LUND UNIVERSITY

Improve and secure the Supplier Capacity Process for IKEA in Greater China

Authors:
Lena Sandberg and Martin Grönlund

Supervisors:
Peter Berling, Faculty of Engineering, Lund University
Paul Björnsson, IKEA of Sweden

Examiner:
Fredrik Olsson, Faculty of Engineering, Lund University

Lund University
Faculty of Engineering, LTH

2012-06-01

Acknowledgements

This master thesis is the final part in our Master of Science degree in Mechanical Engineering at the Faculty of Engineering, Lund University. The thesis has been conducted for IKEA of Sweden, Älmhult, in collaboration with the Department of Industrial Management and Logistics, Faculty of Engineering, Lund University.

The main part of the data collection has been made in the IKEA Trading Office in Qingdao, China. We would like to thank all employees at IKEA in Qingdao for their great support and willingness to help us, both with the thesis and with personal matters. We would also like to thank IKEA for giving us the opportunity to write this master thesis, and we would also like to give our special thanks to Peter Berling, our supervisor at Lund University who has given us a lot of guidance throughout the project.

Lund, June 2012

Lena Sandberg

Martin Grönlund

Abstract

Title	Improve and secure the Supplier Capacity Process for IKEA in Greater China
Authors	Lena Sandberg and Martin Grönlund
Supervisors	Peter Berling, Department of Industrial Engineering and Logistics, Faculty of Engineering, Lund University Paul Björnsson, Plan & Secure Capacity, IKEA of Sweden, Älmhult
Keywords	Capacity Planning, ONE Supplier Capacity Process, Process Implementation
Background and Problem discussion	To guarantee that the products in the IKEA catalogue are available when requested, IKEA needs to plan and secure capacity. IKEA has developed a process called *ONE Supplier Capacity Process* to solve supplier capacity issues in a more proactive way. The thesis is focused on suppliers' in the category *Frames and Mirrors with frames* in Greater China.
Purpose	The purposes of the thesis are fourfold: • Map and analyze how IKEA is working with capacity planning today • Implement "to-be", the common way of working with ONE Supplier Capacity Process • Evaluate and prove savings • Contribute to improvement of the ONE Supplier Capacity Process supported by appropriate theory.
Methodology	The analysis of the current structure of the Capacity Planning Process at IKEA is based on interviews and the authors' own observations and experiences at

IKEA. The data collection from the implementation is based on material from IKEA and conclusions are based on appropriate theory and the authors' own experience at IKEA.

Conclusion

The implementation of ONE Supplier Capacity Process has received positive reactions and both suppliers and IKEA employees can already experience benefits from a higher control of capacities and a common way of working together. Further improvements are needed to smoothen the implementation process and create advantages for everyone involved in the project in the future.

Abbreviations

Free range:	Local articles, not included in IKEA catalogue assortment.
Trading office:	Locally based office to be close to suppliers and customers.
IKEA of Sweden, IoS:	Headquarter of IKEA in Älmhult, Sweden
Global level:	Decisions on global level are taken at IKEA of Sweden and concern IKEA’s business worldwide.
Local level:	Decisions on local level are taken at IKEA Trading office and concern the local business.
Category:	IKEA team working with one material or one range of products.
MDF:	Medium Density Fiber board.
Reference case:	Part of ONE Supplier Capacity Process education material with production examples.
Demand Planner:	Global IKEA employee responsible for calculation of forecasts based on customer demand.
Supply Planner:	Local IKEA employee responsible for a specific number of suppliers in the area.
Need Planner:	Global IKEA employee responsible for securing product availability.
Business Developer:	Purchasing team leader in IKEA Trading office responsible for managing and developing all suppliers in a category on local level.
Sourcing Developer:	Tactical responsibility for capacity values and capacity planning in one IKEA Home Furniture Business

HFB: Home Furniture Business. The product range at IKEA is divided into 20 different HFBs according to the use of the products.

GPS: Global Purchasing System. IKEAs purchasing software where the capacities among other things are registered.

PF: Photo Frame – smaller frames in different sizes.

WF: Wall Frame – larger frame in different sizes suitable for hanging on walls.

SPI: Supply Plan Information.

Table of Contents

Table of Figures

Table of Tables

1. Introduction

The purpose of this chapter is to act as a base for the master thesis. The chapter starts with an introduction to IKEA together with the organizational structure of the parts of the company that are relevant to this master thesis. The chapter continues with a problem discussion and the purpose of the thesis. Further, delimitations and target group are presented here. Finally, the disposition of this thesis is stated.

1.1 Background and Problem discussion

IKEA is a Swedish retail company that was founded 1943[1] by Ingvar Kamprad and has expanded to a great corporation, with 333 stores represented in more than 40 countries. IKEA's business idea is to offer a wide range of home furnishings with good design and function at prices so low that as many people as possible will be able to afford them.

In September every year IKEA publishes the well-known "IKEA catalogue", which is mailed to households worldwide and also available online at www.ikea.com. The catalogue is the first step towards bringing the customers to the stores or IKEA's website. The catalogue is seen as a promise to the customers where the product range is supposed to be available from September and one year ahead.

IKEA used to be a functional organization divided in departments and decisions were taken within each specific department[2]. IKEA still works in functions, but has a process oriented perspective and works cross-functional in the functional organization. One of the largest changes from a functional organization to a process oriented organization, for IKEA, are the introduction of sorting the articles in product categories and the improvement of information communication between departments. As an example, products made of plastics are communicated and planned through the category *Plastics*. This creates a wider understanding of total need of material and is easier to coordinate with suppliers worldwide. In IKEA's

[1] www.ikea.se, 2012-03-01
[2] Paul Björnsson, 2012-01-26

work towards a process-oriented functional organization, three main processes have been defined:

- Creating the Home Furnishing Offer
- Supplying
- Communication and Selling

The main process Supplying has one overall goal[3]: to guarantee that the products in the IKEA catalogue are available when requested. Supplying is divided into four core processes[4] where *Plan & Secure Logistics,* see Figure 1, is one of the processes. This thesis focuses on the process Plan & Secure Capacity, which is a sub-process within Plan & Secure Logistics.

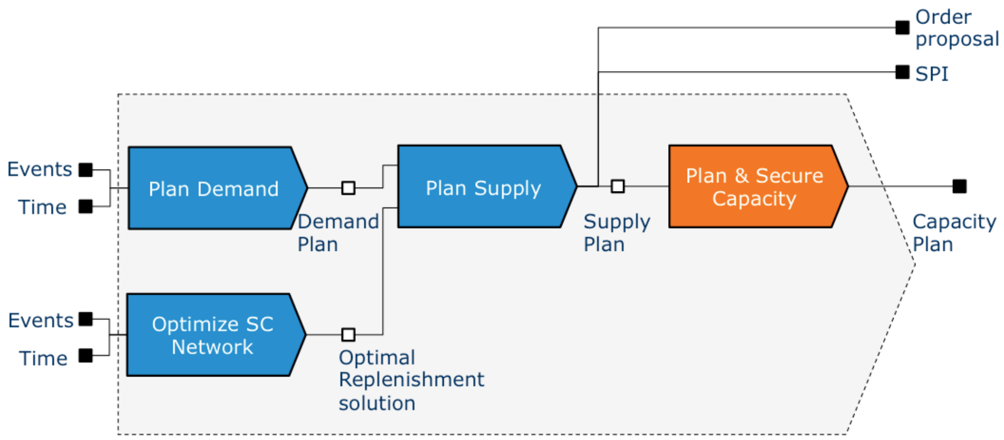

Figure 1: Plan & Secure Logistics[5]

Both IKEA and its suppliers today experiences that some of the true data is lost between them because of misunderstandings, bad communication or different problems from both sides such as unclear measurement systems or different ways of working. The problems are experienced from different functions in IKEA and consequences are visible for both IKEA and its suppliers.

IKEA experiences that there is no common unit of measurement within the company and due to all different units of measurement, it is difficult to

[3] Paul Björnsson, 2012-01-25
[4] Paul Björnsson, 2012-01-25
[5] ONE Supplier Capacity Process – from a IKEA perspective v. 1.0 (2012)

really understand how much capacity every supplier has. Therefore, a standardized unit has been decided – *pieces*. It means that every supplier can use their own choice of unit on local level, but when reporting back the capacity to IKEA they have to count in number of pieces. In this way, IKEA will get the same information from all suppliers for one product and know the total capacity. It will always be possible to go back in the calculations and find the true unit of measurement to compare the figures. For example, textile is measured in meters, while furniture can be measured in both m^2 or $litres,$ or any other unit.

Another issue is the need from one supplier in many Home Furniture Businesses (HFBs). Some categories in IKEA are used for different types of business areas, such as *Plastics.* Plastic suppliers might deliver products to more than one HFB and then the HFBs need to have an overall picture of the capacity to be able to share the supplier. Today IKEA struggles with some fire fighting when it comes to capacity planning. Unfortunately, IKEA has to deal with capacity problems when they occur and would like to work with these kinds of issues in a more proactive way. IKEA would like to establish a tight communication with its suppliers to avoid the feeling of "us and them" and to create a shorter distance where both parties can deal with and solve common problems together.

The different levels of competence makes it challenging to strive for the same goals because not everyone has the same understanding of how capacity issues can be avoided. With better education about IKEA's need of capacity planning, it will hopefully be easier for all functions to work in the same direction.

To be able to understand and work in the same direction, a common action plan is needed. A common way of working includes using the same language and terminology and will simplify discussions. Today even IKEA uses different terminology when dealing with problems.

To guarantee that the products in the IKEA catalogue are available when requested, IKEA needs to plan and secure capacity. To achieve this, eventual problems such as over- or under capacity or wrongly registered capacity need to be detected. To detect these issues a mapping process and an analysis of how IKEA is working today with capacity planning needs to be made.

IKEA has summarized different problem areas focused on product availability and the largest one is Supplier Capacity, which stands for 44% of the problem issues[6]. For this reason the *ONE Supplier Capacity Process* has been developed. The purpose of the process is to work in a more proactive way with supplier capacity issues[7]. It is important to focus on to connecting the global level with the local level since this will link the reality from a supplier point of view with the company. For IKEA, the product demand needs to be communicated through the organization from tactical planning level to reach the operational planning level. If the tactical planning is poor, it might result in bad operational work. It is difficult to correct tactical errors afterwards on operational level and this is why it is important to connect the actual demand to tactical planning with proactive work from the start. IKEA today struggles with fire fighting when it comes to capacity problems, and would highly appreciate a more proactive way of working with this issue[8]. It is important that the implementation of the process is made in a common way with standardized templates and with a common mindset globally.

Implementation of ONE Supplier Capacity will be made for a selected number of suppliers in Greater China. Evaluation of possible savings needs to be performed to see if the efficiency will be improved and how working with similar measurements will affect IKEA and the suppliers.

Since the suppliers in Greater China are the first to be a part of the implementation of the project there are still no common templates and the learning material is not complete as of today, 2012-01-23. It is easier to see demand and capacity from IKEA's point of view from an *outside-in* perspective[9], but to make sure that production data is accurate, an *inside-out*

[6] IKEA Focus avaliability document (2010)
[7] ONE Supplier Capacity material v. 0.999
[8] Paul Björnsson, 2012-01-26
[9] Paul Björnsson, 2012-01-23

perspective from the suppliers is needed. An outside-in perspective starts with a narrow sight where IKEA has good knowledge of what they need, but not what the supplier can deliver. The inside-out perspective starts with the knowledge from the supplier and is later matched with IKEA's need. This is why the production data has to be validated from a supplier's point of view. The implementation of ONE Supplier Capacity Process is very important to the outcome and being a part of the implementation provides insight of how a comprehensive project as ONE Supplier Capacity Process can be developed and improved subsequently.

1.2 Purpose

- **Map and analyze how IKEA is working with capacity planning today**
  The purpose is to map and analyze to create a picture of how IKEA is working with capacity planning at the local suppliers today. A research how much capacities the suppliers have and how the capacity is calculated between the different resources will be made.

- **Implement "to-be", the common way of working with ONE Supplier Capacity Process**
  The ONE Supplier Capacity Process and new mindset regarding capacity planning within IKEA will be implemented at the IKEA Trading Office in Qingdao and at the local suppliers. The new set up of Product and Resource groups is implemented. Systematical insertion of production data into *Global Purchasing System* (GPS) will be made for the implementation of the true capacity.

- **Evaluate and prove savings of ONE Supplier Capacity Process**
  Compare the "to-be" map with the "as-is" map. An overall view of the total supplier capacity efficiency will indicate if, and where, changes should be made. Savings will be measured with soft factors.

- **Contribute to improving the ONE Supplier Capacity Process supported by appropriate theory.**
  The contribution consists of development of templates to the implementation process. Another contribution will be education of

the ONE Supplier Capacity to suppliers and to IKEA trading office in the category.

1.3 Delimitations

This report is limited to suppliers in the category *Frames and Mirrors with frames* in Greater China. None of the other categories or products are included. Further, only production capacities for IKEA are investigated, none of the other capacities for other companies in the suppliers' production.

This thesis is focused on the activity Plan & Secure Capacity, which is one of four activities within the Plan & Secure Logistics process. Problems can originate in other processes than Supplying and then they need to be solved at another level and is not included in this thesis. This report will not analyze whether the forecasts from the demand plan are accurate or if the supplier's inventory control is made in an appropriate way. The thesis concerns the tactical and operational level of capacity planning and strategic capacity planning will not be included.

The suppliers that have been a part of the implementation of the ONE Supplier Capacity Process in the category *Frames and Mirrors with frames* are selected by the category in Älmhult, Sweden and in IKEA Trading Office, Qingdao. There are in total nine suppliers in the category but the number of suppliers included in this thesis were set to seven. The thesis only focuses on articles in the global concept, the range, and not on "free range" articles based on local need. The last delimitation is that hard factors, such as new capacity figures, will not be possible to analyze since the evaluation of the hard factors will not be available within the time frame of this thesis.

1.4 Target groups

This master thesis is mainly aimed at employees at IKEA, especially for those working within the Plan & Secure Supply process. The second target group is students and other people in the academic world interested in capacity planning. The reader is expected to have a basic understanding of production concept, capacity planning and relevant expressions.

1.5 Disposition of the thesis

The master thesis is composed with the following structure:

1. **Introduction**
   The purpose of this chapter is to act as a base for the rest of the master thesis. The chapter starts with an introduction to IKEA together with the organizational structure of the parts of the company that are relevant to this master thesis. The chapter continues with a problem discussion and the purpose of the thesis. Further, delimitations and target group are presented here. Finally, the disposition of this thesis is stated.
2. **Methodology**
   In this chapter the methodology approaches used in the thesis are presented. Different forms of approaches, data collection and research choices are explained. Also, the thesis credibility is discussed. Finally, the authors' choice of methodology is described.
3. **Theoretical Framework**
   This chapter presents the theory that will be the basis for the upcoming analysis and starts with basic theory about capacity planning. This is followed by a text about Eli Goldratt's famous Theory of Constraints. The chapter ends with theory about how to make a successful implementation of a project.
4. **Capacity planning at IKEA today**
   The fourth chapter initially presents the structure of IKEA from an overall perspective down to the sub-processes that this thesis focuses on. This is followed by a review how IKEA is working with capacity planning at the local suppliers today, before the implementation of ONE Supplier Capacity Process.
5. **ONE Supplier Capacity Process**
   The chapter starts with an extensive briefing of the ONE Supplier Capacity Process. Further, an account of how the authors together with the category *Frames and Mirrors with frames* have implemented the process is presented. The chapter continues with explanations of the templates and information that has been sent out to suppliers for data collection.

