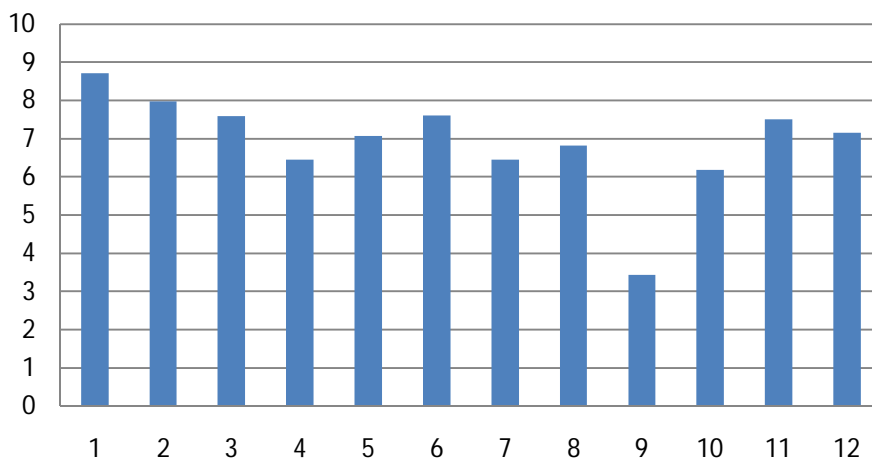


Figure F.10 Result from survey in store regarding Shelf Tray

The survey contained statements about how the co-workers perceive the packaging solution Shelf Tray. A high pile represent something positive and a low something negative except from pile 9, it's a reverse statement used for reliability of the survey, i.e. if the pile from statement 8 is high the pile from statement 9 should be low. The result shows good reliability of the survey, high (6,82) for pile number 8 and low (4,44) for pile number 9.

APPENDIX G – Validation of Total Cost Model

A validation of the total cost model has been carried out to ensure the results and conclusions concerning costs presented in this master thesis are reliable. This Appendix presents the result from the validation applied on a randomly selected IKEA product.

As discussed in Appendix A:1, the thesis have done a few assumptions, such as only taking the Germany market into consideration when estimating costs. In order to confirm if Germany represents IKEA worldwide in a fair way and that all cost results presented in this report are valid and reliable, a validation of the total cost model has been carried out.

The validation model is based on all markets where the real costs for every 12 markets have been summarized to form a real total cost ($Total\ Cost = Cost\ DE + Cost\ GB + Cost\ NL/BE + \dots$). This cost is compared to the cost occurred when the worldwide forecast is applied on the Germany-market, as the thesis has done. One product discussed in this report was randomly selected to be tested in the validation-model.

Figure G.1 illustrates the outcome of the validation and as can be seen is the reliability high. This since the piles is almost equal, both for the Ready-To-Sell and the Regular packaging solution¹³⁷.

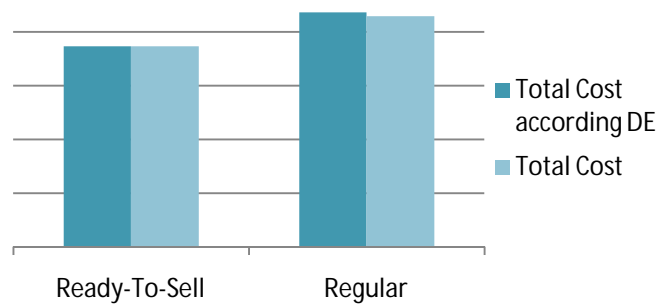


Figure G.1 Total cost using Ready-To-Sell and Regular solution for a randomly selected product when cost are based on Germany respectively based on all markets

One of the master thesis conclusion regarding costs is that *Picking cost* has, in many cases, a great impact on cost savings using a Ready-To-Sell solution. To ensure this is reliable for all markets a similar validation test was carried out where the real *Picking cost*, when all markets are taken into consideration, is compared to *Picking cost* when only take the Germany market is taken into consideration.

The result of this validation is shown in Figure G.2. It confirms that Germany gives a fair view of *Picking cost* impact since the size of the piles are about the same.

¹³⁷ If the cost for each market are compared the value varying since different markets have different conditions, but when summarize all markets as a total cost the value are equal to Germany as Figure G.1 illustrates.

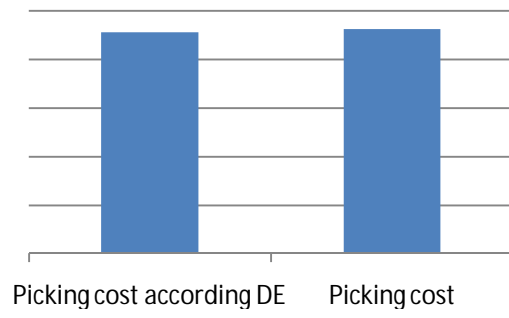


Figure G.2 Picking cost in warehouse when the only the Germany market are taken into consideration and the when all markets are taken into consideration