A new business model for customized laminate flooring concepts

Authors

Tomas Eliasson
Carl Johan Måwe
ABSTRACT

The laminate flooring company Pergo (Europe) AB has during the last years identified an increasing market demand for customized flooring solutions. In the autumn of 2004 Pergo had no standardized product offer and the existing administrative process was not suited to produce and deliver customized products. Experiments concerning a new décor production technique with extensive potential based on digital printing have also contributed to the need for efficient handling of information flows and décor development processes internally in the company. In the production sites there are limitations in terms of high costs of scraps and set-up times which set demands on the new customized products.

In this thesis a proposal is presented that conforms both to existing production facilities as well as to the demands that is set by the market. The product offer is based on existing components from Pergo’s standard assortment. This makes it possible for the customer to get a customized product at the same time as the need for development personnel is minimized in the development process. The impact on the production regarding high costs of scraps and high set-up times will also not be significant since the customized products are partly standardized.

The routine that has been used historically in the development of customized products is time ineffective and requires a lot of hands-on work from a large number of persons in the organisation. This process is today functioning outside the existing routines and process flows that is connected to the ERP-system Movex. In this thesis a new internal process is presented which is based on that the development activities connected to customized products also is handled in the ERP-system Movex.
SAMMANFATTNING

Laminatgolvsföretaget Pergo (Europe) AB har under de senaste åren identifierat en ökad marknadsefterfrågan på kundanpassade golvlösningar. Hösten 2004 fanns inget standardiserat produkterbjudande och den befintliga administrativa processen var inte anpassad till att tillverka och leverera kundanpassade produkter efter kunders önskemål. Försök med en ny dekorproduktionsteknik med stor potential baserad på digitaltryck har också bidragit till behovet av att effektivt kunna hantera informationsflöden och dekorutvecklingsprocesser internt i företaget. I produktionsanläggningarna finns begränsningar i form av höga kassationskostnader och ställtider vilket ställer krav på de nya kundanpassade produkterna.


Den rutin som historiskt sett har använts vid utveckling av kundanpassade produkter är tidsineffektiv och kräver mycket hands-on arbete från ett stort antal personer runt om i organisationen. Denna process ligger i dagsläget utanför de befintliga rutiner och flöden som är knutna till ERP-systemet Movex. I uppsatsen presenteras en ny intern hanteringsprocess som baseras på att man knyter aktiviteterna i utvecklingen av kundanpassade produkter till ERP-systemet Movex.
Acknowledgements

This final thesis project has been prepared at Pergo (Europe) AB in Trelleborg and in Perstorp and concludes our Master of Science education at Lund Institute of Technology within the department of Logistics and Production Economy.

Working in this project has been very interesting and learning and we have had the opportunity to gain an insight into many different departments at Pergo. Our experiences during this thesis have made us develop skills obtained earlier in different courses but it has also helped us gain valuable knowledge that most certain will be useful for us in the future.

The fundamental base of our project originates from a mapping of different processes within Pergo. This indicates that we have been very dependent on getting in contact with different persons in order to collect the required information. We are very satisfied with the cooperation with Pergo and we feel that we have been supported all along the way. Therefore we would like to send out a big THANK YOU to all personnel at Pergo that has taken their time to explain how things work and answered our many questions.

Finally we would like to especially thank our supervisor at Pergo, Håkan Wernersson, who has been supporting us through the whole project and giving us interesting ideas and feedback on what we have done. This thank you is also directed to our supervisor at LTH, Ola Alexanderson who has helped us a lot in our endeavor to reach our goal with this project.

Carl Johan Måwe
Tomas Eliasson

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LIST OF CONTENT

1 INTRODUCTION ..............................................................................................................1

1.1 THE PERO GROUP – A DESCRIPTION OF THE COMPANY AND ANALYSIS OF THE PRESENT SITUATION ..............................................................................................................1
  1.1.1 History .....................................................................................................................1
  1.1.2 Pergo’s laminate .....................................................................................................2
  1.1.3 Production facilities...............................................................................................3
  1.1.4 The impregnation process .....................................................................................3
  1.1.5 The pressing process ............................................................................................3
  1.1.6 The bonding process ............................................................................................4
  1.1.7 The milling process ..............................................................................................5

1.2 PERO’S PRODUCT SEGMENTS ..................................................................................5

1.3 THE FLOORING MARKET ..........................................................................................7
  1.3.1 Europe ..................................................................................................................7
  1.3.2 Pergo’s markets ....................................................................................................8

1.4 CHALLENGES FACING PERO (EUROPE) AB ..........................................................8
  1.4.1 Cost reductions ....................................................................................................8
  1.4.2 Flexibility .............................................................................................................8
  1.4.3 Customized orders ...............................................................................................8

2 ASSIGNMENT AND PROBLEM ......................................................................................11

2.1 BACKGROUND – CUSTOMIZED FLOORING SOLUTIONS ........................................11

2.2 ASSIGNMENT .............................................................................................................11

2.3 TARGET GROUPS .......................................................................................................11

2.4 OBJECTIVES ..............................................................................................................11

2.5 DELIMITATIONS ........................................................................................................11

2.6 THESIS RELEVANCE ...............................................................................................11

2.7 OPPORTUNITIES TO GENERALIZE THE SOLUTION ...............................................12

2.8 PROBLEM BREAKDOWN ............................................................................................12

  Theme I ..........................................................................................................................12
  Theme II .........................................................................................................................12
  Theme III .......................................................................................................................12
  Theme IV .......................................................................................................................12

2.9 THE CUSTOMIZATION PROJECT’S POSITION AND INTERACTION WITH ONGOING PROJECTS WITHIN PERO ..................................................................................13

3 METHODOLOGY ..........................................................................................................15

3.1 RESEARCH STRATEGIES .........................................................................................15

3.2 METHODS FOR DATA COLLECTION ......................................................................17

3.3 QUANTITATIVE AND QUALITATIVE DATA ................................................................18

3.4 DATA COLLECTION: PRIMARY VS. SECONDARY ..................................................18
  3.4.1 Primary data ..........................................................................................................18
  3.4.2 Secondary data .....................................................................................................19

3.5 OUR RESEARCH METHODOLOGY ..........................................................................19

  3.5.1 Problem Identification ........................................................................................19
  3.5.2 The use of Action Based Research ..................................................................20
  3.5.3 The use of Case study .......................................................................................20
  3.5.4 Data collection .....................................................................................................20
8.5 Empirics and Analysis - “How to Evaluate Pergo’s Production in Order to Be More Flexible”? ........................................................................................................... 56
  8.5.1 How to evaluate Pergo’s production in order to be more flexible .............. 56
  8.5.2 The measurement tools today .................................................................... 56
8.6 Conclusion - “How to Evaluate Pergo’s Production in Order to Be More Flexible”? ......................................................................................................................... 57
  8.6.1 Proposal for new measurement tools in Pergo’s production ....................... 57

9 Implementation .................................................................................................... 60

10 References ......................................................................................................... 62
1 Introduction

The aim of this chapter is to introduce the reader to the background of the thesis. The chapter describes the history and the present situation of Pergo AB as well as the challenges facing the company at the time of writing of the thesis.

1.1 The Pergo Group – a description of the company and analysis of the present situation

The Pergo Group is a company with a leading global position in the laminate flooring market. The company manufactures and sells laminate flooring with glue-free click joints along with various accessories. The Corporate Headquarter (=Pergo AB), the European Headquarter (=Pergo (Europe) AB) and the main manufacturing facilities are located in Trelleborg, Sweden. Net sales amounted to MSEK 2,780 in the full year 2004 and the number of employees was 774 on December 31, 2004.1

“Our philosophy is based on three cornerstones, Design, Performance and Support. Most flooring companies have specialized in one of the three. With Pergo you will find the partner that masters them all.” 2

1.1.1 History

The Pergo Group originates from Perstorp AB a Swedish company in the chemical industry. After the Second World War Perstorp AB started making the “Perstorpsplattan”, a laminate board used for example in kitchen cupboard doors and table tops. Laminate flooring was first mentioned in 1977 when an innovation project called “Idea 77” started. Perstorp AB was looking for new ways to use its extensive know-how in the areas of laminate and chemistry. In 1980, the first laminate floor was sold in Sweden and during the 80’s laminate flooring spread throughout Europe. A new plant for production of laminate flooring was built in Trelleborg in 1985. The name Pergo was adapted four years later by combining the first letters in Perstorp and “golv” (Swedish for flooring) and since 1989 the products are marketed under the trademark PERGO®. In 1994, Pergo AB looked overseas and laminate flooring was launched in North America. Being the first laminate flooring brand, Pergo is today the most well known laminate flooring in this region. During the 90’s the Pergo brand was also launched in Asia and Latin America but net sales from this region amount to only about four percent.3

2 Extract from Pergo’s marketing brochure targeted to contract customers 2003.
3 The Pergo Pulse, Pergo (Europe) AB Intranet, 12 November
1.1.2 Pergo’s laminate floor

The laminate in a PERGO floor is built up by a number of impregnated papers. The layers on top of the décor paper are called overlay papers and Pergo’s floors one or two overlay papers. The thickest paper underneath the décor paper is called base paper. In the impregnation process all papers are impregnated with either phenol or melamine resin and in addition to that an aluminum oxide preparation is made in order to strengthen the wear protection. At Pergo’s production facilities in Sweden the laminate is pressed in a separate process under high temperature and pressure. The laminate is glued on top of a high density fiberboard (HDF) in a bonding process. Simultaneously, a sound reducing backing is glued underneath the HDF-board. The construction of a laminate floor is described in figure 1.3 and figure 1.4.

![Figure 1.1 - Laminate construction](www.pergo.com)

![Figure 1.2 - Laminate floor construction](www.pergo.com)

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1.1.3 Production facilities
Today Pergo has three production facilities, one in Garner, North Carolina, USA and two in Sweden, Perstorp and Trelleborg. In Sweden, a restructuring process is taking place. As a part of the process, the pressing lines are moved from Perstorp to Trelleborg during 2004 and 2005 in order to consolidate the production to one plant. When the restructuring project is finished, the only production in Perstorp will include the impregnation of the different paper qualities in the laminate floor. In Trelleborg the bonding, the milling and the packaging of finished flooring will take place.

1.1.4 The impregnation process
The impregnation lines impregnate the overlay paper(s) and the décor paper with melamine resin and the base paper with phenol resin. The impregnation machines, all located in the Perstorp site, have different capacities and technical performance capabilities. One of the melamine lines are more flexible than the other lines in which décors requiring small batch sizes are impregnated while the rest of the melamine machines impregnate large batches of décor and overlay papers. In Perstorp there is also a pilot machine which not is a production machine but belongs to the R&D and is used mainly for process development. The set-up times are comparatively small while the scraps and rejections are high in the impregnation lines. The process is described in figure 1.5.

1.1.5 The pressing process
The pressing line presses the base paper, the décor paper and the overlay papers together under high temperatures and pressures. On top of the laminate, a structure foil runs in order to give the laminate a surface that matches the design of the décor. The structure foil is very expensive and therefore the structure foil is recycled. The rejections and scraps are high while the set-up times are relatively low compared to the total cost of the refined product. In 2004 the pressing lines were located in Perstorp but will from 2005 be moved to the Trelleborg site. The process is described in figure 1.3.
1.1.6 The bonding process

In the bonding line the laminate and a protective and sound-reducing backing is attached to the HDF-board. This is made under high temperatures and pressures. The lines consist of three major parts, gluing, pressing and

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*Created by the authors*
cooling before it is conveyed to the milling line. In this line rejections and set-up times are comparatively low. The process is described in figure 1.4.