6. **Implementation of ONE Supplier Capacity Process**
   The sixth chapter initially presents feedback and opinions from suppliers regarding the implementation of ONE Supplier Capacity Process. Further, capacity data received from the implementation of the process is presented.
7. **Analysis and evaluation of the implementation**
   In this chapter the empirical data is analyzed with the theoretical framework. Areas of improvements in the ONE Supplier Capacity Process and improvements for the local suppliers will be identified.
8. **Conclusions**
   The eighth chapter is the concluding chapter, which will provide guidance and recommendations for how the process could be implemented in the organization in the future. The chapter presents the deliverables and a discussion regarding advantages, disadvantages and possible improvements.

2. Methodology

In this chapter the methodology approaches used in the thesis are presented. Different forms of approaches, data collection and research choices are explained. Also, the thesis credibility is discussed. Finally, the author's choice of methodology is described.

2.1 Methodology approach

According to the *stair of knowledge*[10] a study can be done in eight working approaches. They are named in level of analytical depth[11]:

- Explorative
- Descriptive
- Explanative
- Predictive
- Normative
- Reformative
- Evaluative

An *explorative* study is made when none or little knowledge about the area exists. The study encourages the writers to create their own opinions about the subject. *Descriptive* studies are made when fundamental knowledge in the area exists. It explains the characteristics of the area and its surroundings but it does not describe relations. An *explanative* study asks the question: what causes this phenomenon, and why? It describes a deeper picture of causes and relationships within the problem area. If a *predictive* study is made, different outcomes of the project are made in advance. This demands great knowledge of the subject. A *normative* research is done when the writers have knowledge and understanding, and the aim is to develop a certain solution, give guidelines and suggest measurements. The *reformative* way is based on the previous steps. The difference is that now the study is done in a more practical way and current structure and behavior is changed.

[10] Bertil I. Nilsson, 2012-01-19
[11] Ibid

The *evaluative* study examines whether the results of the interventions made in the target area are meeting their objectives. [12,13]

2.2 Induction, deduction and abduction

Normally there are two approaches when making a research that describes the relationship between theory and empirical data. These are *induction* or *deduction*. There is also a third approach, which is called *abduction*[14].

2.2.1 Induction

Induction is when data collection is started without prior knowledge of theory in the research area. No theoretical studies are made beforehand. The results are based upon observations and results collected from reality, theoretical and general conclusions are drawn and used to form new theory[15].

2.2.2 Deduction

Deduction is the opposite of induction and the most common and structured research method. Existing theory is used to make predictions about reality and there are tested empirically for verification. Finally conclusions are drawn and based on the empirical findings; the conclusions will be confirmed or rejected[16].

2.2.3 Abduction

The abduction research methodology uses both the inductive and deductive approach. This approach switches between theory and reality, and is therefore a combination of the other methods. The theoretical predictions are compared with the gathered empirical data. It is simply a way to draw conclusion of what caused an observation.

2.3 Qualitative and quantitative studies

Data in a research can be either *qualitative* or *quantitative* depending on the purpose of the study.

---

[12] Paulsson, U. & Björklund, M. (2003): *Seminarieboken,* pp. 58
[13] Ibid, pp. 58
[14] Bertil I. Nilsson, 2012-01-19
[15] Bertil I. Nilsson, 2012-01-20
[16] Paulsson, U. et al (2003): pp. 62

2.3.1 Qualitative analysis

A qualitative analysis is based on the writers' interpretations and often consist of words and descriptions. The analysis is made to create a deeper understanding of a specific area, subject or occasion. Observations and interviews are two examples of qualitative analysis. Collection and analysis occurs almost parallel in time. Advantages of a qualitative analysis are that theory is well established in reality and that the data is detailed.

2.3.2 Quantitative analysis

A typical quantitative study is based on numerical data. Examples are mathematical models and questionnaires. The analysis is often made by statistical treatment, and an advantage with this type of approach is that results can easily be presented in figures and tables since it is based on numbers. It is a convenient way to handle a large amount of data. However, everything cannot be measured in a numerical way and this is when the qualitative approach needs to be considered. It is also a risk that the numerical data is analyzed in an inappropriate way, which can lead to wrong conclusions. Another disadvantage is that the researchers need to be fully confident that the data collected is in good quality[17].

2.4 Data collection

There are two types of data, named *primary data* and *secondary data*. Primary data is collected directly from the source by the researchers and secondary data is data that has been collected and handled by someone else. Primary data is valid and adjusted to the thesis but takes long time to collect. Secondary data is less time consuming, although it is important to discuss the risks of secondary data. In contradiction to primary data, which is trustworthy for the researchers, the secondary data needs to be challenged. Questions that are needs to be asked[18] are: *is this relevant for the problem description? Is the precision high enough? How is the quality on this study? What was the purpose?*

[17] Denscombe, M. (2006): *Forskningshandboken,* pp. 208
[18] Sellstedt, B. (2002): *METODOLOGI FÖR FÖRETAGSEKONOMER*

2.4.1 Interviews

Depending on the purpose the interview can be prepared in three ways: *structured, semi-structured* or *unstructured.* In a structured interview the questions are strictly prepared in advance and the purpose is to stick to this plan. The difference in a semi-structured interview lies in its execution. The questions are still well prepared but can be performed in a non-specified order. Thus, the interviewee can talk more freely about the subject. An unstructured interview is more like a lecture or discussion with the interviewee, where the interviewer is mostly listening.[19].

There are also different types of interviews. Usually, five different types can be performed. They are; *descriptive interviews, deep interviews, goal-oriented interviews, deepening interviews* and *focused interviews*[20]. Descriptive interviews are usually conducted in the start-up of a process or project to get an initial understanding. Deep interviews are used to get a deeper understanding of e.g. a process. Goal-oriented interviews are performed in order to achieve better knowledge in a specific area. The deepening interviews are made during the handling of data to achieve lacking information. A focused interview focuses on several different areas during the interview.

2.4.2 Observations

Observations can be done in many different ways and is a good way to collect objective information. Examples of observations are time keeping and observation of production. Data received is often of high quality but can be very time consuming.

2.4.3 Literature studies

Literature is a valuable source for existing knowledge and theories regarding a specific subject. In a literature study, written material is used as an iterative process throughout the whole process of the thesis. It is easy to reach and inexpensive but belongs to secondary data and therefore it has to be viewed with critical eyes.

[19] Darmer, P. and Freytag, P. (1999): *Företagsekonomisk undersökningsmetodik*
[20] Darmer, P. and Freytag, P. (1999)

2.5 Credibility

To ensure the authenticity of a thesis the credibility must be verified. Credibility can be evaluated in three aspects; *validity*, *reliability* and *objectivity*[21]. Higher credibility leads to higher trustworthiness of the report. To ensure credibility, source criticism is also an important factor.

2.5.1 Validity

Validity shows the quality of a scientific answer in a study; if it answers the question it is supposed to answer[22]. High validity on a study means that the data should be accurate and not generate a high amount of errors. To increase the validity, several perspectives should be used for the same purpose. For instance, the same data collected can be crosschecked with other different methods. Controlling validity is often meaningless, since the only way to control it is if the real truth already is known.

2.5.2 Reliability

Reliability concerns the trustworthiness of the study. It describes to what extent a measuring device would show the same answer if the measuring would be performed over and over again[23]. The reliability and validity can be pictured with a dartboard, see Figure 2. If the hit rate is spread randomly over the dartboard, the result is neither valid nor reliable. If the hit rate is concentrated to a location that is not accurate, the reliability is high but validity is low. If the hit rate is spread out around the accurate location, the result is valid but not reliable. The last possibility is when the result is valid and reliable, which means that the hit rate is centralized and concentrated. This is normally the result to strive for.

---

[21] Paulsson, U. et al (2003): pp. 59

[22] Ibid, pp. 59

[23] Ibid, pp. 60

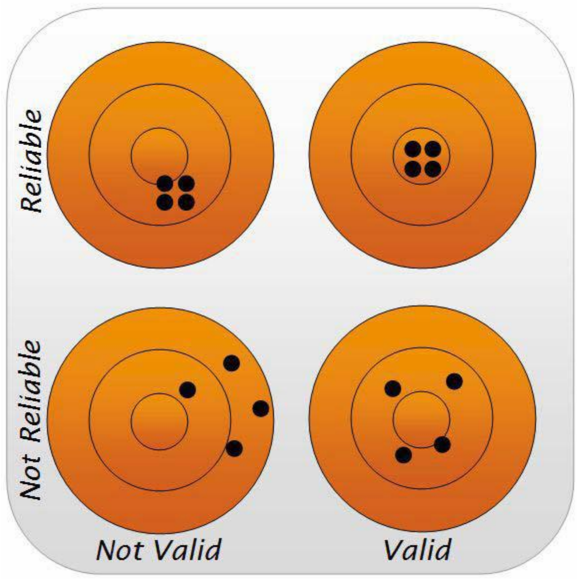

Figure 2: Validity/reliability dartboard

2.5.3 Objectivity

Objectivity shows to what amount the researchers own values affect the thesis. A high objectivity can be reached by making clear explanations and motivations throughout the report[24]. The result of high objectivity is that the reader may create his own opinions and conclusions about the results of the report.

2.6 Authors choice of methodology

2.6.1 Methodology approach

A descriptive, normative and reformative perspective has been chosen in this master thesis. The descriptive study will be performed when explaining the current situation within IKEA. A normative approach will be used when suggesting improvements and the reformative perspective is applied when implementing the process.

2.6.2 Induction, deduction and abduction

Since the analysis of the thesis is based on both theory and empirical data, this part of the report is abductive. New theory, in form of an

[24] Paulsson, U. et al (2003): pp. 59

implementation plan and templates for the upcoming suppliers, is created to contribute to the ONE Supplier Capacity Process. Some conclusions are drawn from experienced reality and can be seen as partly inductive while some of the gathered data is verified by the theory, which is a deductive research.

2.6.3 Qualitative and quantitative studies

In this thesis there are mostly qualitative analyses from interviews and meetings, together with observations from production at the suppliers.

2.6.4 Data collection

Both primary and secondary data are used is this thesis. Secondary data are used in the theoretical framework, some parts of the present situation and in the empirical data chapter. Primary data are used for describing the present situation based on interviews and meetings. The empirical data chapter is also mostly based on primary data. The data has been collected in Chinese and then translated into English.

2.6.4.1 Interviews

To get a basic understanding of the ONE Supplier Capacity Process and the IKEA functions, descriptive unstructured interviews have been performed. Meetings together with suppliers and the IKEA trading team has also been performed where the authors took a passive role and made meeting minutes. The interview guides can be viewed entirely and uncensored in appendix B.

A second meeting has been held with all suppliers. During these meetings, structured deepening interviews were made in order to follow up the supplier visit and get a first picture of the effect of the implementation.
All questions during the interviews with the suppliers have been made in English and then translated to Chinese, and the answers have been translated back to English.

2.6.4.2 Observations

Observations are made during the visits to the suppliers' production. The purpose is to verify that the bottlenecks are valid and aligned with the data provided by the supplier.

2.6.4.3 Literature studies

The authors have chosen to use non-fiction literature regarding capacity, production and operations analysis, together with other relevant theory to form the theoretical framework. Internal documents at IKEA is also used in this thesis.

2.6.5 Credibility

2.6.5.1 Validity

The validity in this thesis is considered to be high since transcripts of the interviews have been verified by at least one part that was participating in the interviews except from the authors. Eight interviews have been performed according to this master thesis.

2.6.5.2 Reliability

Reality changes and for a company like IKEA it changes quickly. If the ONE Supplier Capacity Process would be performed in a similar way later, the result would probably differ, but the conclusions would most likely be the same, since the concept has been developed before the start of this master thesis.

During the interviews and observations, both authors have their own interpretations and thoughts and therefore it has been very important that attitudes and other external issues have been anticipated, so that the evaluation can be unbiased. This increases the reliability of the thesis.

It is worth to mention the translation between English and Chinese during the implementation phase. Information translated from one language to another can be tricky and there is a risk that some basic understanding is lost due to language barriers.

2.6.5.3 Objectivity

No personal opinions from the authors have been included. None of the authors have prior engagements within IKEA or any other connections that can decrease the objectivity of the study. The objectivity of the literature is considered to be high since multiple independent sources are used.

3. Theoretical Framework

This chapter presents the theoretical framework that will be the basis for the upcoming analysis and starts with basic theory about capacity planning. It begins with general theory concerning capacity planning and narrows down to aggregate capacity planning. The chapter ends with theory about how to make a successful implementation of a project.

3.1 Capacity Planning

Today, companies need to be more aware of their supply chains to stay competitive and meet an increased demand[25]. The pressure on company leaders to know their whole supply chain is high[26] and capacity planning is one of the key areas in order for operations to stay competitive[27]. Planning starts with a forecast of a product need. The need can change over time and no forecast is definite since no one can predict the future. To be as well prepared for the changes as possible, specific detail decisions can preferably be taken later in the process, by postponing detailed decisions.

Insecure capacity planning can create a problem with insufficient product availability. There are two different sides of a capacity problem, over- and under capacity. A capacity problem can be about whether to increase capacity or not, to decide between investing in new resources or use existing resources in a more efficient way[28]. One issue is to create a valuable solution of the usage of people, technology and facilities[29], since these resources are expensive to change and difficult to adjust rapidly. Another challenge is to wisely use information and data without wasting time or effort in non-useful work.

---

[25] Accenture: *Profit, Sales & Operations Planning: A Key Component of Supply Chain Mastery,* (2008), pp. 4

[26] Brown, S., Blackmon, K. and Cousins, P. (2001): *Operations Management*, pp. 163

[27] Howard, A., Kochhar, A. and Dilworth, J. (2002): "A rule-base for the specification of manufacturing and control system activities", pp. 7

[28] Jonsson, P. and Mattsson, S-A. (2011): *Logistik: läran om effektiva materialflöden*, pp. 348

[29] Rajagopalan, S. and Hung-Liang, Y. (2001): "Capacity planning with congestion effects", pp. 365

Over capacity, depending on the company's cost structure is combined with higher fixed costs than necessary and difficulties to compete with lower costs per unit[30]. On the other hand, under capacity will generate lost sales and might even result in decreased market share due to lost customers. If the manufacturing is designed to handle more than the expected demand, an under capacity problem will not occur[31].

To avoid under- or over capacity, decisions concerning capacity planning needs to be considered at a high level to provide the manufacturer the opportunity to reach the strategic goals. The perfect production set up is when the capacity is fully used, including all necessary idle time for maintenance service, change of shifts, raw material and set-up times[32]. Unfortunately, this scenario with a fully balanced capacity production is rare and misalignments are both natural and common. When aiming for a balanced production, it is important to measure the capacity and be aware of its limits.

There are some definitions used when measuring capacity[33]:

- *Maximum capacity*: The best case scenario that would occur if the production was running every hour of the day, every day of the year without any interruptions for service or holidays.
- *Nominal capacity*: the true and realistic production capacity. The calculation of the nominal capacity is based on shift hours, machine hours, days and the number of shifts.
- *Available capacity*: machine breakdown, wasted material, unplanned worker absence or everyday maintenance service will decrease the nominal capacity to an available capacity. Available capacity is difficult to measure, but the most accurate capacity.

---

[30] Hammesfahr, J., Pope, J. and Ardalan, A. (1992): "Strategic Planning for Production Capacity", pp. 43

[31] Towill, D.R. and Childerhouse, P. (2010): "Industrial engineering priorities for improved demand chain performance", pp. 215

[32] Jonsson, P. et al (2011), pp. 352

[33] Jonsson, P. et al (2011), pp. 347

There are different horizons of capacity planning within manufacturing; from long-term down to short-term planning. The focus is to align the levels to meet the demand and be prepared for the orders[34].

The time frame for long-term capacity planning differs from company to company, but is normally 1-1,5 years and the focus is generally more on forecast demand than on known orders. This long-term capacity planning is performed on a strategic level. Decisions on the strategic level serve a very important role of creating a better operational capacity planning, and research show that there are limitations for operational improvements if the manufacturing strategy is unclear[35]. Tactical capacity planning is mid-term planning where the organization's vision and market[36] is broken down to a more lucid level. The tactical planning thus forms a bridge between the strategic level and the operational level[37]. It shall support the operational work with clear directives for the operational planning.

There are two main questions to answer on tactical level are[38]:

1. What relationship should exist between the capacity and anticipated demand?
2. Should the capacity exceed anticipated demand, be less than the demand, or aim to match the volume and variety exactly?

Short-term capacity focuses on the operational manufacturing planning[39], such as individual orders or monthly and weekly resource planning. The plan is detailed and the decisions are considered as fixed[40].

3.2 Capacity utilization

Manufacturing strives to lower cost per unit produced to increase the total revenue[41]. There are two costs to consider when planning the production;

---

[34] Accenture (2008), pp. 12
[35] Hammesfahr, J. et al (1992), pp. 41
[36] Accenture (2008), pp. 4
[37] Accenture (2008), pp 6
[38] Galloway, L., Rowbotham, F. and Azhashemi, M. (2007): *Operations Management in Context*, pp. 182
[39] Olhager, J., Rudberg, M and Wikner, J. (2001): "Long-term capacity management: Linking the perspectives from manufacturing strategy and sales and operations planning", pp. 215
[40] Brown, S. et al (2001), pp. 186
[41] Accenture (2008), pp. 3

fixed and variable costs. Fixed costs are constant over time and are not affected to production volume or whether the production is running. For variable costs on the other hand, variation is proportional to the volume of outputs and time. In other words, the larger volume produced, the lower cost per unit in fixed cost. In Figure 3, the connection of fixed and variable costs is shown depending of the volume. Note that this is an example of the variation of costs, it the connection is not always linear.

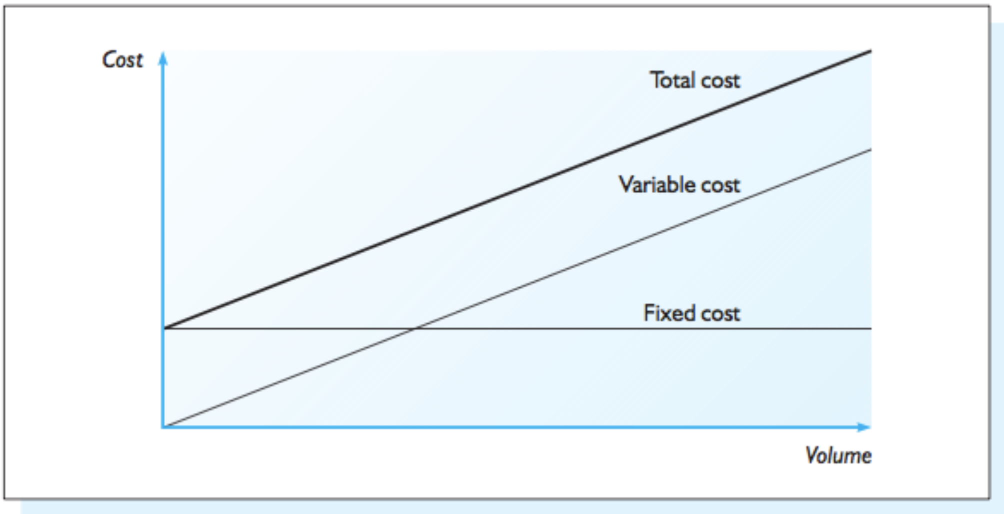

Figure 3: Connection of fixed and varable costs[42]

To create valuable capacity planning, manufacturers have to utilize existing resources effectively in the most valuable way to streamline the costs[43]. A maximized utilization means that the capacity is fully used. Major factors to consider when making trade-offs between the decisions of investing or not are[44]:

- Production layout: The production layout has to be planned in an effective way to avoid unnecessary transport time, double handling of the products and non-value adding activities, but at the same time provide an efficient way of using the machines.

[42] Galloway, L. et al (2007), pp. 180
[43] Jonsson, P. et al (2011), pp. 348
[44] Brown, S. et al (2001), pp. 170

- Technology: Technology includes expensive investments in machines, equipment, software systems and technology know-how. The more expensive technology, the higher importance the use is.
- Workforce: Workforce performance is difficult to measure compared to machines. The performance can vary from day to day and often depends on education, motivation and know-how. The benefit of human resources is the flexibility to move between workstations, but people need breaks and cannot work as continuously as machines.

If accurately assessed capacity planning, the results occur as increased revenue, lowered costs, and improved profitability[45].

According to Eli Goldratt's Theory of Constraints, a chain of activities is never stronger than the weakest link[46], which seeks to strive towards the global objective, or goal, of a system through an understanding of the underlying cause and effect dependency and variation of the system in question[47].

Therefore, a system bottleneck is the key to the maximum capacity of a system. In order to achieve maximum output of the production, focus has to be on the bottleneck and to increase production capacity; the capacity in the bottleneck has to be increased. Higher capacity in a bottleneck means more effective use of existing resources[48]. A production bottleneck is defined as the production station with the lowest production capacity and where the performance or capacity of an entire system is limited by a single or limited number of components or resources. In the definition of a bottleneck, the definition is that there must be finite capacity within a system. Usually, it is defined by the slowest step in the process. In other words, regardless of what is done, the slowest step or weakest link will determine the rate or strength of the whole system.

---

[45] Bloodgood, J. and Katz, J. (2004): "Manufacturing capacity, market share and competitiveness"

[46] Balachandran, B., Balakrishnan, R. and Sivaramakrishnan, K. (1997): "Capacity Planning with demand uncertainty", pp. 59

[47] http://www.dbrmfg.co.nz/ (2012-04-01)

[48] Colwyn Jones, T. and Dugdale, D. (1998): "THEORY OF CONSTRAINTS: TRANSFORMING IDEAS?", pp. 3

The mindset is that an hour of capacity lost in the bottleneck is an hour of capacity lost for the entire company. Increased capacity for a bottleneck means more effective use of existing resources[49].

In the original verbalization, the five focusing steps of Theory of Constraints looks like the following[50]:

- Step 1: **Identify** the system's bottlenecks.
- Step 2: Decide how to **exploit** the system's bottlenecks.
- Step 3: **Subordinate** everything else to the above decision.
- Step 4: **Elevate** the system's bottlenecks.
- Step 5: If in the previous steps a bottleneck has been broken, **go back** to step 1

When a bottleneck is detected, it is possible to move the bottleneck upstream or downstream in the system to reach an increased capacity by allocating capacity. The allocation of capacity is based on product need forecasts and the planning of how to allocate the capacity between different resources depends on how well this forecast is made[51]. If the prediction of future demand is poor, the allocation of capacity will not be accurate.

Reducing or increasing capacity requirements is primarily a question of adapting the company's production plans describing the quantities it plans to manufacture. A reduction in capacity requirements can be achieved by deliberately allowing the production planning of smaller volumes than what is asked[52].

It is also possible to reallocate both short-term and long-term capacity. Long-term capacity allocation is e.g. when a supplier during low season produces more for stocks that will be used during high season. Short-term

[49] Ibid, pp. 3
[50] Colwyn Jones, T. et al (1998)
[51] Galloway, L. et al (2007), pp. 174
[52] Jonsson, P. et al (2011), pp. 350

reallocation is e.g. when there is a lack of capacity in a machine that produces a certain number of articles it is possible to reallocate resources so that the machine spends more time on the items that have capacity problems[53].

3.3 Aggregated capacity Planning

Aggregated capacity planning is at a higher level of capacity planning than production planning[54] with focus on mid-term perspectives. One type of aggregated capacity planning can be seen as a two-stage process plan where the first step is to create an overall picture of the total product need and the second step is to determine the exact number of detailed products. All activities have to be planned in a coordinated way to support the two levels of capacity planning[55].

Capacity planning can be made in a hierarchical way where the decisions start from the top and naturally get more detailed over time. Every level is connected to a certain time period, which is shorter the further down in the hierarchy one gets.

Hierarchical capacity planning is vertically defined as follows[56]:

- *Forecast of aggregate demand.* A long-term vision connected to the company's strategy that provides a forecast based on previous sales patterns and experience.
- *Aggregate Production Plan.* An aggregated production forecast and plans of workforce level needs for long- and medium periods[57]. Statement of total volume of items with requirements to satisfy total demand for all product groups.
- *Master Production Schedule.* At this level, individual items are disaggregated to a time plan including resource categories and individual orders[58].

---

[53] Galloway, L. et al (2007), pp. 176
[54] Bitran, G. and Hax, A. (1977): "On the design of hierarchical planning systems", pp. 30
[55] Bitran, G., Haas, E. and Hax, A. (1982): "Hierarchical Production Planning: A Two-Stage System", pp. 233
[56] Bitran, G. et al (1977), pp. 42
[57] Bitran, G. et al (1982), pp. 242
[58] Brown, S. et al (2001), pp. 184

- *Materials Requirements Planning System.* This is a detailed production time plan including assembly for components and sub assemblies towards finished goods.

It is possible to apply aggregated planning on several levels and integrate it with the daily planning. It is more difficult to perform aggregated planning on a strategic level for example, since more than one point of view of a company's interests needs to be considered.[59]

The first step in aggregated planning is to put similar products together by grouping individual parts and finished products to create a better overview of the product need and avoid the very detailed plan too early in the planning phase. Secondly, an aggregated planning schedule is used to model the production plan of how to produce the overall volume. This schedule will guarantee appropriate coordination later in the two-step capacity planning[60]. In the third step, the aggregated plan is disaggregated into a detailed production plan for individual products. Benefits of working at a higher level are for example to avoid massive data complexity and inaccurate forecasts that might be the risk with too detailed plans early in capacity planning[61]. Detailed decisions early in the planning process come with a higher amount of insecurity. Further, detailed capacity planning is not necessary in order to make the trade-offs in a mid-term perspective.

The purpose of aggregated planning is to have the option to react fast to changing markets and demands since the production is not locked and wrongly set to far back in the planning phase[62]. It gives the manufacturer a better chance to keep a flexible production and make adjustments later. Another benefit is to have the knowledge about the true production capacity, which can make it possible to produce products in advance and in that way avoids periods of heavy workload. The better prepared for changes a company is, the more competitive it can be.

---

[59] Nahimas, S. (2008): *Production and Operations Analysis,* pp. 126
[60] Bitran, G. et al (1982), pp. 234
[61] Bitran, G. et al (1982), pp. 234
[62] Accenture (2008), pp. 13

When different products are produced in the same way, the overall production planning can correspond to a united item or a group of items. Aggregated Production Planning is closely related to the way of dividing products[63]. The introduction of three product levels makes it possible to link the production methods to each other[64].

- 1. *Items*. The most detailed level of individual products in product hierarchy.
- 2. *Families*. Items with similar production setup that are grouped together.
- 3. *Types*. An aggregated production plan of grouped families.

Aggregated capacity planning makes it possible to allocate capacity in a short-term perspective to minimize the difference between peaks and valleys in demand[65]. Then, a stable capacity plan can be developed to secure production over a planning horizon without depending on high or low seasonality.

Aggregated capacity planning can predict an approximation of raw material quantities and number of resources required. This makes it possible to allocate capacity between the different product families and individual products on the item level. By postponing the detailed capacity plan, a clear balance is needed to fast respond to the incoming orders of individual items. In this phase, the forecasts need to be more accurate and correct.

Production with high fluctuation of demand might suffer from instable manufacturing due to order fluctuations. Below in Figure 4, the diagram shows an example of weekly difference of need. The red line shows maximum capacity and for week 22 and 25, the need is higher than the capacity. On the other hand, during week 21 and 23, the need is lower than the production capacity and more products can be produced. With a diagram like this, the production manager can work proactively and produce the orders for week 22 in week 21 and the orders for week 25 in week 23.

[63] Bitran, G. et al (1977), pp 29
[64] Bitran, G. et al (1982), pp 235
[65] Jonsson, P. et al (2011), pp 350

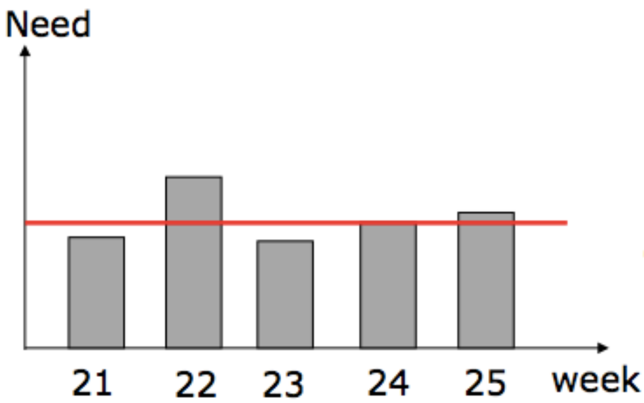

Figure 4: Examples of need fluctuations[66]

There will always be demand fluctuations compared to the forecasts[67]. The tricky part is to align the fluctuations with actual capacity. Below, Figure 5, shows variations in demand over time with high and low seasons. To be able to meet the peaks, a balanced capacity plan is necessary[68].