1.1.7 The milling process
In the milling line the board is cut down to either planks or tiles before the clickjoints are milled. In the end of the line the floor is packaged. Set-up times for new profiles are comparatively large but the initial scraps are low. The process is described in figure 1.4.

![Diagram of production process](image)

Figure 1.4 - The production in Trelleborg 2004

1.2 Pergo’s product segments
The trademark PERGO is positioned in the premium segment within laminate flooring and is currently priced up to three times higher than other

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* Created by the authors
laminate flooring companies. Pergo’s product portfolio is wide and contains over 250 different articles in Europe only.

Pergo has divided its customers into three different segments, specialty, chains and contracts. The specialty segment is specialized flooring stores, chains are mainly home improvement chains and the contract market is mainly building-constructors, retail chains, restaurant chains and hotels.

The ranges offered to the different segments are described in figure 1.5. Pergo has outsourced the production of some floors.

Figure 1.7 - Pergo's product ranges

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1.3 The flooring market

The flooring markets in Western Europe and North America can be divided into a consumer market and a contract market. The consumer market encompasses sales to consumers via retail outlets like specialty stores and home centers. The contract market comprises public environments such as hospitals, restaurants, shops, offices and hotels and multi-family dwellings. The focus of this thesis is the latter, the contract market.

1.3.1 Europe

The flooring market in Western Europe is today estimated at about 1,900 million square meters in annual sales. This market has grown by about 250 million m² since 1996, which corresponds to an average annual growth of about 3.7 percent. The laminate flooring market has during the same period had an average annual growth of 2.9 percent. The largest flooring category is carpet, with an estimated market share of about 44 percent in 2000. The market share of carpet has declined in favor of hard flooring, such as wood and laminate flooring. There are major variations in the European market between regions and with regard to the market share for different floor types.

The European laminate flooring market is highly fragmented with a large number of players. These players are often producers of panelboard and melamine faced boards. In total, there is a substantial over-capacity in the laminate flooring market.

![Flooring Market in Europe](image)

Figure 1.8 - The flooring market in Europe year 2000.

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11 The Pergo Pulse, Pergo (Europe) AB Intranet, 17 November
12 Ibid
1.3.2 Pergo's markets

Pergo’s sales allotted to the different markets during 2004:
- North America 59 %
- Europe 37 %
- Asia and Latin America 4 %

1.4 Challenges facing Pergo (Europe) AB

1.4.1 Cost reductions

The past few years Pergo has faced problems causing declining profits. The main reason to the declining profitability has been tougher competition from other low priced laminate manufacturers mainly originating from HDF-board manufacturers. The efforts of reaching profitability are focused on the cost side and several restructuring projects have been initiated in order to reach lower production and overhead costs. In the latest restructuring project the laminate pressing machines are moved from the Perstorp plant to the Trelleborg plant.

1.4.2 Flexibility

The fact that Pergo has a big variety in optimal production batch volumes but strives to maximize batch volumes in order to minimize the cost per square meter will make the production facilities more inflexible. Pergo offers products to the large-scale home centers as well as to the small-scale specialty retailers. Pergo is therefore trying to offer a larger scope of products so that the specialty retailers can get exclusive high-end products not offered to the home improvement retailers. By doing this, the specialty retailers can avoid price competition with the home centers and Pergo can charge higher prices from the specialty retailers. The problem with this strategy is that Pergo has to extend its product portfolio even more which leads to higher overhead costs in terms of development and administration and a need for higher flexibility in the development process as well as in the production facilities.

1.4.3 Customized orders

The major trend in the contract market is that the customers in larger extent demand customized products. The recent trends with uniformly designed stores, showrooms, design hotels and store within store concepts have created new demands on the flooring suppliers to the contract market. Some vinyl flooring manufacturers have already business concepts offering contract customers highly customized. The company considered as the best,

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14 Interview 12 November 2004 - International Key Account Managers Pergo (Europe) AB.
by many persons throughout Pergo’s organization, when it comes to customized flooring solutions is Amtico which on its website presents no less than 84 different case studies for the contract market. Pergo’s products have several advantages compared to vinyl floors. The laminate floor has a lower life cycle cost due to lower maintenance costs and is slightly lower priced. The drawback is that a laminate floor is harder to customize because of production delimitations and high and complex development costs.

Pergo’s marketing department has categorized the contract market into four different business concepts based on a two times two matrixes holding the product offer and the undertaking of the customer. The product offer is either a standard product or a customized product. The undertaking of the customer is either a mandatory concept where the customer agrees to contract a certain volume such as a complete chain of stores. A prescribed concept is for example when every store decides if they want to buy the floor or not. Consequently the risk for Pergo is much higher in the latter case. Historically Pergo’s Key Account Managers throughout Europe have offered products from the standard assortment because that creates minimal changes in the production and minimal effort from Pergo’s development department. The standard product offered is something the Key Account Managers know is possible to do in practice. The problem with offering a standard product is that other flooring suppliers can offer similar standard solutions since Pergo’s design often is copied by other laminate manufacturers and in the end the price often is the decisive factor. When it comes to customized orders the situation is very different. The Key Account Managers see a great potential in customized flooring concepts with unique design being offered to the customer. A customized flooring concept can generate more orders as well as better profitability since no other laminate manufacturer can offer customized design at present. As a result, the International Key Account Managers with coordination responsibility for the Key Account Managers throughout Europe have decided to change direction for the contract market. From focusing primarily on offering orders from the standard assortment the Key Account Managers are expected increase the offer of customized flooring concepts.

Pergo’s prioritization today

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<th>Mandatory concept</th>
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<td>Customized product</td>
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Table 1.1 - Pergo’s prioritization for the contract market 2004.\(^{16}\)

Pergo’s future prioritization

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<th>Mandatory concept</th>
<th>Prescribed concept</th>
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<tr>
<td>Customized product</td>
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Table 1.2 – Potential prioritization for the contract market.\(^{17}\)

The expected increased demand of customized orders will change the conditions of work for the Key Account Managers, the R&D, the planning and the manufacturing departments. During Pergo’s history the company has developed a number of customized décors to different customers. These customized orders have generally been in large scale with few exceptions. The customized flooring concepts so far have been seen as a way to develop the PERGO trademark and a way to close a contract including other floors from the standard assortment. Therefore it is hard to estimate how profitable a single customized floor generally is. The challenges facing Pergo now when it comes to offering customized orders is what the product offer should look like in terms of volumes, prices and technical properties, how Pergo shall handle the internal customization process efficiently and what the manufacturing department must change in order to produce customized solutions efficiently.

\(^{16}\) Information from the international Key Account organisation, 26 January 2005.

\(^{17}\) Ibid.
2 Assignment and problem

In this chapter the reader will be introduced to the initial assignment and the stakeholders of this thesis. The composition of the thesis and the order in which the work will be pursued will also be described.

2.1 Background – customized flooring solutions

As mentioned in chapter 1.4.3 the International Key Account organization within Pergo (Europe) AB has identified a new and potentially profitable market segment among contract customers, customized flooring solutions. The décor paper in the laminate process today is produced with the use of gravure printing, which gives high quality and good margins at high volumes due to low variable costs. One major problem with gravure printing is that the initial costs are very high and to develop a single décor can cost several hundred thousand SEK. That makes small, customized orders expensive to produce at present. A new technique to develop and produce décors based on digital printing is under development and this technique provides new possibilities to produce décors to lower initial costs. Another problem is that Pergo right now doesn’t have an efficient internal process to handle customized products administrative as well as in the production facilities.

2.2 Assignment

The assignment offered to us was: “What should Pergo do in order to be able to offer customized products on the market?”

2.3 Target groups

The target groups for this thesis are the R&D department including décor and surface development, the marketing department for Pergo (Europe) AB and the planning department at the manufacturing units in Trelleborg and Perstorp.

2.4 Objectives

The objective of this thesis is to present viable proposals that will assist Pergo (Europe) AB in succeeding on the contract market by offering customized products.

2.5 Delimitations

This thesis will include an order flow investigation and a change program concerning the internal processes through the value chain from order reception to packaging in the manufacturing department. The thesis will not focus on the customer marketing, distribution or the financing aspects of the
proposed changes. The proposals made are to be reached without major investments or adjustments in resource allocations.

2.6 Thesis relevance
The aim of this master’s thesis is to provide Pergo’s with an external view of the current capabilities of the organization. The thesis strives to help Pergo find new potential product offers and new approaches to improve existing process flows. Consequently this thesis can help Pergo reach success in the contract market, which is one of Pergo (Europe) AB’s strategic goals for the future.

2.7 Opportunities to generalize the solution
This thesis is targeted towards the Pergo (Europe) AB and the solution is specific for the company and its processes. Therefore the solution is relatively hard to generalize.

2.8 Problem breakdown
The problem of finding an answer to what Pergo should do in order to be able to offer customized products on the market can be broken down into four themes. The themes are also described in figure 2.1.

Theme I
In the first theme we have the ambition to find answers to the question “if customization is the right way to go for Pergo”. The possible printing processes will also be discussed in order to verify the possibilities of using printing methods in the production and development of customized flooring solutions. This is important to do before we evaluate the product offer and the administrative and production processes.

Theme II
In theme two we will answer the question “how should the product offer be designed”. The answer to this question should both conform to the capabilities of Pergo as well as the market demands for customized products.

Theme III
In the third theme we intend to map the existing development process in order to evaluate it and answer the questions “how to lower time to customer” and “how to lower labor in the development process”.

Theme IV
In theme four we will try to answer the questions “how to lower the scrap for small batches in the production”, “how to measure the costs for small
production orders” and “how to evaluate the production in order to be more flexible”. This is made in order to improve the possibilities to offer customized products to small contract customers. Another important question is “if it is achievable” for us to solve these questions without investments.

2.9 The customization project’s position and interaction with ongoing projects within Pergo

The major ongoing projects at Pergo have been mapped in a matrix described in figure 2.2. On one axis the projects have been categorized as cost reducing and revenue building projects. On the other axis the projects are categorized as product, administrative or production process related projects. The work on how to develop the customized order process will affect the revenues positively and simultaneously reduce the cost related to development and production of customized products. The project will involve the product and the administrative processes related to customized orders but will not have any influence on the existing production process.

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The project will not include any changes in the manufacturing process even though some changes in the administrative routines will be suggested.

This project has been interacting with other ongoing projects in Pergo’s organization. We have closely cooperated with the marketing department and the décor development personnel in order to work out a suitable product offer and map the sales and development process of customized products to make them more efficient. The effects of the press-restructuring project on the customized order process have been evaluated and the proposed solution in this project is conformed to suit both present as well as future organization and production techniques. Experiences from old Movex projects have been taken into consideration in the evaluation of the final proposal of this project. The positioning of the customization project and our thesis and the interaction with other projects at Pergo is illustrated in figure 2.2.

Figure 2.2 - Interrelated projects and its objectives

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3 Methodology

In this chapter different methodology regarding strategy and data collection will be described.