[66] ONE Supplier Capacity Process v. 0.999
[67] Balachandran, B. et al (2007), pp. 49
[68] Galloway, L. et al (2007), pp. 180

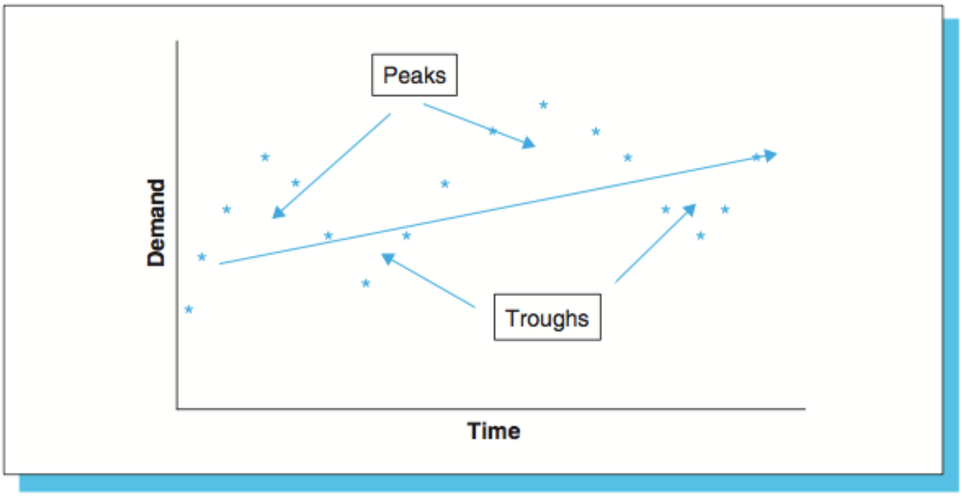

Figure 5: Variations in demand over time[69]

Change in demand is related to variation in production costs[70]. Labor-intensive manufacturing, for example, is very dependent on accurate production forecasts to make sure that a labor is available when production needs to be increased. One way of smoothen the demand fluctuations is to expand the time horizon and try to foresee an average demand. Average demand is calculated by dividing the demand over time with the amount of weeks. Below, in Table 1 the difference between demand and forecast can be seen. Added to the average demand, a safety marginal is proposed. The demand represents the actual need and is visualized by true orders, while the forecast strives to predict the demand. The difference between those two factors is the experienced *error*.

[69] Galloway, L. et al (2007), pp. 180
[70] Nahimas, S. (2008), pp. 131

Table 1: Difference between demand and forecast[71]

Week	Demand	Forecast	Error
1	120	123	3
2	101	101	0
3	115	116	1
4	114	109	5
5	98	109	11

With a perfect balanced between demand and capacity, the result is a linear graph between the product availability and the cost. This balance is shown in Figure 6 below. Due to the recent mentioning of a safety marginal in Table 1, there should be an incline of at least 45 degrees to have slightly higher product availability than customer demand.

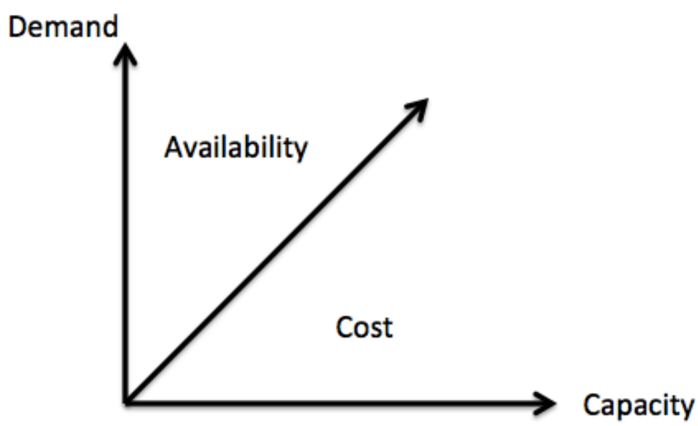

Figure 6: Relationsship between demand and capacity[72]

[71] Galloway, L. et al (2007), pp. 180
[72] Paul Björnsson, 2012-01-23

3.4 How to implement a project[73]

The reason behind implementing a project is usually the need of improve the existing way of working or the introduction of a brand new project. Resources such as time, money or knowledge can be spent for example to make organizational changes and this stress the outcome and proven savings of the changes.

The implementation of a project stretches over different phases and every phase is important for the subsequent steps and the final result. The following steps are important to cover when approaching the project implementation:

- Project definition
- Solution design
- Solution details
- Execution and deployment
- Close

Project Definition is highly important since this is the base to the project and has to contain all necessary information. Definitions of the main deliverables and the business case based on the company strategy shall be presented. Important information includes documentation of current processes, organization and systems. Clear mapping will visualize savings, current problems and bottlenecks in the systems or processes. Background knowledge of the project is essential when it comes to the motivation of implementing and supporting the project. This step should also cover definitions of all the improvement opportunities and a clear mapping of the as-is situation and what the to-be solution will look like.

Project definition has to state the scope of the project and what changes both business processes and departments will go through. This is very important in order to stick to the planned budget and avoid later discussions of further areas to include in the scope. Projects sometimes tend to expand because

[73] Wetterauer , U. and Meyr, H. (2005): *Supply Chain Management and Advanced Planning,* pp. 325

new areas of interest are found and this can be extremely costly if allowed in the scope, including the fact that the time plan will be difficult to stick to.

Furthermore, explanation of the solution and its processes and functions is needed. All steps in the solution have to be transformed into detailed explanations for everyone included otherwise the implementation might be jeopardized. Finally an implementation plan with associated time-plan is agreed on. The implementation plan is based on the to-be solution with gate checks according to the time-plan to secure the correct working pace during the implementation.

In the second step, *Solution Design,* the solution is further developed and refined with risks, benefits and major pitfalls. A more detailed explanation of how the software is going to be connected to the theory and the practical work is required. Also, all departments should be well informed of how the project implementation will affect their local work and how the project shall be maintained in the future. It is important to clarify the support from the management to whom eventual questions shall be raised. Three main objectives to be documented are:

- Concept: Process KPIs for evaluating the implementation and its performance should be analyzed and explained. Employees responsible for software systems have to be aware of the changes and that new maintenance routines might be needed. It is important to understand that the organization will go through changes and the communication concerning the changes has to reach all involved staff and cover the functional gaps to make sure that all details are discussed.
- Activities: All activities in the processes have to be documented in detail with purpose, in- and outcome and process owner. Especially the critical activities such as cross-functional activities should be sequenced and highlighted.
- Scope: Delimitations, expectations and roles and responsibilities are crucial for the success of the implementation and need to be considered carefully. All discussions concerning possible questions

later in the implementation are necessary to communicate this early in the project; otherwise the cost for the project is likely to expand.

- Business Release & Roll-out Plan: The rollout plan is essential to communicate throughout the organization since this will be the practical working method and explains the workload for each individual during the implementation. The plan should be transparent for everyone to avoid any misunderstandings of whom is responsible for what activity and to simplify potential problems. This will make it easier for everyone involved to know whom to ask questions for example.

During the *Solution Details* step, training and education will be held to secure that everyone has the same knowledge and intentions of the project implementation. A problem during this phase might be to gather the staff at the same time due to everyone's usual working tasks. It is important that everyone gets the information and the possibility to ask relevant questions in the beginning of the roll-out. This phase will also be an instructive meeting for the management team to realize unexpected issues and gaps in the roll-out plan. At the same time, this will save a lot of time in the end since the risk of loosing the scope will minimize if questions are raised early. Solution Details step might also include some rework of the implementation plan and changes in the time plan or work in progress templates.

There are different stages of acceptance during a new project and it is important to let the involved employees take some time to understand and accept the new way of working. The phases of acceptance are:

• Shock: The environment and new event is totally unexpected which leads to unwillingness to understand.
• Refusal: Lack of acceptance and understanding creates refusal of changing behavior to the new process.
• Rational understanding: Some understanding is clear at this stage and it is possible to see the reasons and needs behind the changes, but still there is no changing of the behavior towards the goal.

• Emotional acceptance: Now the possibilities and opportunities are clarified and some risks can be identified. This is the first step towards the new way of working.
• Training: It is now possible to develop the behavior and participate in trainings to further understand the project purpose.
• Knowledge: With the newly experienced knowledge, an own way of dealing with the project is found.
• Expertise: The project is now a part of the daily work and both expertise and knowledge based on experience can be added to the behavior.

Execution and Deployment is more of a fine tuning phase for the overall project. This is where the software can be further developed and customized to better fit the purpose and be more effective. Even the key processes have to be investigated once more and documented to detect if any other improvements can be done. This phase should not be underestimated because of all short cuts it can create for the future, but there are a few ways of avoiding the phase to be too costly. It is important to focus on possible improvements for the actual objectives, but not lose the scope by opening up for new suggestions outside the area. Secondly, it is also crucial to get support from the management team, both in time and communication to make sure that the project gets the resources needed and the approval of taking new decisions.

In the last step of an implementation, *Close*, the work is mostly focused on maintenance and some minor changes of the software systems. It is important to use continuously follow-ups to see that the project is not lost or forgotten. Improvement suggestions are welcome and should be encouraged, since it is an evidence of a well-implemented project, when someone wants to further gain benefits from it.

4. Supplier Capacity Planning at IKEA today

The fourth chapter presents the structure of IKEA from an overall perspective down to the sub-processes where this thesis is focused. This is followed by a review how IKEA is working with capacity planning at the local suppliers today, before the implementation of ONE Supplier Capacity Process.

The collected data is based on the authors' experiences and information from IKEA together with interviews with Need Planners, IKEA of Sweden in Älmhult, and Supply Planners, IKEA Trading office in Qingdao, during the master thesis' data collection.

4.1 IKEA process structure

Three main processes are defined within the IKEA organization:

- Creating the Home Furnishing Offer
- Supplying
- Communication and Selling

The purpose of the process Supplying is: *making our range available for the customers by buying, producing and distributing it to the lowest cost and high customer experienced product quality*[74]. The input to the process is *customer need in the life at home* and output is *customer need fulfilled in the life at home*. The process Supplying consists of four core processes, two steering processes and seven support processes. Further on in this chapter, the thesis will stay within the delimitations stated in chapter 1. Hence, the process *Plan & Secure Logistics,* see Figure 7, will be investigated deeper, and the surrounding processes will not be explained further.

The focus is now to connect the products between the departments by introducing a system where the articles are grouped together in Product groups and handled on an aggregated level instead of an article level. IKEA works with most of the products related to a certain material as one flow and this thesis stretches within the category *Frames and Mirrors with frames*.

[74] IKEA Supplying BPM Manual

The purpose is to create a common understanding of the total need from IKEA and coordinate between all suppliers worldwide.

The purpose of Plan & Secure Logistics is to *secure one common plan for current and next fiscal year that not only optimizes all flow, but also enables all business units & senders/receivers of goods to execute it with excellence*[75]. The planning in Plan & Secure Logistics is tactical and concerns the upcoming 0-84[76] weeks.

Plan & Secure logistics has three different outputs; an Order Proposal, an exported "supply plan" (SPI) and a Capacity Plan. The Order Proposal is a predicted future order based on previous selling data, patterns and estimations of the future. The SPI contains a weekly, detailed order plan based on expected IKEA average need. The data changes due to calculated forecasts and the stores direct orders in the system when products are ordered on daily basis depending on stock levels in the store. To meet the need and check availability, a Capacity Plan is essential.

This thesis focuses on the process *Plan & Secure Capacity*, a sub process to Plan & Secure Logistics. Plan & Secure Capacity process strives to create accurate forecasts from true production data, which will validate future balance between capacity and demand[77]. The results from the Plan & Secure Capacity process are formed in the Capacity Plan.

---

[75] IKEA Supplying BPM Manual
[76] Paul Björnsson, 2012-01-25
[77] Paul Björnsson, 2012-01-26

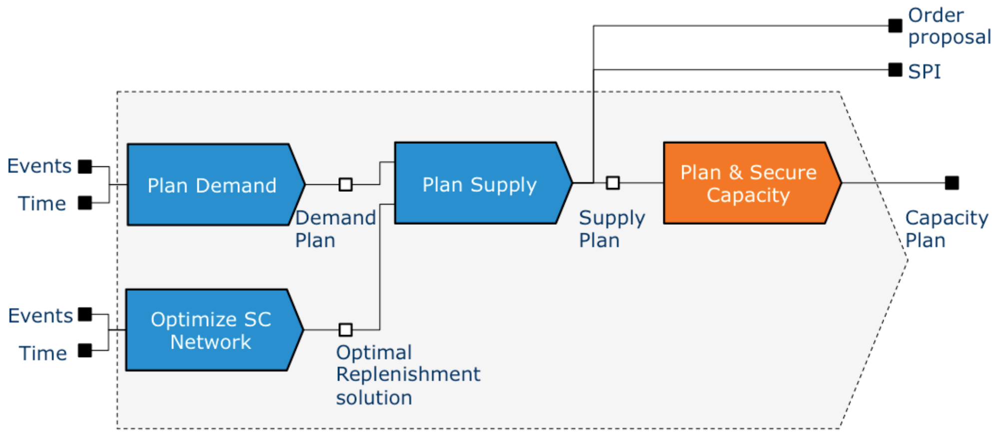

Figure 7: Plan & Secure Logistics[78]

To understand the true capacity in Plan and Secure Capacity, both IKEA's and the suppliers' point of view are needed.

4.2 Current Supplier Capacity Process at IKEA

At IKEA, there are different functions and roles working daily with sales forecasts, capacity planning, lead-times and calculations of expected production capacity. There are two different roles that more specifically work with capacity planning on daily basis at IKEA; Need Planner and Supply Planner. The Need Planner is based in Älmhult, Sweden, and he/she has a short/mid-term focus on product availability[79]. The task is to predict how many articles IKEA needs for the next financial year to be able to meet the customer need and have products available in store. The calculation creates suggested stock levels of the products to meet the demand from the stores. Some stores have a bigger need of certain articles and get direct deliveries instead. A second task is to keep as low stock level as possible, but still meet the customer demand. Below, an extract from Need Planner work description is shown[80].

- *Responsible for the availability (service level) at lowest supply chain cost*
- *Responsible for the global Need Planning*

[78] ONE Supplier Capacity Process – from a IKEA perspective v. 1.0 (2012)
[79] Paul Björnsson, 2012-05-28
[80] IKEA Need Planner work description

- *Responsible to secure/balance the total need and capacity per range*
- *Responsible to act on capacity exceptions together with Trading and to pre-order against agreed capacity and commitments in order to manage variation(s) in 'need'*
- *Responsible for the stock level, safety stock and stock structure worldwide Distribution Centre group*

When an order is shipped from a supplier, it has two shipping options[81]: direct delivery to a store or delivery to a warehouse. There are two types of IKEA warehouses are: one for slow moving goods and one for fast moving goods[82]. The warehouses are strategically based in three continents for smooth delivery to the stores around the warehouse.

The Supply Planner is based locally in an IKEA Trading office in order to be close to the suppliers and is the connection between IKEA and these suppliers.

"My function is to be the bridge between IKEA of Sweden, Trading office and the supplier. The focus is on the transport and logistics to decrease costs and secure availability." – Supply Planner, IKEA Trading office, Qingdao[83]

The purpose of being close to the suppliers is to have a well functioning relationship to make both parties' expectations clear and visible. Another benefit is to speak the same language, which makes it easier to understand what the supplier means and the reasons behind eventual delivery problems. IKEA wants to avoid that the supplier cancels orders, but it does happen and it creates uncertainty when orders are not shipped on time[84]. IKEA has technicians working locally at every IKEA Trading office to secure the quality and to help the supplier to plan the production according to IKEA's needs. The technicians and the Supply Planners are working as a local team

[81] Paul Björnsson, 2012-01-25
[82] Henrik Rosqvist, 2012-05-25
[83] Ruby Zhang, 2012-03-21
[84] Paul Björnsson, 2012-01-25

together with the supplier and strive for a long-term relationship between IKEA and the suppliers.

IKEA's suppliers weekly receive information from IKEA, such as predicted forecasts and actual orders and the purpose is to help them plan the production. Some suppliers calculate forecasts based on old order data and try to predict the future on their own[85]. To be able to predict the future and create a useful tool for everyone involved in the capacity planning process, IKEA uses an *Exported "Supply Plan",* also called *SPI.*

"We always reference to the SPI forecast. It is our main channel to get and calculate the numbers. This is what I work with on daily basis. The SPI forecast is automatically sent to our suppliers." – Supply Planner, IKEA Trading office, Qingdao[86]

The SPI is generated every Monday for regular range articles and it is possible to see forecasts up to 52 weeks in the SPI. The SPI changes everyday due to new numbers coming from actual sales data directly from the stores. SPI does also include information about IKEA safety stock levels. The stores have the option to change average need due to sales data.

"We send out too much information to our suppliers today via SPI. This can create misunderstandings of the data and wrong decisions can be made" – Need planner, IKEA of Sweden, Älmhult[87]

Since the SPI is a forecast, it is impossible to have the perfect scenario of 100% accuracy. Today the figure is around 62%, which is much higher than previous years due to deeper analysis of data and a higher focus on getting an accurate forecast.

"The accuracy is unfortunately sometimes quite bad. For example, 3 years ago the accuracy was 40-50%, but now the accuracy is almost 60%." – Supply Planner, IKEA Trading office, Qingdao[88]

---

[85] ONE Supplier Capacity manual v. 0.999
[86] Ruby Zhang, 2012-03-21
[87] Henrik Rosqvist, 2012-05-15

IKEA compares the SPI to actual orders once the data is available to find how much the forecasts differ from the true need[89]. When a clear error due to miscalculation can be observed, it is important to find the root of the problem why IKEA could not foresee this matter.

"From what I know, SPI is a huge system between stores, Trading offices and IKEA of Sweden. The stores update real sales figures everyday in the system and then the sales system transfer the data to the IKEA system." – Supply Planner, IKEA Trading office, Qingdao[90]

The local team at IKEA Trading Office reviews the SPI forecast three times every year to build an understanding of whether the forecast is possible to carry out or not. The SPI forecast is also communicated with the suppliers and their opinions are considered. If the suppliers see difficulties in turning the plan to reality, IKEA tries to help them with the production planning; especially the technicians can help the suppliers with production efficiency improvements.

"It is important to balance the IKEA need with supplier's capacity to be able to secure product availability. If we don't manage this, there will be a higher cost and a lower product availability." – Supply Planner, IKEA Trading office, Qingdao

When the SPI is available, it starts to show the forecast plan from three weeks ahead and 52 weeks forward. The reason for the three weeks delay is the lead-time, which is approximated to three weeks within the category *Frames and Mirrors with frames*. This lead-time is decided on category level together with the suppliers.

---

[88] Ruby Zhang, 2012-03-21
[89] Paul Björnsson, 2012-01-26
[90] Ruby Zhang, 2012-03-21

"SPI is a good reference for both suppliers and Supply Planners. We get the updated SPI forecast once a week and the information is also sent to our suppliers." – Supply Planner, IKEA Trading office, Qingdao[91]

Even though the SPI has improved and is more trustful today, a few percent wrongly estimated order forecasts could escalate to huge differences when it comes to capacity and production planning[92].

Today, the suppliers have no standardized way of working together with IKEA to plan their capacity[93]. The information received from their system connected with IKEA, gives the suppliers hints of the future orders, but the suppliers admit that they sometimes only base the production according to actual orders to be sure that they will sell all products[94]. They do not trust the SPI forecast enough to, for example, take an average of the forthcoming three weeks and produce according to the predicted orders.

"The cooperation between IKEA and our suppliers is not working well enough when it comes to capacity planning. This has created a course of action where we handle the problems when it occurs and I think that one reason might be the distance between the suppliers and IKEA's Need Planners in Älmhult." – Need Planner, IKEA Älmhult[95]

Some suppliers find it uncertain to plan a production too far in the future and experience a big difference between the SPI forecast and received orders. They admit that production and capacity planning for one week is short and creates high fluctuations when it comes to things like labor need. This behavior leads to high fluctuations in the production, which often results in fire fighting and higher costs for the supplier[96].

"Suppliers always want to align their capacities with IKEA's need. Sometimes the suppliers have overcapacities compared to IKEA's need and

---

[91] Ruby Zhang, 2012-03-21
[92] Paul Björnsson, 2012-01-26
[93] Paul Björnsson, 2012-01-25
[94] Production manager, Supplier A, 2012-03-13
[95] Henrik Rosqvist, 2012-05-15
[96] Paul Björnsson, 2012-01-26

then they try to get bigger orders from IKEA. This is not possible. We have to work close together with suppliers to create a good balance; it is a win-win situation if the balance between us is stable." – Supply Planner, IKEA Trading office, Qingdao[97]

The Supply Planners are well aware of the fact that some suppliers sometimes adjust the production only according to received orders and not on SPI forecast because of insecurity. Suppliers also base some of their production planning on current stock level and capacity. Most of the Chinese suppliers within the category *Frames and Mirrors with frames* have a high degree of manual production and can in short time adjust the number of workers to increase capacity at some workstations in the production.

"We can adapt to a higher product demand from IKEA by employing more workers to our factory in only 20 days!" – IKEA supplier, Qingdao[98]

IKEA uses other software systems than SPI to plan the capacity and to see more perspectives of both the capacity and transportation system. One such tool that IKEA uses to manage capacity problems is *Fulfillment*. Fulfillment shows future orders based on the total need of one product. IKEA has more than one supplier to produce an article. The suppliers do not get to know IKEA's total need of one product, only what IKEA needs from the specific supplier. To decrease transportation cost, IKEA focuses on having a high filling rate when transporting the goods to a warehouse. Fulfillment gives an overall perspective of how IKEA Trading office can contribute to a higher filling rate by combining orders from different suppliers in the same area in one shipment. Supply Planners can foresee if goods planned to be delivered to a warehouse might need to be redirected to Direct Delivery to a store, and can then allocate the transport to the right place.

"Lots of work effort is put on increasing the filling rate. If the filling rate is high, IKEA will save money on every single article and this is also something I work with. This is something that the supplier is very involved with as well. If the supplier doesn't produce a lot, the transportation time

[97] Ruby Zhang, 2012-03-21
[98] Production manager, Supplier A (2012-03-12)

will increase, because it takes longer time to reach transport fulfillment." – Supply Planner, IKEA Trading office, Qingdao[99]

The Supply Planners get the possibility to react early to IKEA's need fluctuations via Fulfillment. When IKEA has a higher product need and it is clear that suppliers need more capacity during a week to meet order expectations, it is possible to *front load* capacity. Front loading is when the supplier is asked to increase capacity if there is any available. In extreme cases, IKEA has to search for capacity at another supplier to meet the demand. This creates undesirable fire fighting for IKEA.

"We use Fulfillment to get the information that we cannot get from SPI forecasts." – Supply Planner, IKEA Trading office, Qingdao[100]

A supplier's capacities are registered in the software system Global Purchasing System, GPS. The purpose of GPS, among other things, is to enable monitoring potential capacity issues 84 weeks ahead by matching the capacities with the need. Capacity issues can hopefully be solved before they become an actual problem to avoid fire fighting. However, the current problem is that the capacities in GPS are inaccurate. There are a few main concerns with the way GPS handles suppliers' capacities today. First of all, the resources are named after the product name, not after different sizes. This becomes problematic for articles like RIBBA that is produced in 12 different sizes and every size comes in 5 different colors. GPS does not give any information about how the different frames are produced. If one size is produced in a different way that the others, today's capacity figure in GPS does not consider each and every capacity. Secondly, the figures inserted in the capacity column are based on the suppliers' estimates of the capacity on a two-year basis. This method is currently showing the wrong capacity in 60-70%[101] of the cases. This results in mistrust to the system and the registered data.

[99] Jessie Ding, 2012-03-21
[100] Ruby Zhang, 2012-03-21
[101] Piotr Andrukiewicz, 2012-01-27

"I do not trust the capacity data in GPS, but they are the only capacity figures that we have. Before this project (ONE Supplier Capacity Process – authors' remark) I was forced to trust the figures, because I could not dig deeper into the reason where they come from." – Supply Planner, IKEA Trading office, Qingdao[102]

[102] Ruby Zhang, 2012-03-21

5. ONE Supplier Capacity Process

The chapter starts with an extensive briefing of the ONE Supplier Capacity Process. Further, it is accounted for how the authors together with the category Frames and Mirrors with frames have implemented the process. The chapter ends with explanations of the templates and information that has been sent out to the suppliers for data collection.

5.1 ONE Supplier Capacity Process

IKEA has defined a standardized way of working with capacity globally to simplify handling of capacity information and at the same time make it easier for the suppliers to be aligned to IKEA's total need. This way of working is called ONE Supplier Capacity Process and will be rolled out to all suppliers worldwide from February 2012. The process will be implemented and maintained locally at IKEA Trading offices in order to get a local connection to each supplier. The goal for the ONE Supplier Capacity Process is to solve supplier capacity issues in a more proactive way[103]. IKEA and their suppliers should have a common way of working and a common and agreed way to define, register and maintain supplier capacity in one framework.

5.1.1 What is ONE Supplier Capacity Process about?[104]

ONE Supplier Capacity Process is a framework to use in order to take integrated decisions connected to today's structure. This will create a common way of working by using three steps.

1. Define
2. Register
3. Maintain

The definitions are the same for all functions and a basic measurements system gives a natural focus on how to work proactively and innovatively to meet IKEA's needs.

There are three main reasons for how ONE Supplier Capacity Process will contribute to this. The benefits are:

[103] Paul Björnsson, 2012-01-23

[104] ONE Supplier Capacity Process manual v. 0.999

- **Soft factors:** Less fire fighting due to long-term planning and better communication, a more natural way of working together cross functionally due to a common language and goal, simpler structure for the many suppliers.
- **Contribute to reduce supply chain costs:** The global overview will enable IKEA to use the suppliers in an optimal way. The Capacity Decision making framework will continuously support with information about risk/uncertainty variables such as risk level, cost of risk and risk transfer options. Then the downstream flow will be more stable and enable a support for Transport, distribution center and retail planning.
- **Contribute to a better product availability:** Supplier capacity figures will be visualized by a common way of defining, registering and maintaining of information. Capacity planning will be done in pieces but possible to follow up in other units in HFB/Category/Trading area, a proactive way of solving potential tactical and operational capacity issues.

The definitions stated in ONE Supplier Capacity Process are:

- Resource group, *RG*: Production resource/resources with similar characteristics constitutes a "Resource group". A Resource group *provides capacity* and is locally defined by IKEA Trading office.

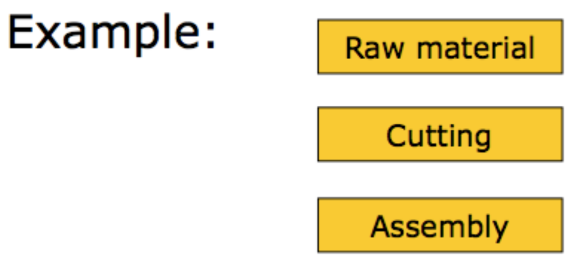

Figure 8: Resource groups

- Product group, *PG*: Article/articles with similar characteristics that share the same Resource group/groups constitutes a Product group.

A Product group *consumes capacity*. Product groups are globally defined on IKEA Category level.

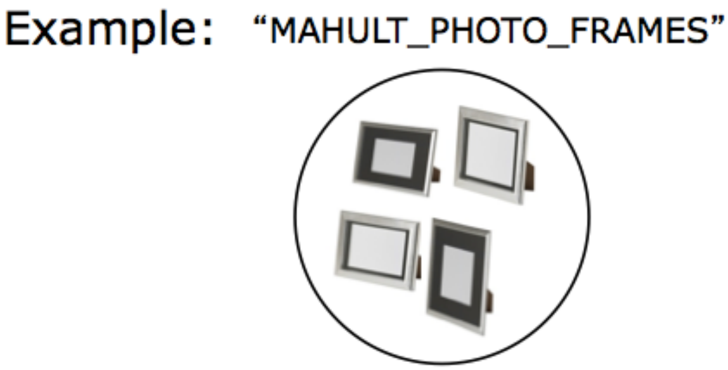

Figure 9: Product group

- Dedicated supplier capacity: Defined as the capacity dedicated to a given Resource group for IKEA on an agreed period of time. The dedicated capacity on Resource group level is dimensioned as the total local capacity need for connected Product group/groups and can be defined in different units of measurements (kg, hours, m^3 and m^2).

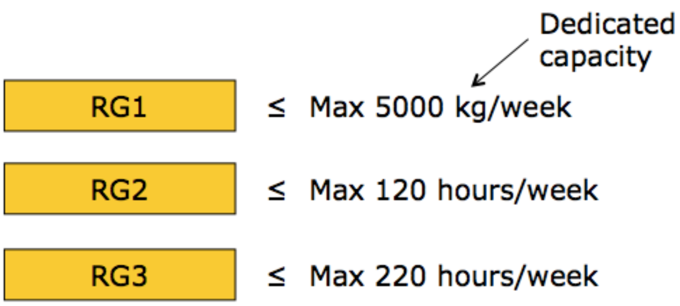

Figure 10: Dedicated supplier capacity

- Allocated supplier capacity: Allocated supplier capacity is defined as the capacity that is allocated to a given Product group within a given resource group.

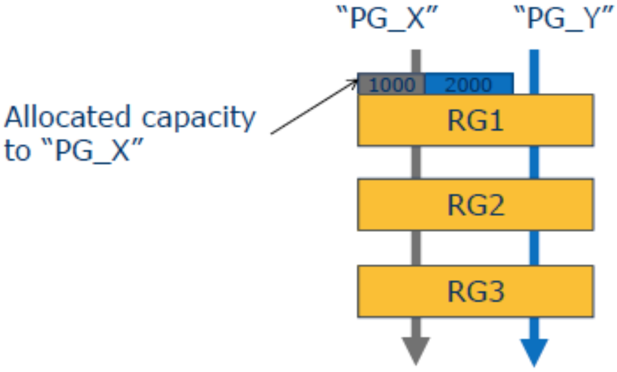

Figure 11: Allocated supplier capacity

- Available supplier capacity: Defined as the available capacity, but not dedicated to a given Resource group on an agreed period of time.

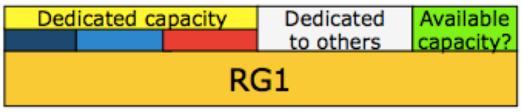

Figure 12: Available supplier capacity

- Supplier capacity value: Defined as the value that is allocated to a given Product group within a bottleneck. A bottleneck is where the performance is limited by one or a number of Resource groups.

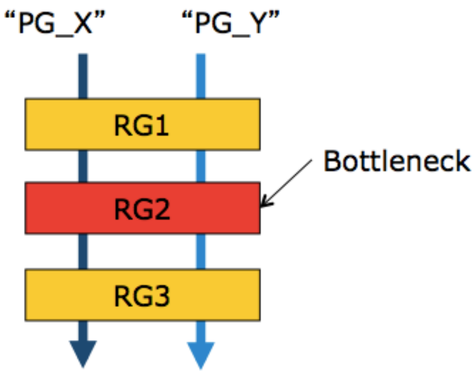

Figure 13: Bottleneck

- Supplier capacity type: Defined as the *bottleneck type* for a given Product group. Predefined classifications are:

➢ 01 Component
➢ 02 Raw material

- 03 Labor
- 04 Electricity
- 05 Machinery
- 06 Tool
- 07 Packaging
- 08 Storage
- 09 Maintenance
- 10 Others

- Supplier value name: Defined as a combination of Product group, restricted Resource group and bottleneck type.