3.1 Research strategies

When performing a research it is important to have a strategy before the research commences. There is no “single right way” but there are certain strategies that are more appropriate than others for answering a specific question. Therefore, the planning of how information should be gathered, organized and analyzed is an important part of the project.

Among the most used methodology strategies one finds Survey, Case Study, Experiment and Action Based Research.

Survey means that the research is made on a large but limited group with help of interviews and prepared questionnaires as two examples. This research is often used to answer the questions where, what and how. An important question is often raised when a survey-research is made. The question concerns if the result is generally applicable. Is it possible to transfer the result to other individuals that have not taken part in the research?

If a survey research is made on a larger delimited group a case study has a tendency to prefer a smaller group where the researcher can perform the investigation on a deeper scale. To be able to understand certain things it might be necessary to understand many others and especially how they are related and affect each other. A case study works better than a survey research for this type of questions since it offers the possibility to look into the complexity of a specific situation. Case studies are often used when investigating social relations and processes since they often have a tendency to be connected and show a mutual affection on each other. The “case” that is the starting point for the research is usually something that is already existing. It is not a simulated situation like for experiments where the researcher purposefully tries to control different variables. A typical example of a case study could be to investigate the working environment in a company. How easily the result is to generalize depends on what company that has been investigated and if the result is possible to apply on similar companies. For example if the research has been made in a car factory, the

20 Patel Runa, Davidsson Bo, Forskningsmetodikens grunder, (1991)
Denscombe Martyn, Forskningshandboken, (1998)
results might be useful for other similar car factories even though the research only was made on one specific factory.

*Experiment* is a research strategy where a few variables are studied and the purpose is to control what it is that affects these variables. One example could be that a researcher wants to determine if music played in a fashion boutique will affect the revenue. The variables concerned in this experiment would consequently be music and revenue. Music is the variable that is manipulated and is called the independent variable. The independent variable can be given different values. For example, different types of music like *jazz*, pop or rock could be played. Revenue is the variable that is dependent on the manipulation and is therefore logically called the dependent variable. The researcher should study at least two groups. The first group, a so called experiment group, should listen to music in the fashion boutique and the other group, a so called control group, should not be listening to music. Since the independent variable can admit different values like rock or pop music, the experiment group can be divided into several groups where every group hears different music, volume etc. What is important to consider, despite what the values in different groups might be, is that the researcher tries to control all factors that might influence the independent variables and the dependent one.

*Action Based Research* is often associated with practically oriented, small-scale research projects. When this research strategy was new its focus was on changing issues and this has continued to be a base of the strategy. The research should not only give an understanding of the problems related to an activity but the research itself should come up with suggestions for change. Usually this is something that is made after the result of a research has been presented. This leads to the next distinguished feature in the action based research which is that it is a cyclic process in which the concerned parties have a tendency to be involved both in the design and the execution of the research.
The action based research is characterized by four different outlines.

- **Practical orientation.** Its purpose is to take on “real” hands-on issues, mainly on work- and organizational environments.

- **Change.** Change is considered as an integrated part of the research, both in a way to manage practical problems as well as way to obtain knowledge about phenomena and actions taken.

- **Cyclic process.** The research method encloses a feedback mechanism as the initial results gives opportunities to implementation and later on an evaluation from this implementation. This evaluation gives an opening for further investigations.

- **Participation.** The central persons in the research project are the participants. Their commitment is active, not passive.

### 3.2 Methods for data collection

All methods for data collection have their pros and cons and besides the importance to select the most suitable method it is also important to consider the disadvantages and risks associated with the chosen method. One way to reduce these risks is to use more than one single method for data collection. Using more than one method for data collection supports the validity of the research but that also implies that one has to allocate extra resources in order to accumulate the same data more than one time. In a project with limited resources an approach enclosing multiple data collection methods can provide a poor result. Despite the disadvantages we

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chose to use two primary data collection methods, interviews and observations.

3.3 Quantitative and qualitative data

Quantitative data is often referred to as data that can be collected and measured in numbers or with words as in questionnaires where you mark already written answers. This means that the researcher in advance has decided what type of possible conclusions the investigation can lead to. In a study that uses a qualitative method, the conclusions are not determined in advance in the same way. In the qualitative method the numbers are not what you are aiming for. The method is more focused on the researchers interpretation and understanding. To make this feasible a deeper and closer investigation is necessary, which is possible by making interviews. The reason for using these methods is to understand what the researcher is investigating and it is difficult to separate them since there is no absolute distinction.\textsuperscript{22}

3.4 Data collection: Primary vs. Secondary\textsuperscript{23} \textsuperscript{24}

Most sources of data can be divided into two general categories, primary or secondary. Primary data means that the information has been gathered by the researcher. This can be done by observations or information that’s been gathered by questions. Secondary data means that the information has been collected and documented by someone else than the researcher.

3.4.1 Primary data

Observations offer the researcher the possibility to study processes and occurrences in a natural environment. Primary data based on the eyes direct observation. This means that the researcher does not have to rely on subjective estimates from interviews. However, the possibility to study processes and actions in a real environment is not only an advantage. The researcher has to be aware of that the actions observed in a specific moment, may not be representative.

Information that has been collected by questions is often in the form of interviews or some kind of questionnaires. Usually there are two aspects that need to be considered when collecting information with these methods. One has to do with how much responsibility the interviewer should have concerning the design of the questionnaire and the order in which the questions will follow. This is called different levels of standardization. The other has to do with to which extent the interviewed persons can answer the

\textsuperscript{22} Internetkälla GBG universitet.
\textsuperscript{23} Holme Idar Magne, Solvagn Bernt Krohn, Forskningsmetodik, (1997)
\textsuperscript{24} Denscombe Martyn, Forskningshandboken, (1998)
questions. For example if a question only can be answered with a “yes” or “no” the question is completely structured.25

Questionnaires are suitable when
- A large number of respondents are used and when they are on different locations for example mail questionnaires to a large group of people
- Standardized data is requested and the answers can be kept short

Interviews are suitable when
- Detailed information is needed
- Data is based on issues that are sensitive since these questions must be addressed with caution to make the interviewed persons open up and answer honestly.

3.4.2 Secondary data
Data that has already been gathered and documented by someone else than the researcher can be statistics, catalogues, an earlier study or any other relevant data. An important thing to be aware of with secondary data is what the purpose and motive was with the material and to see which source it comes from.

3.5 Our research methodology
We choose to divide the methodology into five faces
- Problem identification
- The use of Action Based Research
- The use of Case study
- Data collection
- Empirical investigation and Analysis of four themes

3.5.1 Problem Identification
From the start of the project an office and computers were offered to us at Pergo and it was clear from the beginning that we would spend almost all our working time at the company to get in close contact with the employees. Since the objectives for this thesis are set rather wide the first three or four weeks were used to investigate and understand the company and its business. This was done with the purpose to try to identify problems and opportunities that could be more closely examined. The research strategies chosen to accomplish this were based on the Action Research Framework together with Case Studies.

25 Patel Runa, Davidsson Bo, Forskningsmetodikens grunder, (1991)
3.5.2 The use of Action Based Research

After consideration of different methodology approaches we decided to use parts of the action research framework in order to reach the anticipated goals and objectives. Both the Survey and the Experiment strategies were quite quickly rejected since we did not think they would fit for the project assigned. The image of Action Research as a cyclic process is aligned with our ambition to both identify problems and to come up with suggestions to avoid or eliminate problems. Another characteristic of Action Based Research is that the participant’s commitment is active and not passive. Our way of using that characteristic was that all ideas or suggestions that came up were verified with concerned parties at Pergo. This meant that many additional interviews and observations were made to get feedback on what we had suggested. In addition to that we held a presentation after twelve weeks for invited personnel at Pergo where the identified problems and the suggestions on how to handle these were presented. An hour was set for the presentation and another for discussions with the personnel in order to get directions on how to proceed with the project.

3.5.3 The use of Case study

To be able to understand how customized orders have been handled earlier we investigated how the process was designed and which departments that had key roles for this type of production. Overall we used the case study quite simply to investigate the processes and the working environment on the company since case study often is associated with a deeper investigation which was our ambition.

3.5.4 Data collection

Most of the data gathered has been primary data. The main reason for this is that we have made a lot of interviews and observations as the project has developed. When it comes to secondary data it mostly consists of the Pergo AB homepage and the web based intranet. Lists of product articles, decors, and customers were used to get an overview of the possibilities of creating various customized orders. These data were gathered on request mainly from the production manager and the product manager. Statistical data were also used concerning production follow-up were the purpose was to examine returns for variable volumes in the lamination and the pressing departments which will be explained further in appendix 3.

In the beginning of the project we spent some time looking for theories that could fit to the project’s purpose. Different articles concerning mass customization and postponement was read, the connection to our goal might not be obvious but we hoped to find ideas that could be used. As the project proceeded we found out that theories concerning industry strategy and
organizational issues would be more useful for the analysis part of the thesis.

3.5.4.1 Interviews
At first when we had almost no knowledge at all of the company and the business, the interviews were more like discussions where different personnel explained how things worked for us. After a while when the knowledge increased we prepared the interviews and they were more structured and focused on certain details that we wanted to learn more about. So in short terms the level of structure and standardization of the interviews performed were related to the knowledge of the specific area. We have interviewed about 30 people for more specific questions. In addition to that we have talked with people we met in corridors, in the design and production departments, during lunch’s etcetera which have helped us get a feeling of their ideas and thoughts about Pergo. There were two reasons for doing this. The first is that it is interesting to hear different opinions from workers both on the “floor” and on “manager positions”. The second is that it provides information of both qualitative and quantitative standard.

3.5.4.2 Observations
The data gathered from observations are not dependent on what people say they are doing or what they say they think. Therefore observations balance the interviews performed in this thesis since the primary data otherwise completely would rely on the personnel’s estimations and conceptions. The observations also provide quantitative verification of the data gathered from the interviews.

With the aim of creating a reliable and systematical observation process it is important to create an observation schedule holding a scope of factors such as selection of observation points, frequency and duration. In the approach of this thesis the selection points are focused completely on the manufacturing sites of Trelleborg and Perstorp and include the processes impregnation, pressing, lamination and milling.

Naturally some risks and disadvantages are associated with observation studies. One problem is that the observed party’s behavior may be affected by the observer’s presence. Moreover the observations might simplify the surrounding factors for the observed process. Consequently it is not assured that the observed process can be generalized on other situations when supplementary factors are added.
3.5.5 Empirical investigation and Analysis of four themes

After we had identified problems that could be investigated more closely we chose to divide them into four themes which were described in chapter two. These four themes lead us to a search for theory that could fit the different issues. Porters Five Forces and theories concerning the organizational structure were used since they would bring ideas that could help analyzing the different themes. These theories will be described in the next chapter. The four themes are the base of this thesis and the investigation and analysis of them would lead to the conclusions that we will present in the end.
4 Theory

4.1 Porters 5 Forces

In order to find an answer to the question whether Pergo (Europe) AB should commit itself to customized products we have used Porters Five Forces framework with the intention of finding what factors influence Pergo’s profitability. By doing this we will evaluate how new customized products will affect the company’s profitability in a situation where Pergo is stronger in the contract market by offering customized products.