Example:

- Product group MAHULT_FRAME
- Resource group TOOL_KM
- Bottleneck type 05

=>Name to register: MAHULT_FRAME;TOOL_KM;05

Figure 14: How to register in GPS

- Unit of measurement: The supplier capacity value is defined, registered and maintained in pieces.

5.2 Implementation plan

ONE Supplier Capacity Process is implemented via the following steps, according to ONE Supplier Capacity Process manual.

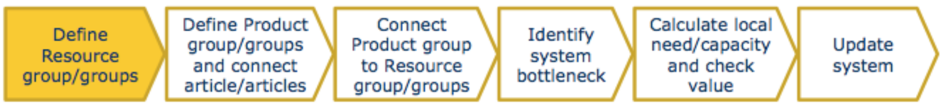

Figure 15: Steps of implementation[105]

This is the implementation plan executed by the authors together with IKEA Trading office in Qingdao with help from IKEA of Sweden. The developed Implementation Plan is presented in order to provide understanding of the process implementation in reality. The reason behind the need of an executed process is to make it very clear for everyone involved what the purpose is and what is expected from him or her. It was used during the implementation of ONE Supplier Capacity Process in the category *Frames and Mirrors with frames.*

1. ***Select a team to work with and implement ONE Supplier Capacity Process***
   - Input: Individual knowledge, interest in the project and contact with IKEA Trading offices.
   - Responsible: ONE Supplier Capacity Process owner.

105 ONE Supplier Capacity Process v. 0.999

- Activity: The category contacts employees in the selected category in the local IKEA Trading office to lead the implementation after the introduction.
- Output: An established team to implement the concept.

2. ***First draft of product group***
   - Input: Production and product information, number of products and suppliers.
   - Responsible: Sourcing Developer and Category Leader.
   - Activity: Depending on production setup, products and material the products within one category can be divided in groups with similar characteristics.
   - Output: First draft of Product group classification.

3. ***Educate involved staff in ONE Supplier Capacity Process***
   - Input: ONE Supplier Capacity Process manual, reference case and templates.
   - Responsible: ONE Supplier Capacity Process owner.
   - Activity: To support the suppliers, the responsible Supply Planner has to be educated and well informed about the ONE Supplier Capacity Process. An essential review to create a deep understanding of the concept before the suppliers get involved is recommended as a start. A review of the templates is necessary in order to help the Supply Planner educate the supplier.
   - Output: Deep knowledge and understanding of the ONE Supplier Capacity Process for involved team members.

4. ***Inform and send preparation material to supplier***
   - Input: Resource group capacity table, Production flow map, ONE Supplier Capacity Process education material.
   - Responsible: Business Developer Manager.
   - Activity: The next step is to communicate with the suppliers to inform them of the necessity and overall concept concerning Resource groups. This will give the suppliers basic understanding of the templates they have to complete before the visit by IKEA's employees. The suppliers should be asked to

divide the production into Resource groups, define correct capacity for each Resource group and evaluate bottlenecks.
- Output: Establish a supplier understanding to prepare for discussions at the same level.

5. ***Kick-off meeting***
- Input: Prepared team members and appropriate representatives from the selected supplier gathered together.
- Responsible: ONE Supplier Capacity Process owner.
- Activity: During one week, educate and inform both supplier and responsible Supply Planner in ONE Supplier Capacity Process.
- Output: Create a team spirit and a secureness to implement the project.

6. ***Supplier visit***
- Input: Prepared team members and supplier.
- Responsible: Category Leader and Business Developer Manager.
- Activity: Presentation of the company including production process map, preliminary resource group capacity table and production setup. Production tour with focus on bottleneck stations and buffer zones. Discussion concerning resource group classification, bottleneck decision, Resource group capacity table calculation, further implementation steps, summary and clarification of responsibilities and expectations.
- Output: Better understanding of production setup and clarified bottlenecks. All information needed for next step.

7. ***Team Workshops and Summary***
- Input: Given information and individual conclusions from supplier visit.
- Responsible: Business Developer Manager.
- Activity: Further discussions concerning resource group and product group classification. Calculations to find true capacity in the bottlenecks.
- Output: Final decision on product groups and connection to resource group. Bottlenecks and classification type are to be

defined. Meeting minutes including valuable knowledge and experiences should be documented.

8. ***Resource group capacity table***

- Input: Calculations from Team Workshop and Summary.
- Responsible: Supply Planner.
- Activity: Figures for every resource group linked to a product group is to be inserted into the Resource group capacity table. Convert present unit into pieces and highlight bottlenecks with red color. Calculation of local need and capacity.
- Output: Proposal for capacity allocation in order to increase capacity and define a future solution for solving the bottleneck. Complete Resource group capacity table.

9. ***Register in Global Purchasing System***

- Input: Resource group capacity table.
- Responsible: Supply Planner.
- Activity: Register accurate figures from Resource group capacity table in Global Purchasing System.
- Output: Updated Global Purchasing System.

10. ***Data collection***

- Input: Resource group capacity table.
- Responsible: Supply Planner.
- Activity: In cases where information is missing, further data collection has to be made to complete the Resource group capacity table. This step is unnecessary if step no. 7 is complete.
- Output: Complete Production flow map, Resource group capacity table and classification of detected bottlenecks.

11. ***Recap meeting with supplier***

- Input: Final decision from team workshop and summary, interview guide.
- Responsible: Supply Planner for supplier and Business Developer Manager

- Activity: Inform the supplier about the final classification and calculation of the Resource group capacity table. Suggest improvements in the production to increase the capacity. Interview the supplier about ONE Supplier Capacity Process.
- Output: Establish the next steps for production capacity improvements and when to meet for update.

12. Evaluation of recap meeting with supplier

- Input: Answers from interview with supplier in step 10.
- Responsible: Business Developer Manager and Supply Planner.
- Activity: Review and evaluate answers from the interview.
- Output: Gain valuable knowledge and information for further improvements. Documented meeting minutes.

13. Update and review work in progress

- Input: Meeting minutes from step 11.
- Responsible: Business Developer Manager, Supply Planner, Sourcing Developer and Category Leader.
- Activity: Evaluate whether any changes to improve can be made and how.
- Output: Decision on future improvements for ONE Supplier Capacity Process.

14. Evaluate and prove savings of project

- Input: Experiences, meeting minutes, knowledge, figures on cancellations, production capacity, deviations between orders and demand plan and interview from step 10.
- Responsible: Process owner and Category Leader.
- Activity: Evaluation of ONE Supplier Capacity Process within the category. Comparison between the demand plan and the actual orders. Show actual savings from capacity planning accuracy.
- Output: Suggested improvements and future decisions for maintenance

5.3 Production process map

At step four in the Implementation Plan, the supplier is going to prepare and explain a process map of the production during the kick-off meeting. This map shows the production with all product groups and how these are connected to the resource group. See Figure 16 for an example. The colored ellipses symbolize product groups and the horizontal rectangles symbolize the resource groups. The methodology states that it is crucial to map correct and shows the accurate relations between product groups and resource groups. During the implementation process it is common that this map might need to be revised a couple of times depending on the suppliers knowledge of their production. It also depends on the category side if they are happy with the dividing of the resource group.

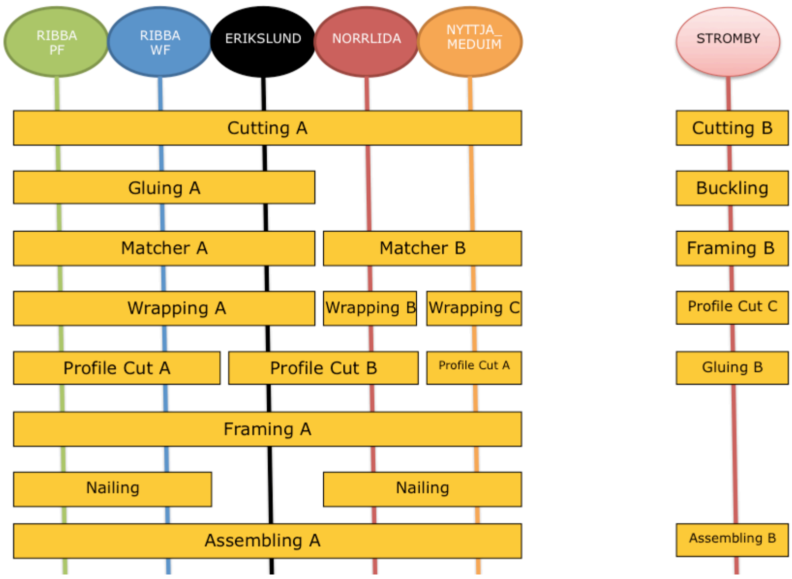

Figure 16: Example of production flow map

5.4 Resource group capacity table

The template that has been created by the authors and been sent out to the suppliers are based on the common agreements in the kick-off week by IKEA of Sweden and the category *Frames and Mirrors with frames*. The template shows the reality in the factory today for a Product group, and together with the process map of the production it is easy to find the bottlenecks for each Product group and identify where it is possible to reallocate capacity if necessary. In table 2, the Resource group capacity table for suppliers is shown. The templates are created to be as simple as possible and encourage the suppliers to understand and follow the instructions.

"I want simple templates. If my wife can understand the templates, they are simple enough for everyone to understand." – Logistics Manager, Shanghai Trading office[106]

The templates were sent out in English and translated to Chinese by local IKEA Trading office team to the suppliers.

Table 2: Resource group capacity table

[106] John Astom, 2012-03-22

Product group								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Consumption	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Resource Group 1	Y/N							
Resource Group 2	Y/N							
Resource Group 3	Y/N							
Resource Group 4	Y/N							
Resource Group 5	Y/N							
Resource Group 6	Y/N							
Resource Group 7	Y/N							
Resource Group 8	Y/N							

1. **Resource group:** The supplier states their resource group for the specific product group. The complexity of the production line and the amount of resource groups will determine the size of the table.

2. **Shared machine:** This is mainly a control question to the supplier. If the answer is yes, it is a good reminder that the figures should be double-checked with the process map of the production.

3. **Number of machines in this Resource group:** Specify how many machines this Resource group is using within this Product group. Example: 2 cutting machines.

4. **Consumption:** Here, the supplier defines the production speed. This is the most important number for the Resource group capacity table

that is shown in table 2**.** Consumption can be indicated in the unit preferred by the supplier (i.e. sec/pcs, meter/min).

5. **Maximum working time in hours:** This is the dedicated capacity for the resource group, defined in hours.

6. **Production capacity:** This is dedicated capacity for the resource group defined in the unit that the supplier has expressed the consumption in. Although it is easy to convert the numbers into pieces if necessary. The dedicated capacity is expressed by Consumption * Maximum working time in hours. On page 13 in the Theoretical Framework this is described as *available capacity.*

7. **Allocated hours:** In this box the supplier indicates how many hours that are allocated to this product group in this resource group. This should show the exact actual hours that the resource group are up and running for a specific Product group. Switching times, down time and lunch breaks should be subtracted.

8. **Allocated capacity:** The actual capacity for the product group in the resource group. It is defined in the unit that is preferred by the supplier. To get the actual allocated capacity, calculate Consumption * Allocated hours.

9. **Final allocated capacity in pieces/wk.:** In this box the supplier expresses the final allocated capacity, which can be used in the GPS. This might be the same figure as (8) but it has to be in the unit pcs/wk.

10. **Highlight the resource group with lowest capacity:** The last step for the supplier is to observe where the lowest number on step 9 is. This is the bottleneck for this product group and should be highlighted in red color.

5.5 Suppliers involved in the implementation

Below, the suppliers that have been a part of the implementation and handled by the authors will be presented. The category *Frames and Mirrors with frames* is one of IKEA's sixteen categories and provide mostly frames and mirrors, but also to a small extend electronic products like digital clocks. The category has nine suppliers in total, which is quite few suppliers compared to other IKEA categories, and seven of them have so far been included in the ONE Supplier Capacity Process. Two of the suppliers are 100% dedicated to IKEA, but not owned by IKEA. The frames NYTTJA, RIBBA and VIRSERUM stand for 60% of the purchase value or 50 million pieces per year[107]. There are 3 medium suppliers in the category with partly dedicated production to IKEA all year around. The last two suppliers are very small and do only produce a very few articles for IKEA. One of the small suppliers has a production for IKEA during three months per year and the production is only assembling of pre-ordered product parts.

The raw material for most of the frames is MDF, but there are also frames manufactured in pine, plywood and aluminum. Frames are suitable for line production since the production follows the same logic for all sizes and shapes. Most of the factories have line production with a varying amount of automatic production. The frames are made in a standardized way in most of the factories. The biggest difference is the amount of manual work. Frames are manufactured in the same way depending on the size of the frame.

Supplier A

Supplier A stands for almost 50% of the category purchase value which makes it the without doubt most important supplier for the category. In the factory is large quantities of best sellers like NYTTJA and RIBBA are produced. Supplier A is a factory that is 100% dedicated to IKEA and produces 147 articles in 10 product groups. The articles from Supplier A are made by MDF only.

Supplier B

Supplier B is the second largest supplier for the category. The factory also produces NYTTJA and RIBBA and does also produce large quantities of products like STROMBY. Supplier B produces only for IKEA with 6 product groups and 115 articles, only in the material MDF.

Supplier C

[107] Jens Karlsson, 2012-02-13

This factory is a large and important supplier of the product MALMA. Except MALMA, they are producing 5 other product groups. Supplier C produces frames made from pine, plywood and MDF.

Supplier D

IKEA is a large and important customer for Supplier D who has a couple of other customers. For IKEA, they are producing 9 products groups with 96 articles.

Supplier E

Supplier E is a small supplier. For IKEA, the factory only produces a small amount of frames, mostly the article FJÄLLSTA. The production for IKEA is only running about 3 weeks per year and the products are then stored to serve the demand.

Supplier F

Supplier F is also a small supplier and mostly produces plastic frames in different forms. They also have some free-range products in low-level production.

Supplier G

Supplier G is a small supplier for IKEA and produces various kinds of electronic products. For IKEA they are producing electrical clocks. Supplier G does not have line production and do much of the work manually.

6. Implementation of ONE Supplier Capacity Process

The sixth chapter initially presents feedback and opinions from suppliers in Greater China regarding the implementation of ONE Supplier Capacity Process. Further, capacity data received from the implementation of the process in presented.

6.1 Feedback from suppliers on ONE Supplier Capacity Process

To be able to improve the implementation over time, feedback is important. It can further help to analyze the reasons behind unexpected problems or present positive criticism that should be communicated and remembered. The suppliers in this master thesis have answered questions at different stages of the implementation in order to ensure that all reflections and improvement suggestions were caught and not forgotten. The time line for the interviews stretches from the beginning of the implementation and three months ahead. The responsible Supply Planner from IKEA translated all interviews from English to Chinese.

The first interview was made after the first day of information and education of the project. The focus of the interview was the size of the supplier such as number of articles, dedicated percentage of the production to IKEA, number of customers, number of production lines etc. to get an overall impression of the supplier.

The second interview was held after the supplier had completed the first tasks and the results were discussed. The purpose was to investigate the supplier's level of understanding and to see what other information they could have needed from IKEA at this point to reach better results. The information was mostly the suppliers' own reflections in order to create an understanding of the project implementation so far. When eventual problems were discussed, common communicated solutions were reached to further help the supplier to get back with more accurate data until the next meeting.

Interview number three was held when all data was correct and verified by both IKEA and the supplier. The focus was on gathering all useful information for future implementation and also to encourage the supplier to give interesting suggestions on improvements to the project. The last interview was also an effective way to summarize “lessons learned” from one specific supplier and avoid the same mistakes with the next.

Some of the suppliers did not have full control of their own production and how much of it that was dedicated to IKEA. The Product groups were divided before the meeting and suppliers knew that they had to have this mindset before the meeting. Most of the suppliers agreed that it was a suitable splitting of the article. They were informed that all discussions and suggestions were welcomed.

After the education, the suppliers confirmed that they had understood the concept and the reference case and that they were familiar enough with ONE Supplier Capacity Process to handle terms as Resource group, Product group and bottleneck. They also agreed on the homework to improve the production flow map and connect the Resource groups’ capacity to the Resource group capacity table.

In general, all suppliers were familiar with the grouping of the articles and they were clearly familiar with the terminology. They had created a production flow map and it was based on the reality as of today.

The most common problem for the suppliers was to distinguish between allocated capacity and dedicated capacity. Some of the suppliers wanted to calculate the Resource group capacity table backwards to find the “perfect match”, but this would not reflect the reality. One supplier called the maximum capacity dedicated capacity to make the case look as good as possible, but this is not the reality either.

All the suppliers asked for better standard templates to use as reference. They wanted to have templates in Chinese where they just had to fill in data. The suppliers also asked for learning material in Chinese. Today’s material is in English and was explained and translated to Chinese by IKEA employees. If the supplier wants to go back to refresh their memory, they have to be able to both read and speak English. The suppliers thought it was difficult to remember the exact way to measure and convert the data and with material in English. They thought it was very time consuming and difficult to go back and try to understand the concept again.

"I didn't really understand the true definition of keywords such as Resource group, Product group and Bottleneck after our first meeting, and it was difficult to not have any material to go back to as a reference since I don't speak English." – IKEA supplier, China[108]

Another concern was the guideline to convert all data into pieces from previous measurement system. The suppliers did not know if they should use an average of the regular measurement unit and they were afraid of loosing the exact length, width or any other unit. The production does not look the same at all frame production suppliers because of different machines and this is why a reference case that suits all suppliers is difficult to create.

An issue was also the shared machines. Some standard machines can be used for all types of frames, but the production layout only allows the machine for a limited number of products. The question related to this issue was: Should the machines be shared on our production flow map, or reflect the reality where they are not shared?

Overall, the feedback was positive. The concept mindset was new to all suppliers and even though the concept was not fully understood or implemented yet, the employees in the production management were happy about the changes and could already see the benefits of a better control of the capacity. The common mindset also decreased the number of misunderstandings and different opinions when it came to production planning. Some suppliers experienced a better control of the labor cost because ONE Supplier Capacity Process provided a clear definition of how much labor each Resource group needed for full capacity.

[108] Production manager, Supplier B, 2012-03-14

"From production planning perspective, we like it. We didn't have the common understanding before. Now both parties have the same understanding and everyone uses the same methodology. It is easier for us. There is no more fighting on the floor about production planning." – IKEA supplier, China[109]

On the question concerning where or if the suppliers can see any improvements today, or in the future, there is a common answer from most suppliers. They already experience a better control of the true capacity and with the new knowledge of allocating unused capacity, it is easier to see whether the orders are possible to deliver or not. The expectation is that this will lead to an improvement when it comes to the number of cancellations. Some of the suppliers detected that they had much more capacity than they thought and this information can be used to make today's production more effective and be prepared for the future orders.

"It is very clear for us how to do the production planning. I can place an order and the production has no excuses to say no. They can allocate capacity to produce the order." – IKEA supplier, China[110]

"My production is more organized today, which creates easier production planning."- IKEA supplier, China[111]

Concerning the support from IKEA, most of the suppliers thought that it had been very helpful to be able to call IKEA Trading office and receive clarifications on the material, but it had been quite time consuming. It has been lots of revising of the numbers and rework with the production flow map, but the result was very satisfying.

"We needed more support to get the correct the numbers than we expected." – IKEA supplier, China[112]

[109] Production manager, Supplier A, 2012-03-13
[110] Production manager, Supplier A, 2012-03-13
[111] Production manager, Supplier B, 2012-03-14
[112] Production manager, Supplier D, 2012-04-19

None of the suppliers had correct answers at the first follow up meeting and requested a review of the reference case again. During the review, some of the problems were solved and other issues were clarified to the supplier that they knew what to do when they came back to their work.

"I am very satisfied with the way we work but not with my homework." – IKEA supplier, China[113]

The root cause to most of the inaccurate production data was the wrong production flow map and the suppliers realized how important it is to have the basic information in place before any further steps can be taken. They also realized that the production flow map needed more attention and work than they expected. The work gave them a better understanding of the whole concept and why it can contribute to a better organization for them and for IKEA.

Some suppliers were initially very concerned about an increased workload, but looking back, they admit that it has been a major improvement for them as well and worth the invested time.

"My production is more stable and since I already can see improvements, I look forward to keep working with this and hopefully create an even more efficient production." – IKEA supplier, China[114]

6.2 Reference cases

During the implementation of the project, the authors have realized that no suppliers are alike. Some are very complex with complicated production lines, while some are very simple. In this part of the chapter, the discovered scenarios are presented together with each supplier's production flow map. Noteworthy is that the first four suppliers stand for 75%[115] of the total category purchase value. The data presented in this chapter reflects the reality and how the capacity is allocated today. It is based on bottleneck analysis, which is made with the Resource group's capacity tables that all suppliers have compiled for their Product groups. From the bottleneck

[113] Production manager, Supplier A, 2012-03-13
[114] Production manager, Supplier A, 2012-03-13
[115] Zhang, Kevin (2012-03-05)

analysis the authors have received data that shows which Resource group that is the bottleneck for each Product group and how much capacity each Resource group consumes. From the supplier visits, the authors managed to identify which type of bottleneck it example is. Types of bottlenecks are for example labor or machine, and depending on the type of bottleneck, the figures and scenarios can be differently analyzed on how to improve the capacities. The exact capacity values will be presented in Appendix A.

When this thesis has been published, the production flow map for Supplier F has not been handled over yet.

6.2.1 Supplier A

Supplier A has wide range of Product groups and many Resource groups are connected in a complicated way. The largest Products groups like NYTTJA and RIBBA share many Resource groups, but not all of them. STAVE and BILLY OLSBO share only one or two Resource groups and MAHULT, LEVANGER_SQUARE and LEVANGER_OVAL do not share any Resource groups and are produced mainly manually.

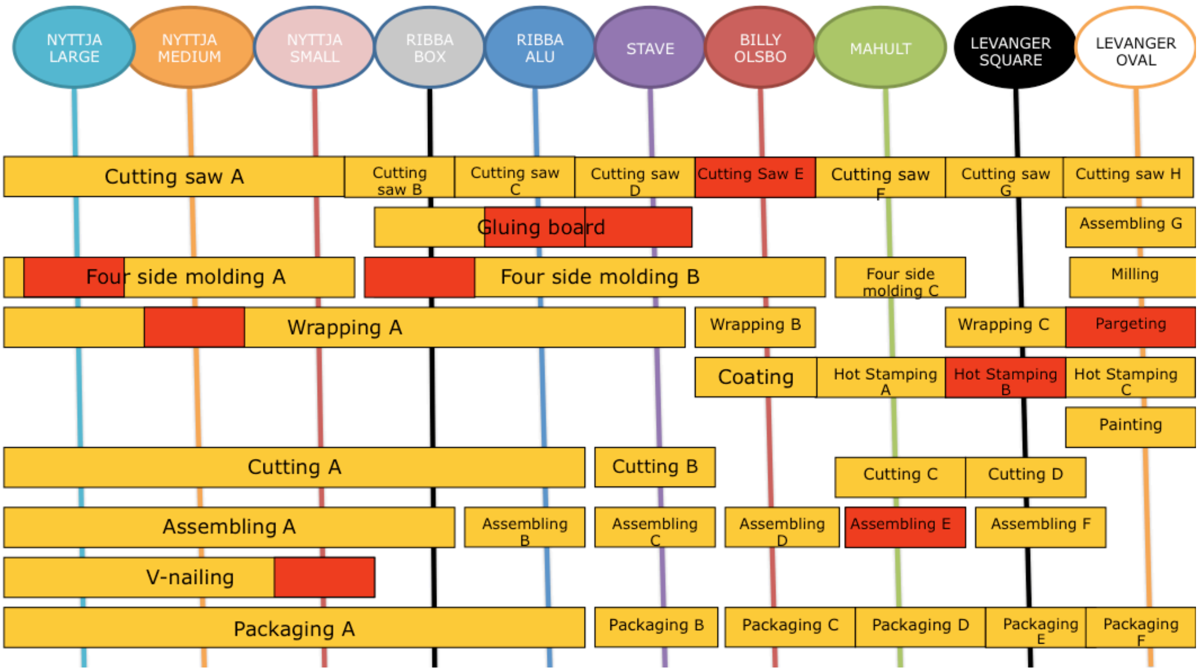

Figure 17: Supplier A production flow map

The discussions about this map for Supplier A have mainly been about whether Resource groups should be shared or not. An example is the first Resource group, *Cutting Saw*. It is the same cutting machine for all Product groups, except for LEVANGER OVAL; they are manufactured in the same place in the factory. The reason why the Resource groups are not shared in the flow map is that the switching time is too long to make it worth changing. Supplier A has eight similar cutting saws, but use one for each Product group. The authors have, together with IKEA Trading office Qingdao and IKEA of Sweden, decided that if sharing is not likely in reality, they should not be stated as a shared Resource group.

Another discussion has been about whether NYTTJA should be divided in two or three Product groups. Since IKEA of Sweden decides the Product groups on global level, this is an important question and has to fit well with other suppliers' manufacturing processes globally. Supplier A is one of the larger suppliers in the category and dividing NYTTJA into three Product groups suits the production better for Supplier A. Therefore, the category at IKEA of Sweden has decided that NYTTJA should be three Product groups.

The third discussion regarding Product groups is about LEVANGER, which was one Product group from the start. The authors early realized that the frame is produced differently depending on the shape. The article with the squared shape is mainly produced with machines, while the oval article is produced mainly manual. With this insight, the Product group was divided into two groups, LEVANGER_SQUARE and LEVANGER_OVAL.

The implementation process for Supplier A was generally easy. They were motivated and interested in the project and made a great effort to get the numbers and figures correct. The bottlenecks are visible in red in the production flow map. It is clear that most of the bottlenecks are in the machines, but some of them are in the manual work sections *Assembling* and *Pargeting*.

6.2.2 Supplier B

The six Product groups for Supplier B are connected to the Resource groups as in Figure 18. Five of the Product groups are standard range articles like NYTTJA and RIBBA and they share some of the Resource groups. The last

Product group, STROMBY, does not share any Resource group with any of the other Product groups.

Supplier B was interested and had no problems to make their numbers and figures correct during the implementation. RIBBA and ERIKSLUND have a similar production line and the bottleneck is *Wrapping A*. For NORRLIDA and NYTTJA, the bottlenecks are *Assembling A*, which is in the manual working part of the factory.

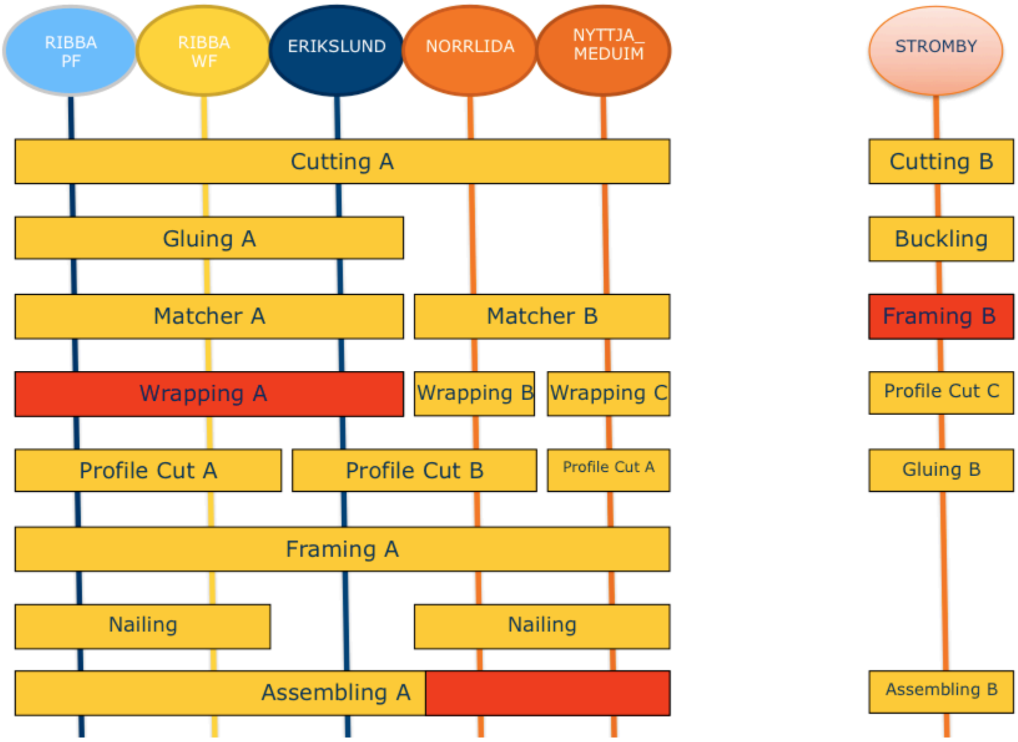

Figure 18: Supplier B production flow map

6.2.3 Supplier C

Supplier C has a complicated production setup. As shown in Figure 19, HEMNES_WHITE and HEMNES_BLACK do not share any Resource groups with the other Product groups, except for *Packaging*. The other four Product groups share some of the Resource groups. Since Supplier C produces frames in pine and plywood except for the standard MDF material, the Resource groups are different in some aspects from the other large suppliers. Pine and plywood requires more treatment since it is has higher density and it not as shapeable as MDF.

In Figure 19, the first Resource group is the raw material. It is not really a Resource group since it does not consume any capacity except for storage, which is estimated to be very large. In this process map raw material is a Resource group just to visualize which material the frames are made of.

Supplier C had some problems in the implementation process and the figures and numbers became correct after a few recap meetings. The bottlenecks for HEMNES, LUNS, JONDAL and MALMA are in the machinery. It is only PS that has a bottleneck in the form of manual work.