Porter’s model figure 4.1 is based on the insight that a corporate strategy should meet the opportunities and threats in the organizations external environment\(^\text{26}\). This means that it’s not only the existing companies on the market that determines the competition level; there are also other forces that play an important role. Especially, competitive strategy should base on an understanding of industry structures and the way they change. Porter has provided a framework that models an industry as being influenced by five forces, these forces are- Threats of new entrants, Threats of substitute products, Bargaining power of suppliers, Bargaining power of buyers and Rivalry among existing firms\(^\text{27}\).

![Porter’s five forces framework](image)

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4.2 Mass customization

A recent trend is that companies producing commodity products try to fit various market demands to the existing mass production facilities. The reason to this is that consumers become more and more fastidious when it comes to finding a product fitting their needs. This new demand has its origin in new production technology and intense competition leading to a large range of products on the market. There is a lot of research made in this area and we have found inspiration in some of the ideas presented in these articles. How relevant mass customization is for different industries is hard to say but to address the issue seriously is becoming more and more common. The challenges that these companies need to deal with has to do with two important subjects. What products are going to be mass customized? And what is the desired level of customization to be allowed for these products? The main challenge for Pergo in its endeavor to apply mass customization is to find a product structure that can be mass customized. Hence other ways to mass customize must be found. The product offer partly based on mass customization ideas is presented in Theme II.

The strategy of mass customization aims to achieve an individual customer product from standard components. It’s in many ways the opposite of Henry Ford’s “mass production” concept where high volume and low variety are the major themes. Mass customization also implies high volume production but of high variety of products.28

There are a number of definitions on mass customization and below you will find one of them.

The objective of mass customization is “to deliver goods and services that meet individual customers’ needs with near mass production efficiency”.29

Mass customization is best used when both fixed and marginal costs are low and the importance of mass customization has been able to grow due to the lesser fix costs that modern technology has brought to three areas; information, production and distribution.30

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28 www.smthacker.co.uk/postponement_mass_customisation
29 Tseng & Jiao, Handbook of Industrial Engineering, (2001)
4.2.1 Information
Internet has made it easy to supply information which gives consumers a cheap and effortless way of finding out what products and services that is on the market. For companies this means that they can display immense amounts of product information on web pages and take orders from anywhere in the world.

4.2.2 Production
New technology has made it cheaper for the production to be more flexible. Computer Aided Design has made it easier to create new products and is in many ways replacing expensive prototypes. Computer-guided machinery allows production to shift much faster and are eliminating the time and expense of retooling.

4.2.3 Distribution
Improvements in distribution reduce the fixed cost of getting products to consumers. With bar-code scanners and smart packages that make it possible to follow goods at any time the accuracy and speed of delivery has increased while the costs have been declining.

4.3 Function oriented organization
After spending some weeks on Pergo (Europe) AB interviewing people from different departments we could see that the information that is requested in every step of the process for handling a customized order, is today not working satisfying. Therefore we searched for theories regarding the organizational structure to see if any ideas originating from function and process oriented organization could be of any help. The purpose was not to implement a new structure which is something that takes a lot of time and of course means a lot of work and involvement from everybody at Pergo. One example of an idea that we used was to bring more focus of an overall picture which is associated with a process oriented organization and it lead to the information mapping described in theme III.

The theories behind function oriented organizations were introduced during the beginning of the industrialization. This period was distinguished by technical progress like the moving assembly line and mass production and also an abundant supply on labor. Function oriented and hierarchic organizations originate from the belief that effectiveness is created by the control of different parts of a company. Specialized departments control their respective part of the activities and then hand them over to the next.

31 Ljungberg A., Larsson E., Processbaserad verksamhetsutveckling, (2001), Studentlitteratur
After a series of handing-over, a task is completely fulfilled. This gives clear boundaries for responsibility and authority and well-defined ways for making decisions. The function-oriented organization is considered excellent for organizations with high demands on safety and control, for example armies and fire services. The organization form is also considered to be easy to govern.

In recent years more and more criticism has been directed to the function oriented way of thinking as the organization form that optimizes the company’s profitability. Critics mean that in an organization form like that there is a large risk that decisions and processes that seem good for the department may have a negative impact on the company as a whole. The internal outlook is vertical and the managers are focused on their own departments, which mean that the activities are governed, measured and developed vertically. In reality most processes are not vertical but horizontal. This can leave the affect of a lack of an overall picture, insufficient focus on the customer and sub-optimizations.

4.4 Process oriented organization

Today process oriented thinking is common in many companies for example Ericsson AB and Trelleborg AB. In the process oriented organizations the process is the natural starting point for how a company shall design, lead, operate and develop its activity. Processes are about satisfying needs. A process starts with a customer request that triggers a number of activities that together work to satisfy the need. It is when the different activities cooperate that value is created to the customer. To work in a process means responsibility for a “bigger picture”, from customer request to customer satisfaction. The largest difference between function - and process organization is especially the focus on an overall picture and how you relate to the customer. With a process oriented thinking the activity is not meant to be based on different departments but in different value adding processes that focuses on the customer requests and needs, and how to satisfy these. This means new responsibilities and authorities and therefore a change in roles. The focus is moved from department managers to process owners.

4.5 Discussion about theories

When writing a paper an article or as in this case, a final thesis it’s important to know what has been written before about the subject. There are some logical reasons for this and one that could be mentioned is the fact that the wanted results from a research already might have been displayed by

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32 Ibid.
33 Loinder A., Processledning för ökad samverkan mellan företag, (1996), Linköping universitet
someone else. In our research we had identified different problems and divided them into four themes and we searched for theories that could help us analyzing and come up with suggestions to the problems. An earlier research on the specific problems for Pergo was not found but the theories that are described above have helped with the analyzing part of this thesis. The reason for this is that we have not had our starting point with them but more used ideas and adapted to certain ways of thinking. This is also the reason to why we kept the descriptions so short.
5 Theme I

In this chapter the question, “if customization is the right way to go for Pergo” will be answered and in addition to that the possibilities of different printing methods will be discussed.

5.1 Empirics and analysis – “Is customization the right way to go?”

5.1.1 Industry analysis and Pergo’s profitability

Pergo has for several years suffered from declining market shares and low profitability. As a background to why it is important to investigate and maybe develop the contract and customized markets, an analysis of Pergo’s present situation has been made. Porter’s five forces model has been used to investigate what factors affect the profitability of Pergo (Europe) AB. The analyzed factors are described in figure 5.1.

![Figure 5.1 – Porter’s five forces framework applied on Pergo.](image)

Threat of new entrants

In the beginning of the 80’s laminate flooring was introduced and spread around Europe by Pergo, at that time named Perstorp Flooring, a division of Perstorp AB. After a while, the board suppliers saw the potential of laminate flooring and started to produce their own floors. From being the sole player on the market with high growth and profitability they now met competition from other financially strong players. Today the threat of new entrants is low since in total, there is a substantial over capacity in the laminate
flooring industry and new entrants can count on low returns on invested capital if they enter the laminate flooring industry.

**Bargaining power of suppliers**

Pergo’s most important suppliers are the companies delivering HDF-boards, structure foils, paper and the décor suppliers. Pergo buys the HDF-boards from a few large manufacturers. Some of these manufacturers produce laminate floors themselves to low costs. This places Pergo in a difficult position regarding negotiations of price. These board suppliers have a much stronger bargaining position than Pergo since they are larger and there are few of them on the market.

The major problem with the décor suppliers is that they have a relatively strong position in comparison to Pergo mainly because of two reasons. Pergo uses a limited number of suppliers and besides that the décors are a very important component in the product. In some cases it is actually the décor supplier that owns the décor, which makes it hard to prevent them to sell it to other laminate producers. For structure foil, there are only a few suppliers on the market that can fulfill Pergo’s demands. Consequently, the foil supplier is stronger than Pergo in negotiations. For the other paper components that are included in the production process of a laminate floor, Pergo’s bargaining position is better because the paper are a commodity with a lot of suppliers globally. The downside is that Pergo is a quite small customer and the volumes are relatively low. In total, the suppliers are very strong compared to Pergo, which will affect Pergo’s profitability negatively compared to the laminate manufacturers focusing on economies of scale. It is hard for Pergo to influence the present supplier situation without increasing the scale dramatically and therefore our proposal is to focus on other areas in Pergo’s endeavor to reach profitability.

**Bargaining power of buyers**

Earlier IKEA was as a big customer of Pergo. As much as 60% of the production was bought by IKEA and this made it possible for them to put pressure on lower prices. The risk with this type of customers is that prices typically successively decrease. Compared to other laminate producers Pergo has small volumes that make it difficult for them to compete with price. Consequently, Pergo decided to stop working with IKEA as customer. The European sales today are more focused on smaller customers and customized products can even more strengthen Pergo’s position among small price insensitive customers that requires superior quality.

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35 Interview 19 January 2005 – Production planner Pergo (Europe) AB
**The threat of substitutes**
The threat of substitutes is significant for Pergo as it faces competition from various flooring types such as vinyl, wood, ceramic, linoleum, and carpet. When making a decision on which floor to buy, customers often consider many different parameters that are important for them. For contract customers, architects are often involved in the purchase decision. To these customers, the profit potential is high if it is possible to offer some kind of customization regarding patterns and colors. By offering customized products in some form, Pergo can take a leading position on this market since the laminate floor is well suited for use in public environments due to its price and technical properties, such as wear protection, moisture resistance, and cleaning possibilities.

**Rivalry among existing firms**
The European laminate flooring market is highly fragmented with a large number of players. These players are often producers of panel boards and products for the furniture industry. There are a couple of very large producers that compete mostly with price. They focus on economies of scale and produce around 80 million m²/year. Pergo produces much less and focuses on the premium segment. The corner stones are design, functionality, and support. Pergo has the widest range of products and is leading in development and design. In order to keep high prices, customers must feel that they are getting more from the product compared to cheaper alternatives. That is why it is necessary for Pergo to focus on quality, design, and accessories. By using Pergo’s development capabilities, Pergo can offer customized products that cannot be copied by competitors, and at the same time, the company will strengthen its position as a premium supplier of flooring solutions based on design and technical superiority.

**5.2 Conclusions – “Is customization the right way to go?”**
The conclusions based on the discussion above are that a commitment in offering customized products on the market can help Pergo reach higher total profitability. The main reason for this is that customized products together with Pergo’s design, development, and production capabilities can help Pergo achieve higher market shares on the profitable contract market and in the long run reduce the standard product portfolio which will lead to lower décor development and stock keeping related costs. In addition to that, Pergo’s trademark will be strengthened, and Pergo can focus on more profitable and less price sensitive customers.
5.3 Empirics and analysis – Digital and gravure printing

5.3.1 Digital printing

The fast improvement of the digital printing technique with roots in the textile industry has created new possibilities for the laminate flooring manufacturers especially in the premium segment. The digital printing technique gives new opportunities for Pergo to offer smaller volumes of customized products since the initial costs to develop a new décor are low while the variable costs are higher compared to gravure printing. The downside with this technique today is that the capacity of the digital printing machines is limited. Consequently, digital printing can supply only a small part of Pergo (Europe) AB’s production at the moment. Another important issue is when or if the digital printing technique can be used in the existing production facilities. In the digital printing project it is discussed whether the digital printing technique should be used only for décor development of new standard products or if the digital printing machines should be used as a production machine for small customized products.

5.3.2 Gravure printing

Gravure printing is an established technique of printing décors to laminate flooring manufacturers and offers high quality to low variable costs. One problem with this technique is that the initial costs are high, often several hundred thousand SEK, to make a new set of printing cylinders. Another problem is that the minimum order size from a décor supplier is one ton or more than 10,000 square meters of décor paper. This makes it difficult to offer a customer smaller quantities without a guarantee that all costs can be covered. In late discussions with décor suppliers where the cost drivers of the printers where evaluated it was possible to reduce this minimum order-size to half a ton. This opens new possibilities of using gravure printing based customized floors also for smaller contract customers.

5.4 Conclusions – Digital and gravure printing

The digital printing technique offers opportunities for Pergo but it is uncertain when and even if the technique can be used for production purpose. At the same time new possibilities of ordering smaller quantities of gravure printed décors have arisen. Therefore we have decided to evaluate

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36 Interview October 2004 – Head of R&D at Pergo (Europe) AB.
37 Interview October 2004 – Design development member at Pergo (Europe) AB
38 Interview October 2004 – Head of R&D at Pergo (Europe) AB.
39 Interview 12 November 2004 – International Key Account Managers at Pergo (Europe) AB.
the possibilities of offering customized products both based on digital and gravure printing but with focus on the latter.
6 Theme II

In this chapter the question “how should the product offer be designed” will be discussed. The conclusions should both conform to the capabilities of Pergo as well as the market demands for customized products.

6.1 Empirics and analysis – “How should the product offer be designed?”

6.1.1 Pergo’s production related dilemma

Pergo’s production facilities are today not optimized for either for extremely large-scaled production or extremely flexible production. The production can manage to produce smaller production batches than its major competitors because Pergo has a tradition of offering broad product ranges were some “eye catching” articles are only produced in small volumes. The lamination process used in Pergo’s factories in Sweden is called continuous lamination and generates higher quality and better flexibility than the most common direct lamination technique. Nevertheless, there is a need to further improve the flexibility in the production facilities. At present, it is difficult to produce smaller batches than 100 laminates or 300 m² without high risk to lose the whole production batch due to uncontrollable scraps. To be able to produce small quantities investments in new technology must be made. This puts Pergo in a dilemma in its efforts of either reduce costs through increased capacity utilization or increase revenues through more flexible manufacturing facilities in its effort to improve the financial results.

- If Pergo invests in large-scale production to be able to compete with economies of scale and price the company’s profitability will suffer in the competition with the established low-cost manufacturers.
- If Pergo wants to invest in more flexible production to be able to produce small, customized orders, the volumes would not cover the high initial costs and the overhead costs for R&D.

The question in this thesis is how to solve the capacity versus flexibility dilemma in order to be able to produce customized products.

The answer to this dilemma is to reach profitability by utilizing and strengthening Pergo’s core competencies, brand management, R&D and design and at the same time offer customized floors that suit the production facilities, the suppliers and the development process. A way of doing this is by offering customized floors with restrictions.
6.1.2 Alternative price models – gravure printing

Today the customised product price offered to the customer is based on a price per square meter. Due to the fact that the minimum batch size from the gravure décor supplier is 1 tonne of paper Pergo demands the customer to order a minimum quantity of approximately 10,000 square meters for the order to be profitable with list prices. If the customer does not need the minimum quantity, which is very common, there are three possible scenarios. The first scenario is that the customer forecasts to order 10,000 square meters or more but in the end doesn’t order the full quantity. The second is that Pergo forces the customer to buy 10,000 square meters despite the fact that the customer do not need the full quantity and the third scenario is that the customer pulls back from the deal due to the high minimum quantity that has to be ordered. In the first two scenarios either Pergo or the customer is left with a deal where they pay for material that they do not use and in the third scenario the deal is lost for both parties. In order to meet the demands of the customer better it is important to make Pergo’s cost structure understandable for the customer. If an alternative price model that reflects Pergo’s real cost is used, a solution that fit both Pergo and the customer can be worked out. By using a new price model where the customer is charged for all or some of the initial costs related to the customised order, the risks of starting a project that does not reach break even is minimised for Pergo. The new price model also makes it possible for the customer to lower its costs for the floor concept by increased understanding for Pergo’s process and cost drivers. This can lead to negotiations where both the customer and Pergo can find a solution where the minimum quantity is lowered and both parties still make a good deal. Similar business development has been made between Pergo and its décor suppliers where the supplier has accepted to produce less than 10,000 square meters where the initial costs where covered by Pergo and the variable costs for the paper has been charged separately.

In order to reach the benefits discussed above from an alternative price model there are different alternatives on how the price to the customer shall be built up. The first alternative considered is to charge the customer for all costs related to the customised order including sales costs, development costs and costs for the batch of décor paper from the supplier plus a variable cost for the floor production. The second alternative is to charge the customer for the development costs and the décor cost separately and the third alternative is to charge the customer only for the cost of the décor batch separately.

40 Interview 12 November 2004 – International Key Account Managers at Pergo (Europe) AB.
To charge the customer for the cost of sales separately is positive in the terms of minimising the risks for Pergo. The customer is exposed to all risks in the customised order process. On the downside it is possible that the customer does not accept that he must take the whole risk in the deal. This implies that the customer might draw back from the deal and the price model can work counterproductive. Furthermore the cost of sales for the particular order is difficult to forecast. If the customer wants to order floor from the standard assortment at the same time, it is hard to allocate the costs to the customised order and to the standard assortment order respectively. Today the sales costs are covered by a standardised additional charge in the product calculation. If the customer is charged for Pergo’s development costs risk is transferred from Pergo to the customer which might lead to that the customer thinks it is exposed to risk and pulls back from the deal. It is also hard to estimate the time derived from a particular product since several décors are developed simultaneously. Also the development cost is therefore covered by an additional charge in the product calculation today. The décor cost is the absolutely largest cost when it comes to the cost structure for a new customised product and is easy to link to a particular product.
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<th>Alternative 1</th>
<th>Pros</th>
<th>Cons</th>
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<td>Charge the customer for cost of sales, development cost and décor cost initially.</td>
<td>- Pergo not exposed to any risk of sunk cost of sales, cost of development and cost of décor paper.</td>
<td>- Customer exposed to all risk that might lead to a customer bail out.</td>
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<td>- Hard to estimate and allocate cost of sales.</td>
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<td>- Hard to estimate and allocate development cost.</td>
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<td>- Cost of sales and development costs already covered by additional charge in the product calculation.</td>
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<th>Alternative 2</th>
<th>Pros</th>
<th>Cons</th>
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<td>Charge the customer for development cost and décor cost initially.</td>
<td>- Pergo not exposed to the risks of sunk cost of development and cost of décor paper.</td>
<td>- Customer exposed to all risk that might lead to a customer bail out.</td>
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<td>- Pergo exposed to the risk to not cover the cost of sales.</td>
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<td>- Hard to estimate and allocate development cost.</td>
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<td>- Development costs already covered by additional charge in the product calculation.</td>
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<th>Alternative 3</th>
<th>Pros</th>
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| Charge the customer for décor cost initially. | - Pergo not exposed to risk of sunk cost of décor paper.  
- Easy to change the cost for the décor in the cost calculation. | - Pergo exposed to the risk to not cover the cost of sales and development. |

Table 6.1 – Alternative price models.\textsuperscript{41}

\textsuperscript{41} Created by the authors
6.2 Proposal – “How should the product offer be designed?”

6.2.1 Product offer – Component customization
The ideal solution for the marketing department as well as for the customer would be if the offer completely conformed to the demands of the customer, but since the initial costs are very high and the manufacturing has its restrictions this is an unrealistic option. The product properties identified as having the greatest potential within the customized product segment are the possibilities to vary décor, surface and format.42 A summary of the product offer is presented in figure 6.1.

Format
Historically Pergo has once delivered a customized floor with a format differing from the standard assortment. This customized flooring concept was developed for Seat’s showrooms and consisted of black and white tiles with curved sides visualizing a checked flag. The floor was produced in a separate machine. When a format change shall be made major set-up disturbances occur in the milling line and it takes several hours to change from one format to another. In addition to that the verification process of a new format takes a lot of resources in possession. That is why Pergo currently only offer two different formats, planks and tiles. Our suggestion to Pergo is therefore not to offer the customer to choose format as they please but have to stick with the formats tiles and planks of standard format.

Décor
Regarding décors the digital printing technique is in development and the gravure printing is related to major initial costs of approximately 500 000 SEK and it is very difficult to cover the cost through one order. This cost is mainly derived from the production of a new cylinder set. A way to pass over this problem is to offer the customer a one-colored décor or a color matching of an existing décor. With this option the customer still will have the opportunity to choose from thousands of combinations since Pergo has a wide portfolio of décors. Another argument for this alternative is that less time is required from the design development department in doing a color matching than developing a completely new décor.

42 Interview 12 November 2004 – International key account managers at Pergo (Europe) AB.
Surface
The surface is easy to change in the production process and therefore we suggest that Pergo offer the customer to choose from any of the surfaces offered in the standard assortment.

Technical properties
When it comes to the technical properties the contract customers primarily are interested in the high-end floors, such as Uniq, Practiq and Domestic plus. For that reason we propose to Pergo to offer the customer to choose from these three ranges. This will make it easier for the sales development and the production planning departments to match the customer demands to Pergo’s capabilities than if the customer could choose technical properties freely. Besides that, these ranges will be easier to match to the standard assortment in the production which will lead to less scrap and shorter lead times to customer. A summary of the product offer is presented in figure 6.1.

<table>
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<tr>
<th>The customized product offer</th>
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<tr>
<td><strong>Ranges</strong></td>
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<tr>
<td><strong>Décor</strong></td>
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<tr>
<td><strong>Surface</strong></td>
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<tr>
<td><strong>Format</strong></td>
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Figure 6.1 - The proposed product offer

This product offer holds a number of advantages when it comes to fitting the product to Pergo’s capabilities and processes. The product offer contains only existing components except for the new color matched décor. This mean that the development personnel minimize its involvement in the production of the customized product since every customized order can be treated like a standard assortment order. Since the properties of the product is so much alike other products this product offer more easily can be fitted into the production and this helps to lower scraps and set-up times compared to if the product offer would be more extensive. By just offering larger volumes, minimum 6000 square meters, the production does not have to

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lower its production batches. In total this product offer is feasible solution to fit the market demands to the existing processes and production facilities.

6.2.2 Price model

When the pros and cons with the three price model alternatives are evaluated the most viable and consequent solution is alternative 3, to charge the customer only for the cost of the décor paper initially. The cost of the décor paper is strictly connected to the specific order and is a large initial cost for Pergo. A reel of décor paper with 10,000 square meters costs approximately 7000 Euro. To estimate and evaluate the costs for development and sales is troublesome and it is more efficient to see these costs as fixed costs and cover them with the ordinary additional charges. Another argument for the third pricing alternative is that the customer will not be exposed to more risk than the material cost of the décor paper. In the end, this pricing solution creates opportunities for both Pergo and the customer. The pricing model will reduce the risks by making the customer cover of the initial costs for Pergo’s largest expenses and at the same time give the customer the chance to get a customized floor in a quantity less than today minimum volume.
7 Theme III

In this chapter the results from a mapping of the existing development process is presented. This is made in order to evaluate the process and answer the questions “how to shorten time to customer” and “how to decrease labor costs in the development process”.

7.1 Empirics and analysis – The customized order process

7.1.1 The existing customized order process

To be able to come up with ideas for an improved internal process concerning customized products, a detailed mapping of the existing development process was made. The mapping is required to find the pros and cons with the existing process, which lead to a new proposal for the internal process for customized orders. The mapping is not presented in this chapter but the major problems with the existing process follows.

Problem summary

- The exchange of information between the departments lacks a clear and viable routine which implies a lot of e-mailing and phone calls to get complementary information about the new customized product and the preceding trial order.
- The hands-on job performed by the development and laboratory personnel is time consuming. The R&D personnel are involved in the production of customized orders in larger extent than necessary.
- The legitimacy for customized orders and trial orders are low in the production due to the fact that the production not is responsible for the results of the trial orders. Another reason to that the production down-prioritizes the trial orders is that small orders affect the volume goals set up for the production negatively.
- The follow-up of material and the costs are done manually which is time consuming and inexact. The cost entered for the trial orders in Movex is incomplete and often the lack of material follow-up has contributed to errors in the raw material stock.
- Together all this problems lead to the most important issue related to the value added to the customer. The lead-time to customer is too long.
- Every activity in this process implies waiting time and operative time to perform the activity. By reducing the number of activities the time to customer can be shortened.
7.2 Proposal - The customized order process

7.2.1 Proposal to a new internal process for customized orders
The new process model is principally based on one main change, to do an early registration of the new customized product in the ERP-system Movex before the trial order is produced. By doing this several major advantages can be obtained. The information related problems can be remedied by using a standard formula or a checklist with all the information needed to handle the development procedure efficiently later on in the process. We have developed a checklist based on the interviews made with the development and the operative personnel. The list is presented later in this chapter. This checklist can be used by the key account manager in order to secure that all information needed from the customer is obtained to make the customized order process efficient. A procedure with all information secured can help making the impression of Pergo more professional. Every key account manager knows how to act and what information will be needed with the ambition of coming to an agreement fast.

7.2.2 Advantages of the new customized order process
By using the proposed order process several advantages can be obtained.

The information accuracy will be improved
The new process model will force the key account manager, the product manager and the development personnel to provide all information needed throughout the process in an early stage to be able to get the customized trial order through the production. This remedies the present problem of information confusion. Today the lack of information from former activities in the process can delay a trial order for weeks since some information has to be verified all the way back to the customer.

Opportunities to advance planning and lower scraps
The existing customized order process is characterized by a step by step approach. Every step has to be carried out before next activity can be planned. This implies that an uncertainty occurs considering when the activities later in the process can be pursued. All trial orders are today gathered to be produced on one occasion. This means that a large variety of products are produced in one or a few hours which lead to high scrap rates and set-up times. By registering the new product before the production of the trial order is pursued advance planning is possible. The European planning department, from this autumn centralized in Trelleborg, will in an early stage see when the trial order must be produced in every machine in order to manage the lead time of the trial order. It also gives opportunities to lower the overall production cost by planning every customized trial order
to be produced where it minimizes scraps and set-up times together with similar products.

**The total labour costs of the development and production will be lowered**

The new routine will decrease the number of activities in the customized order process. This will lower the labour costs of the customized order process in total. The hands-on work the development personnel today do during the production process, including follow up of material, issuing trial order forms, supervising the process, putting labels in the hands of the production personnel, order transports, forwarding information and so forth, will be done according to normal routines used for the standard assortment. The inbound material will be marked with Pergo’s reference numbers and the development personnel can focus on the development of future products. The person responsible for the article registering at the planning department and the production controller has to do some extra work compared to the old process model in a few cases when a customized product has been initiated and registered but the product never goes to real production. Therefore it is important for the key account manager to ensure that the customer really wants the new product. In total the new process model will save labour hours compared to the old process.

**The legitimacy for customized orders and trial orders increases**

Today trial orders generally are down-prioritized in the production since the production department lacks information about how and when the trial order has to be delivered. All standard products have lead times that have to be held and the trial orders always come in second hand. There are exceptions when someone from management level requires the trial order to be produced quickly but if the customized product segment’s volumes increase the present routine is untenable. Since the customized trial order in the new process model will be a part of the ordinary production, the manufacturing department also will be held responsible for the production, scraps and lead times of trial orders tied to customized products. This can help legitimate trial orders in larger extent.

**The follow-up of material and costs will be more accurate and done automatically**

Today the follow-up of trial orders in the production is made manually. The only thing that is charged to the development department or the marketing department internally in Trelleborg is the material. Labor and fixed costs are not followed up which implies that the present standard assortment carries the costs of the trial orders for customized orders. Since there have been only a few customized orders so far, this has not been considered as a problem. If the number of customized orders increases the trial orders also
will increase and that affects the costs for the standard assortment negatively. By using the new model the accurate cost to stock will be entered and there will be possibilities to charge this cost internally by tying an order to it. The material will be followed-up according to normal routines which will remedy the problems of the trial orders contribution to material balance inaccuracies.

**Opportunities to give a lead time to the customer**

By registering the new customized product in the Movex in an early stage it opens possibilities to give the customer a lead time on when the pilot floor can be delivered. Today that is difficult to do since the time related uncertainty is high with the existing process. As Pergo’s delivers customized products it eventually will be possible to learn how long time it takes from initiation of a product to delivery of the pilot floor.

**Opportunity to control where in the production process the customized order is**

When the pilot floor is registered and planned it is possible to contact the planning department in order to find out where the product is in the production process and when the pilot floor can be delivered.

**Lower Time To Customer**

The most important benefit from this new process model is that the lead time from initiation of an order to delivery can be shortened which creates value to the customer. Today this process can take several months and the new process will create opportunities to shorten this lead-time substantially.

### 7.2.3 Implications and problems concerning early article registration in Movex

The impregnation of trial orders is today mainly made in the pilot impregnation machine because the scraps for small orders are lowest there and the machine is controlled by the development personnel. To deeper investigate what problems related to register articles in the ERP-system Movex before the trial order is made, a meeting was held with the business controller and the person responsible for the production control. The first issue discussed was how to handle the pilot impregnation machine that today isn’t registered in Movex. The registration of the pilot machine in Movex means a one time investment. The machine must be registered and several connections must be made to the production follow-up, the registration of the pilot machine in Movex means a one time investment. The machine must be registered and several connections must be made to the production follow-up, the

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44 Interview 2 February 2005 – Employee responsible for the décor development at Pergo (Europe) AB.
45 Interview 22 February 2005 - Employee at Pergo (Europe) AB’s planning department.
and the production controller at Pergo (Europe) AB.
accounting department and to the production planning. Probably consultants must be engaged in order to make the registration since the personnel at Pergo neither have time or knowledge to manage the registration themselves. The timeframe and cost for this is very difficult to forecast since different departments are involved in different steps. The conclusion is that this machine registration problem needs to be approached through a new Movex-project where the concerned parties from the different departments must be involved.

The second issue discussed was how to handle the yield and calculation difference for trial orders. Since the trial orders usually are produced in small batches of perhaps 200 meters and often in half format, trial orders will generate a larger percentage of scrap compared to standard orders where the batch size is much larger. Every month the manufacturing is measured on efficiency. If the yield for trial order isn’t adjusted to the larger percentage of scrap it generates it will affect the measured efficiency negatively as the customized orders increase. Today the manufacturing has a close follow up on cost and material for every order, which is compared to the forecasted cost and material that is set by the yield. If a calculation difference occurs this implies extra work for the production controller. A calculation difference can never be accepted no matter how small they are according to the production controller.

To sum up there are still several problems related to the Movex system that has to be solved before it is possible to implement the process model proposed in this thesis. Technically and organizationally the new process model is well balanced according to the interviewed persons at the involved departments.

7.2.4 Information mapping and information security proposal

To get feedback on our idea on how to handle customized orders we invited the involved personnel to a meeting. On this occasion we held a presentation of our idea and gave the opportunity for everybody concerned to discuss the proposal with each other. Since we before this meeting only had presented the idea individually with everybody involved this meeting gave some new inputs on how to implement the new process model. The general opinion was that the trial order process today not is working satisfactory and that the preferred solution would be to be able to treat them in the ERP-system Movex according to the normal routines for standard orders. The new process model would help remedying the hands-on job for the development personnel and to make the process faster. So for the projects continuous work it was suggested to deeper investigate how to handle the problems related to register articles of trial orders in Movex and how to secure the information flow in the new process model. It therefore
was decided to make a mapping of the information needed in the new process model.

In order to identify what kind of information that are needed in every step of the proposed process additional interviews was made with the production leaders in Trelleborg and Perstorp, the planning department in Trelleborg and Perstorp, the production controllers, the development personnel, the product manager and the international key account managers. The mapping is made from the end of the value chain and backwards to secure that no information would be missed during the interviews. A summary of the mapping is described in figure 7.3.

7.2.4.1 Production leader bonding and milling Trelleborg

When the production personnel in Trelleborg make a production order they need information provided from the Movex system concerning the following parameters.

- Date of production
- Machines to be used for the production of the floor
- Volumes
- Time of delivery
- The person responsible for the order
- Backing
- HDF-board
- Laminate
- Format
- Packaging
- Lock
- Sound bloc
- Shall the floor be shipped to the Distribution Center or not

All this information is provided by the production order and the article specification provided by Movex through the detail planner in Trelleborg.

7.2.4.2 Detail planner Trelleborg

The detail planner in Trelleborg needs three specific facts in order to do a production plan, delivery time, the article specification and an acceptance from the planner responsible for the pressing and laminate machines. When an order has been placed towards a specific article the information that an order has been placed must reach the production planner. When the order

46 Interview 31 January 2005 – Production leaders for the bonding and milling department at Pergo (Europe) AB.
47 Interview 1 February 2005 – Detail planner Pergo (Europe) AB.
has come into the system the order must be planned. Before the order can be planned the planner must check if it is possible to produce the order without major changes in the production site. After that a distribution order is sent to the planner responsible for the Perstorp site. When the planner for the Perstorp site has given an acceptance for the order the detail planner can make a production plan aimed for the production personnel. The information discussed above can be obtained by the customer order and the product specification.

7.2.4.3 **Production leader - Pressing in Perstorp**

The information needed includes article numbers of the different parts of the laminate.
- Impregnated décor paper article number
- Foil article reference / Surface
- Impregnated overlay article numbers
- Base paper article number
- Refined laminate article number
- Specification of the process parameters
- Volume needed in the Trelleborg plant
- Time of delivery to Trelleborg

All this information is provided by the production order and the article specification provided by Movex through the detail planner in Perstorp.

7.2.4.4 **Production leader - Impregnation in Perstorp**

The information needed in this step is listed below.
- Article numbers for unrefined material.
- Article numbers for the refined product
- Specification of the process parameters
- Volume needed in the pressing machine
- Time for delivery to the pressing machine

All this information is provided by the production order and the article specification provided by Movex through the detail planner in Perstorp.

7.2.4.5 **Detail planning - Perstorp**

The information needed to make a production order is listed below.
- Article numbers of unimpregnated papers

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48 Interview 3 February 2005 – Production leader for the pressing department at Pergo (Europe) AB.
49 Interview 25 November 2004 – Production leader for the impregnation department at Pergo (Europe) AB.
50 Interview 3 February 2005 – Detail planner at Pergo (Europe) AB.
- Impregnated décor paper article number
- Foil article number / Surface
- Impregnated overlay article numbers
- Base paper article number

The information listed above can be obtained by the customer order and a requirement order from the planning department in Trelleborg.

7.2.4.6 Production controller\textsuperscript{51}

All the information that the production controller needs to be able to do a costing on an article is given when an article registration has been made.

7.2.4.7 Production control system\textsuperscript{52}

All the information needed to register a new article in the production control system is supplied when an article registration has been made. The most important step is therefore to make sure that the information needed for article registration is sufficient. If that is the case it only takes a couple of minutes to register a new article in the production control system. The information concerned is a complete documentation on how the article is build up and manufactured.

7.2.4.8 Article registration\textsuperscript{53}

The person responsible for the article registration needs the product specification and the time when the article must be registered.

7.2.4.9 Product manager\textsuperscript{54}

With the purpose of deciding whether the product shall be reality or not is the information from the business case described in appendix 1 is used. The business case contains information considering:

- Market
- Timeframe
- Volume
- Accessories
- Price

This information together with cost to stock, distribution costs and fixed costs leads to a calculation on the profitability of the order. The profitability potential is the ground for the decision on whether the product shall be

\textsuperscript{51} Interview 25 January 2005 – Production controller at Prego (Europe) AB.
\textsuperscript{52} Interviews 25 January 2005 - Pego (Europe) AB’s planning department.
\textsuperscript{53} Interviews 13 January 2005 - Pego (Europe) AB’s planning department.
\textsuperscript{54} Interview 26 January 2005 – Product manager at Pego (Europe) AB.
produced or not. This information must be provided from the key account manager.

In order to create a product specification later in the process the product manager needs information considering the product (Uniq, Practiq or Domestic plus), format, surface and décor from the development department.

7.2.4.10 Development department / Design

The information needed for the development personnel in order to be able to produce a pilot floor is basically the same as for making 30*30 cm samples. In order to make small sample laminates the person responsible for laminate development need the following information from the key account manager. As a result the key account manager has to acquire this information from the customer before it is possible to move on with the sample process.

- **Field of application:** It is an advantage if the development personnel know in what kind of environment the floor shall be used to match the customer’s requirements to the technical properties for the floor.

- **Décor:** The décor proposal can be in different forms but the most common way of conveying the needs of the customer is to use an internal number used for the standard assortment and what changes the customer wants. For colored floors the best way is to use an NCS-code (Natural Color System) for the desired floor. An alternative to this is to use a color sample from the customer.

- **Surface:** In order to make a laminate sample the development personnel need information on what surface to use. Today Pergo has several different surfaces but only a few of them are more appropriate for public environments.

- **Quantity:** The development personnel must know how many samples of every kind of laminate that is needed before it can be sent to the key account manager for further distribution to the customer.

- **Time of delivery:** The development personnel must know when to deliver the samples to the customer in order to know how to prioritize their work and if they have to point out to the supplier whether the supplier need to act quickly or not.

- **Where the samples should be sent:** If samples should be sent directly to the customer the development personnel must know about this.

- **Volume of an eventual pilot floor:** If the customer wants a pilot floor the development personnel must know about the quantity of this pilot floor before they take contact with the décor supplier and order pilot

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55 Interview 2 February 2005 - Employee responsible for the décor development at Pergo (Europe) AB.
reels for color matching. If the development department does not get information about the volume of the pilot floor problems can occur if Pergo must order more lab-paper of the same sort from the supplier and this can create problems and costs for both Pergo and the décor supplier.

The information listed above must be provided from the key account manager.

When the samples have been presented to the customer and the customer has made a choice the product manager who makes a product specification is contacted. When the product specification is made the development personnel in Perstorp is contacted again. The information needed from the product manager is:

- Surface information
- Décor information
- Overlay information
- Laminate
- Time of delivery

Figure 7.1 concludes the information needed throughout the customized order process.
7.3 Proposal to secure information in the new customized order process

The information mapping made in the previous chapter leads to the conclusion that the most sensitive part of the information flow is the information obtained from the customer by the key account manager. Today the sales process holds a number of rounds of contacts in order to gain complementary information as the development process proceed. Therefore we have developed a check list sheet for the key account manager to use in the contact with the customer in order to secure that all information needed for the product offer is acquired at the first time contact is taken with the customer. By using this sheet the sales process will be smoother and more professional since further contacts with the customer to gain complementary

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information will be minimized. The check list sheet is presented in figure 7.2.

7.3.1 Checklist developed for the Key Account Managers

The check list sheet holds a number of constituents that are listed below. The sheet shall contain all information below before it can be sent to the product manager for business case evaluation.

- **Field of application.** It is an advantage if the development personnel know in what kind of environment the floor shall be used to match the customer’s requirements to the technical properties for the floor.

- **Assignment lifetime.** In order to evaluate the opportunities and risks connected to the customized order project it is important that the key account manager knows the time frame for the order. This is also an advantage when the order shall be prioritized for development and production later in the process.

- **Product properties.** The customer can choose from three products. Uniq, Practiq and Domestic Plus. These three products are premium products with possibilities to higher margins and will fulfill the demands of most contract customers. The choice holds properties as standard classification, sound block, HDF-board, and laminate quality.

- **Texture.** The customer is free to choose texture from Pergo’s standard assortment.

- **Décor.** The customer is free to choose from all décors from Pergo’s standard assortment, color matched décors of Pergo’s standard assortment as well as one colored décors of any kind. The information needed in order to develop a new décor for the customer is PP-number, NCS-number, PMS-number or a sample.

- **Format.** The customer can choose from the existing plank formats and tiles from Pergo’s standard assortment.

- **Quantity of laminate samples.** Trivial matters as how many test laminate samples the customer wants, delivery time and address shall be included in the discussions with the customer.

- **Delivery time of laminate samples.**

- **Delivery address of laminate samples.**

- **Volume of pilot floor.** The development personnel orders lab-reels from the décor supplier and it is important that the customer specify the volume of a possible pilot installation to avoid a second lab-reel production run at the supplier that will increase cost and time to customer.

- **Business case information (see appendix).** In order to make a business case evaluation some information must be obtained from the customer and the key account manager where the most important factor is price structure and price level. For additional information, see appendix???
- **Other floors ordered.** In order to evaluate the profitability of the customized floor it is favorable if additional floors from the standard assortment are ordered in the same deal and if the orders are interrelated.
- **Accessories ordered.**

![Check list sheet developed for the key account managers](57 CREATED BY THE AUTHORS)

Figure 7.2 - Check list sheet developed for the key account managers

57 Created by the authors
8 Theme IV

In theme four an answer to the questions “how to lower the scrap for small batches in the production” and “how to measure the costs for small production orders” will be presented. Another important question in this chapter is “how to evaluate the production in order to be more flexible”.

8.1 Empirics and analysis – “How to lower the scrap for small batches in the production”?

The conclusions presented previously suggest that customization of gravure printed décors can be done. As explained earlier the customized product has certain restrictions, for example does not the offer mean that a customer can choose from endless options and then create a completely customized product. The proposed offer has in reality most to do with changing the color of the décor to a unique color that will help attract contract customers.

In the previous chapter an analysis has been made on how to handle the process for this kind of products. An important part of that analysis had to do with how trial orders should be handled in the production, which implies that small batches must be manufactured in the production machines that are adapted to larger volumes. In an attempt to also see if any actions could be made to lower the scrap figures for small batches, investigations were performed in order to try to find the key drivers for this.

8.1.1 Investigations in the Perstorp site

The collected information gave an understanding of a complex production process. It was discovered that the main problem was the impregnation and pressing lines in Perstorp which generate scraps with every change of order. In Trelleborg where the bonding and milling is made, small batches do not have the same impact on scrap figures. The efficiency of the production is however affected in a negative way. In the impregnation machine the scrap figures are quite high when dealing with small volumes which are originating from the set-up of the order. Depending on the quality of the décor and how easy it has been to adjust tension, wide and length parameters, this activity results in different amounts of scrap. Worst case scenario means that more than hundred meters becomes scrap while in the best case only a few meters are lost. In the pressing line the scrap figures are slightly lower but the disturbance on the standard production has a greater impact and every meter of scrap generates a larger internal cost due to higher refinement level.

The measurement figure used for the impregnation and pressing departments is yield defined by scraps divided by prime material. The
bottom line is that the yield figures become very high for small orders since any change of order means that scrap will be generated. This amount of scrap will be compared to the volume of prime material resulting from the order. Naturally larger batches will provide better yield figures when the scrap generated from a change of order is divided on a larger volume.

A few ideas were raised on how to lower the scrap for small batches. The ones that were examined concerned the impregnation and adjustments of tension, wide and length parameters and specifically how to lower the time for these, since they must be made during the production of the order. All of the material that comes out of the machine during these adjustments is useless which in other word means that it is scrap. If the production of small batches could be matched with standard orders that had similar material properties, maybe the adjustments could be made faster and therefore generate less scrap. Maybe it was possible to gather a couple of small décor reels and then produce them after each other on a specific day. This would be done in order to make it possible to plan working schedules so that extra personnel that day could help with the production.

8.2 Conclusions – “How to lower the scrap for small batches in the production”?

Quite fast it was understood that minimizing the scrap is difficult and something that the technicians and operators of these machines are better equipped to deal with. Besides that the production management continuously works on how to minimize the scrap and yield in the production sites and at present the general opinion among the production management is that it is hard to reduce scrap and yield for small production batches without major investments. Therefore we decided to not investigate further on how to lower the production cost for small production orders.

8.3 Empirics and analysis - “How to measure the costs for small production orders”?  

When the investigation on how to lower production costs for small orders had been rejected the efforts were focused on how to measure the costs for a small production order in the manufacturing department. Today the manufacturing is evaluated on one single measurement, the material exchange rate or yield as it has been mentioned earlier. This yield is the same for all products no matter how big the volumes are on the actual product. The yield is determined by the following calculation. For example if a hundred meters of laminate was run through a production machine and ninety-eight meter of this laminate is ok to use, the yield figure would be 98/100 and in other words 98%. When we interviewed manufacturing personnel and made observations on the impregnation and pressing
machines it was clear that a change of order could be divided in two different types of scrap. One that is generated from the actual change of the order and the other as scrap that doesn’t relate to the order change.

In the product calculation the yield is the same for all products no matter how big the production batches normally are on the actual product. The yield is based on historical data of yield figures. As said earlier larger batch volumes imply higher yield than small batch volumes in reality since the scrap related to the change of order is divided on a larger volume. This implies that products with large production batches carry much of the production costs related to yield and scraps for the products with small production batches. Another angle on this problem is that in Perstorp every production machine’s personnel is evaluated and rewarded after how they perform in terms of yield and scrap rates. In Trelleborg the volume produced is evaluated every month. This has made small batches unpopular among the personnel because the small batches drives down the overall performance in the production and makes it harder to reach the yield and scrap goals. If the production has to deal with an increasing amount of small production orders the present goals in the production will be affected negatively no matter how much the small batches can generate in terms of profit. If the yield instead were adapted to the actual batch size the internal cost system would reflect the real costs related to the production and it would be easier to see which products are profitable and which are not. It also makes it possible to use the new exchange rate in the product calculation in order to forecast the profitability before a small batch is produced.

In an attempt to adapt the exchange rate to the batch size without getting an imbalanced cost structure where the products produced in large batches carry the costs of the products produced in small batches, a yield simulation was made. The investigations and calculations made shall be seen as an example to see if this cost model is viable. The calculations made showed that every change of production order in average leads to a fixed number of meters of scrap on the machines. The other form of scraps that not were related to a production order change could be set to an average percent of the production of the machine. With this information it was possible to do a simulation on different batch volumes to get a more correct yield figure. This new yield figure could therefore give a closer picture to the costs concerning the production for not only small batches but also for larger ones.
8.4 Conclusion - “How to measure the costs for small production orders”?

The production is measured on yield and scrap figures which are related to the volume of the product produced. Today the yield is the same for all volumes and it is an average based on historical data. In order to gain a better knowledge of the costs it is possible to use the yield for different volumes. The yield figure for small production orders will be lower than the values used today in the product calculation. An example with a décor reel on 200 meter would make the internal cost higher compared to present calculations with the average yield as a base. This knowledge can be used to forecast the profitability of a small production order.

8.5 Empirics and analysis - “How to evaluate Pergo’s production in order to be more flexible”?

8.5.1 How to evaluate Pergo’s production in order to be more flexible

Today the senior management’s intention is to make Pergo AB a more flexible flooring manufacturer in order to strengthen the company’s position as a premium flooring company that can fulfill premium customers’ needs in terms of time, design and quality conformance. One problem is that the production has put large efforts in achieving efficiency to minimize the cost of finished goods per square meter. There is always a trade-off between overall efficiency and flexibility in a production site that requires set-up times when changes between different products are made. This problem puts Pergo in a dilemma. Should the production strive to minimize its production costs in terms of cost per square meter or should flexibility be prioritized. The proposal presented below is an approach to encourage flexibility in the production. The downside is that a trade-off between efficiency and flexibility will occur with slighter less focus on minimization of the cost per square meter.

8.5.2 The measurement tools today

8.5.2.1 Impregnation and pressing

As mentioned above the plant in Perstorp today is evaluated by two measures, scrap and yield. The major driver for scrap and yield are change of production orders. This implies that the production personnel strive to minimize the number of production order changes. Consequently these measures benefit large batch volumes and small production orders and test orders have limited legitimacy. The company’s ambition to be a flexible manufacturer is therefore opposed by the measures used in Perstorp today.
Today the scraps in Perstorp are thoroughly measured in order to minimize
the scraps. The problem is that the measures do not encourage flexibility.
Another problem is that every machine is evaluated separately. This often
leads to sub-optimization because of the impregnation’s aim to reach the
exact amount of meters to fulfill the number of laminates ordered.

8.5.2.2 Bonding and milling
The Trelleborg plant is measured differently from the impregnation and
pressing machines historically located to Perstorp. Here the only measure is
volume. The advantage with this measure is that volume is easy to measure
and that the cost of goods produced will be minimized in terms of SEK/m².
The volume measure also implies that cost effective production is reached
by maximizing production volumes. In order to maximize the production,
large batch volumes are vital in the production’s aim to reach its goals.
Larger batch volumes mean that optimal stock levels are hard to reach if the
optimal batch quantity is smaller than a full pallet of laminates. Another
downside is that a large batch makes it harder to produce orders with short
lead-times. The large batches tie up the production for a long time in
advance and that makes it hard to produce customer orders that require short
lead times. The bottom line is that the measure used today doesn’t give
incentive to flexible production.

8.6 Conclusion- “How to evaluate Pergo’s production
in order to be more flexible”?

8.6.1 Proposal for new measurement tools in Pergo’s
production
In order to become a more flexible production facility, new measures should
be used. The proposal for new measures is to evaluate;
- \( \text{(volume) / (operative machine time)} \)
- \( \text{(set-up time) / (order)} \)
- \( \text{(scrap factors related to production order change) / (order)} \)
- \( \text{(scrap factors not related to production order change) / (total volume produced)} \)
This implies that the production will shift focus from maximizing the
production volumes to become more flexible when it comes to capacity
utilization, production order volumes as well as lead times. The internal
price setting will also be more accurate.

8.6.1.1 Volume / Operative machine time
Operative machine time is defined by the time when the machine is
producing refined material or more specifically \( \text{(time when the machine is manned) – (set-up time) – (planned stop time)} \). Volume is defined by
(Output refined material). By evaluating the production using this measure the incentive for efficiency on small orders will increase compared to current measurement system. The production will not be “punished” for producing smaller batches on the premises that the machine will run at constant speed. All of Pergo’s machines more or less run at constant speed today. A practical problem with this proposal is that operative time must be measured. This is not made today. That problem can be solved either by mounting a manual clock at the machine or an automatic device that measure the time when the machine is running. The downside of this proposal is that the production looses its focus on minimizing SEK/m². The benefit is that the production still will focus on efficiency without loosing the possibilities to be a more flexible manufacturing unit.

8.6.1.2 Set-up time / Order

Today the production tries to minimize the total time for set-ups. The factor that has greatest impact on the total set-up time is the number of changes of production orders. Consequently the production tries to minimize the number of production orders by maximizing the batch sizes. If the set-up times are evaluated separately and per order the incentive for minimizing set-up times will still be there but the measure will eliminate the production’s will to maximize batch volumes. The evaluation measure will be unaffected by the size of the batch. This will increase the production’s ability to be more flexible. Again it is necessary to create a routine on how to measure set-up times practically. This can be made manually or automatically.

8.6.1.3 Yield

Today the scrap and yield are evaluated by a number of scrap-factors before and after the impregnation and pressing machines. These factors are used to calculate the yield on every machine. Today a mean value is calculated from these factors. No consideration is taken on how many orders that have been produced during the actual time period. Consequently, the production will perform worse in the means of yield the more production orders that are made. The willingness to produce small production orders and tests are small and the flexibility is low due to the production’s aim to reach “profitability” and low cost production.

One solution to the problem is a proposal where the production uses a set of yield evaluation measures based on set-up related scrap factors and non set-up related factors. By using this system the yield can be divided into two parts, one that refers to the number of orders produced and one that doesn’t. This will make the production more willing to be more flexible when it comes to small as well as large production orders. The two yield measures
are called \textit{yield 1} and \textit{yield 2}. \textit{Yield 1} is defined by \((\text{Scrap related to production order change}) / (\text{Number of production orders produced})\) and \textit{Yield 2} is defined by \((\text{Scrap not related to production order change}) / (\text{Total volume})\). This is possible to measure since similar measurements have been used before but for another purpose, to measure total yield on every machine. The only change that has to be made is to invent the measures in Trelleborg and to categorize the measures used previously in Perstorp.

\textbf{8.6.1.4 Flexibility}

In order to avoid splices in the pressing machine one proposal is to allow variances in volume compared to the ordered amount of laminates. This will decrease the number of small décor reels that lead to splices.
9 Implementation

To sum up the conclusions made from the analysis of the four themes we have developed a proposal to an action plan that can be executed by Pergo AB.

The first step to take is to make customers aware of the new product offer that has been described in theme II and to test the demand potential on the market. It would be desirable for the Key Account Managers to have a meeting with sales managers around Europe where they can explain what this customized product offer involves. When the information has been spread, sales managers have the possibility to present this new product to customers. In order to make it easier for customers to see which parameters that are optional it should be visualized in a product catalogue or a separate sheet. There is an example in theme III which illustrates how this could look like with small boxes that could be filled in for the different options. In order to minimalize the need for complementary information as the development process precedes this also contains a check list for the sales managers. The reason for the check list is to secure that all information needed for the product offer is acquired at the first time contact is taken with the customer.

When it comes to the price model for this product we suggest that an “open card” approach is suitable. If the customers get a picture of the décor costs it might be easier to find a pricing solution that creates opportunities for both Pergo and the customer. The alternative that we suggest is to charge the customer only for the cost of the décor paper initially. The costs of sales and development can be seen as a service to the customer and is to some extent covered by the additional charge in the product calculation. The customer will not be exposed to more risk than the material cost of the décor paper that later not will be purchased. Pergo on the other hand covers the largest expenses concerning the development. Concerning the price of the finished floor we propose that it is set by square meter. What the price should be is settled for each customer and is depending on for example total volume, potential for orders on standard floors and if the development has demanded a lot of extraordinary costs.

Since a one-time investment has to be made and some problems must be solved before a trial order can be registered in the ERP-system Movex, the potential of this customized product should be examined on the market. If it turns out to be an attractive offer and the response from customers are good we suggest that Pergo gather a project group. This project group should be gathered to discuss how to solve the remaining problems and what the costs
would be to make it possible to handle trial order in Movex. First of all the
impregnation machine that is used for trial orders in half format must be
connected to Movex in the same way as the production machines are today
cenering for example production follow-up, accounting and production
planning.

The other issue concerns how the yield figure should be handled in the
development process since this type of order will generate more scrap which
will affect the efficiency negatively. Today the manufacturing has a close
follow up on cost and material for every order, which is compared to the
forecasted cost and material that is set by the yield. If the yield figures
would be the same for trial orders in the development process and sharp
production orders a calculation difference would occur which implies extra
work for the production controller. If the yield figure would be adjusted so
that one figure was used for the trial order and another for when it becomes
a sharp production order it means that most of the work with making an
article must be made again.

If the project group comes to the conclusion that these problems can be
solved to a reasonable cost we believe that trial orders should be handled as
articles registered in the ERP-system Movex.

To visualize the implementation plan a tree-figure was made and is
described in figure 9.1.

![Implementation tree](image)

**Figure 9.1 - Implementation tree**

58 Created by the authors
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List of figures

Figure 1.1 – Laminate construction, www.pergo.com.

Figure 1.2 – Laminate floor construction, www.pergo.com.

Figure 1.3 – The production in Perstorp 2004, created by the authors.

Figure 1.4 – Production layout Perstorp 2004, created by the authors.

Figure 1.5 – The production in Trelleborg 2004, created by the authors.

Figure 1.6 – Production layout in the Trelleborg site, created by the authors.

Figure 1.7 – Pergo’s product ranges, created by the authors.

Figure 1.8 – The flooring market in Europe 2000, Pergo Pulse (Pergo (Europe) AB intranet).

Figure 2.1 – Problem breakdown map with this thesis themes, created by the authors.

Figure 2.2 - Interrelated projects and its objectives, created by the authors.

Figure 3.1- The cyclic process of action based research, Denscombe M., Forskningshandboken, (2000), Studentlitteratur.

Figure 4.1-Porter’s five forces framework, Grant R. M., Contemporary Strategy Analysis, (2002), Cambridge, Blackwell.

Figure 5.1 – Porter’s five forces framework applied on Pergo

Figure 6.1 – The proposed product offer, created by the authors
Figure 7.1 – Information needed in every step of the trial order process for customized products. This figure is the base for the key account manager’s checklist, created by the authors.

Figure 7.2 - Checklist sheet developed for the key account manager’s, created by the authors.

Figure 9.1 – Implementation tree, created by the authors.

Table 1.1 – Pergo’s prioritization for the contract market 2004, created by the authors.

Table 1.2 - Pergo’s prioritization for the contract market 2005, created by the authors.

Table 6.1 – Alternative price models, created by the authors.