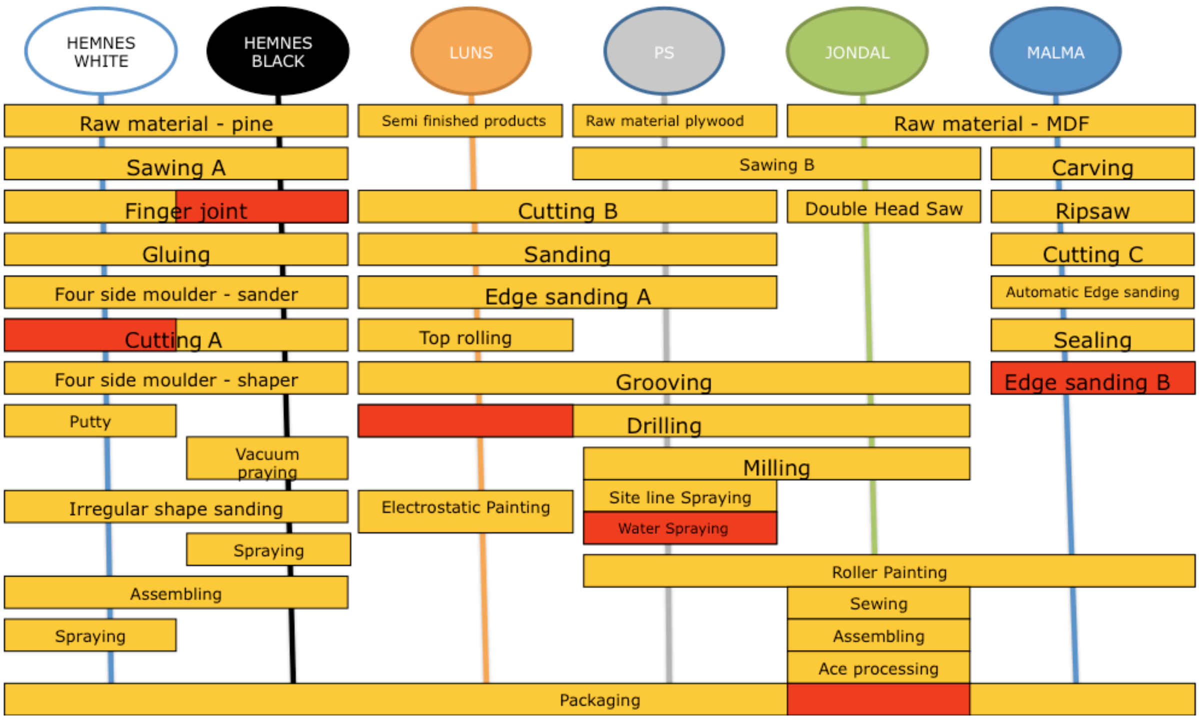

Figure 19: Supplier C production flow map

6.2.4 Supplier D

This supplier is also complicated with a complex production setup. Noteworthy is that two of the Product groups, UNG DRILL_FRAME and UNG DRILL_MIRROR, are only assembled and packaged. The parts are purchased from a sub-supplier and no actual production is performed. The other seven Product groups share some Resource groups as shown in Figure 20.

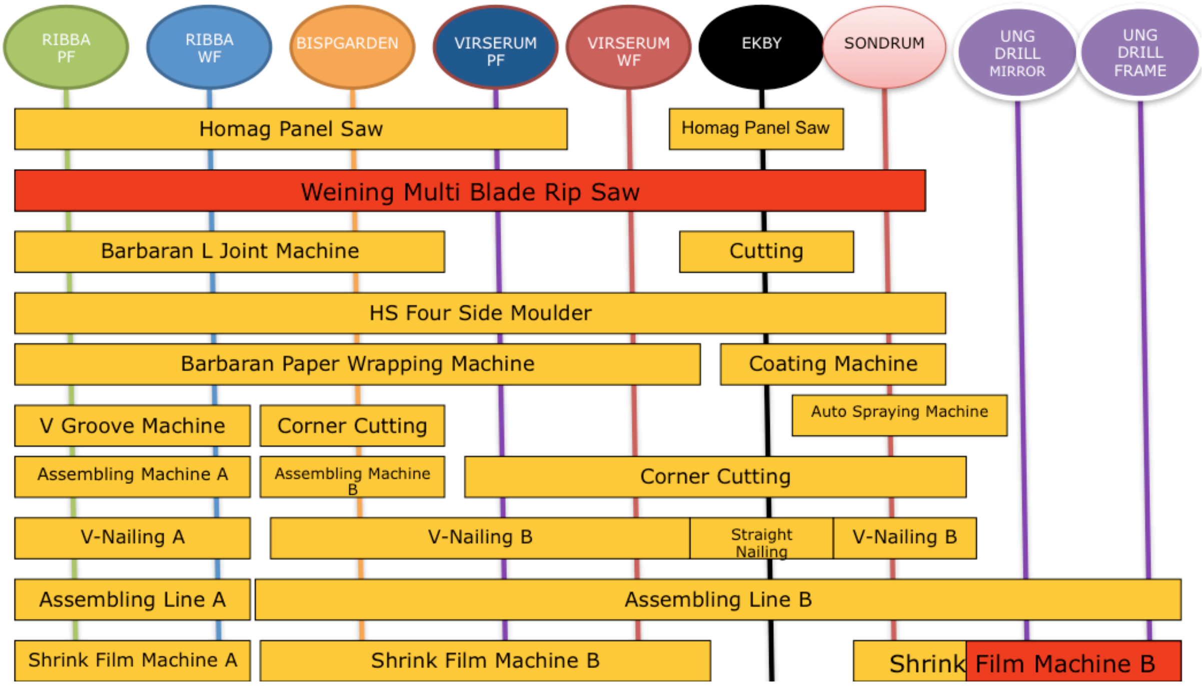

Figure 20: Supplier D production flow map

Discussions with the category were initiated early since VIRSERUM was first Product group. The quantities for VIRSERUM are large, and it was decided that the Product group should be divided into two, VIRSERUM photo frame (PF) and VIRSERUM wall frame (WF), since it suits the production better.

Supplier D was at the start not so motivated to implement the process. The person at Supplier D that became responsible for the project was not the right one, but after some pressure from IKEA, they realized that this project is important and that they can earn great savings. As seen in the production flow map in Figure 20, the bottlenecks for all the first seven Product groups is the *Weining Multi Blade Rip Saw*. The bottleneck for the two UNG DRILL Product groups is the *Shrink Film Machine B*.

6.2.5 Supplier E

The production process map for Supplier E is very simple with only two Product groups, both connected to the same Resource groups. The other articles produced for IKEA in this factory are free-range articles, which is outside the scope of this thesis. In Figure 21, the production flow map for Supplier E is presented.

The bottleneck for both Product groups is *Packaging*, which is a manual production Resource group.

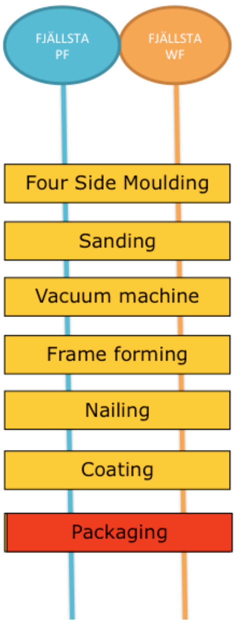

Figure 21: Supplier E production flow map

6.2.6 Supplier G

Supplier G's setup is also simple. Two of the Product groups are very similar and share their Resource groups. The other four Product groups have a similar production and therefore share their Resource groups. Since Supplier G manufactures digital clocks and other electronics, the production flow map and Resource groups are different from the other suppliers, see Figure 22.

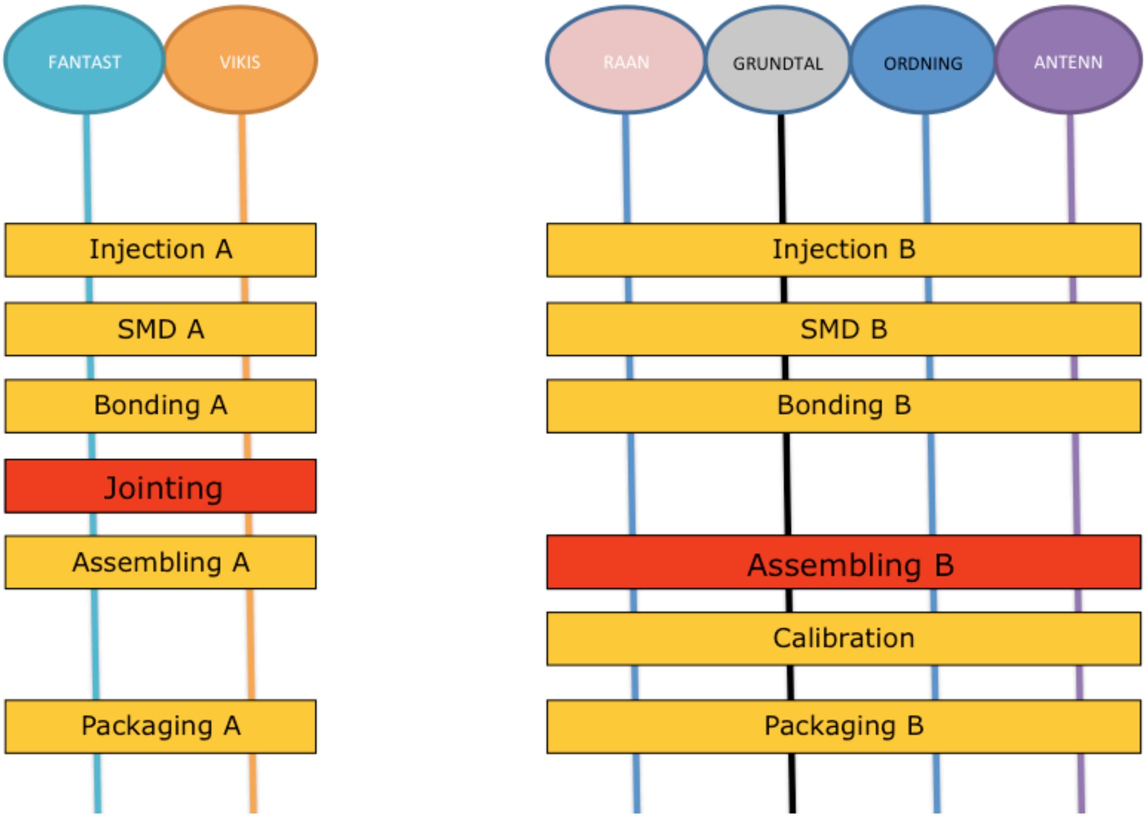

Figure 22: Supplier G production flow map

7. Analysis and evaluation of the implementation

In this chapter the empirical data is analyzed with the theoretical framework. Areas of improvements in the ONE Supplier Capacity Process and improvements for the local suppliers will be identified.

The analysis is structured after the four purposes of the thesis, analyzed one by one.

7.1 Map and analyze how IKEA is working today with capacity planning

By mapping IKEA's work today, the authors have detected several issues with capacity planning. The is a limited way of working with it, and on top of this, the ways working differ between suppliers and Supply Planners. The geographical between IKEA's Trading offices and IKEA of Sweden in Älmhult can sometimes create communication issues and clear definitions can get lost. Supplier capacity planning at IKEA can been seen from two different point of views: IKEA's and the suppliers'. From observations, data collection and interviews the capacity issues are detected. ONE Supplier Capacity Process strives to simplify IKEA's work with capacity planning and secure product availability. It is important to see the issues from two points of views to understand why the suppliers would like to share this kind of information with IKEA.

IKEA's point of view:

- Unawareness of supplier capacity – common terminology will create an overall picture of all suppliers' capacity.
- Sometimes IKEA has an urgent need of increasing capacity fast – the bottleneck classification tells IKEA how the capacity can be increased.
- Inability to predict accurate forecasts - capacity planning on an aggregated level decreases the need of a detailed forecast and postpones the specific article need.
- Great need to adapt to seasonality and holidays - a clear view of suppliers gives a better chance to react early to higher demand.

The following issues are summarized from the suppliers how a common way of working would improve their production planning together with IKEA.

Supplier's point of view:

- Order fluctuations – IKEA can better plan the need and prepare the suppliers in a proactive way of how to balance future orders.
- Unawareness of true production bottleneck capacity – education from IKEA gives the suppliers a better understanding of their own production.
- Too much and expensive safety stock – no need to keep a large safety stock if orders from IKEA are stable.
- Order cancellations – the suppliers can feel secure to be able to produce and deliver
- Difficulties to plan raw material need – IKEA's suppliers can get a chance to plan their raw material need from their sub-suppliers earlier.
- Too much time spent on labor planning – with a stable production, the labor need will be more balanced.

Since IKEA does not work in a common way with capacity planning today, there are no standardized methods for collecting the suppliers' capacities. This has created a variation of registered capacities in IKEA's software systems and limited spread of the knowledge concerning capacities within IKEA. In addition, employees at IKEA have different definitions of capacity. Supply Planners have limited possibilities to verify capacity data from the suppliers and cannot control the credibility of it. The trust is based on experience and "gut feeling". When new concepts and projects are rolled out, suppliers get different types of education and information depending on what approach the IKEA Trading Office uses. With the ONE Supplier Capacity Process the Supply Planner can assure true capacity data and it is easier to establish a two-way communication concerning the supplier's capacity. This creates a problem when IKEA suddenly experiences a much higher product demand, during sudden trends for example, than expected and need to increase their production fast. With too little control of the maximum capacity today, it is difficult to expand the production fast enough.

From a different point of view, IKEA's suppliers get information from the SPI systems, which both employees at IEKA and the suppliers admin not is accurate. The suppliers receive the SPI forecast and do not get any other opportunity to foresee the orders. Since IKEA admits the bad accuracy of the SPI, the mindset is transferred to the suppliers and they do not trust the figures. This creates a short-term planning behavior at the suppliers and they sometimes base their production on actual orders only a few weeks before estimated shipping day. As mentioned in the Theoretical Framework, a balanced product need is one way to avoid high fluctuations in the production, but with capacity awareness, allocation of the capacity can be performed to meet a fluctuating demand. The order fluctuations also lead to difficulties in planning the amount of raw material and labor for the suppliers.

In addition, the SPI needs to be improved so that both suppliers and IKEA can trust the forecasts more. With too much fluctuations and differences between estimated demand and actual demand, IKEA's fire fighting will continue and proactive capacity work is difficult to perform. The SPI forecast contains lots of information such as safety stock levels in IKEA's own distribution centers. Some of this information is unnecessary for the suppliers to have access to and does only create confusion and mislead the focus on the own production.

The main impressions from the supplier visits is that the knowledge concerning system bottleneck is low and it leads to worse capacity planning in some cases. With better education and a higher awareness of where the bottleneck should be, the whole production system can function smoother.

7.2 Implement "to-be", the common way of working with ONE Supplier Capacity Process

7.2.1 Similarities between the suppliers

Some similarities and differences between the suppliers have been noted during the work with this thesis. The project is focused on suppliers in Greater China where manual work in the production is common. Manual work is very flexible since the workers can change working stations, but as mentioned in Theoretical framework on page 17, the production speed varies from person to person and can sometimes be difficult to measure in an exact way compared to machinery production speed. For suppliers within the category *Frames and Mirrors with frames* with more automatic production, the average production speed might be easier and more stable to measure since machines have a stable production speed. In this thesis there are suppliers with both manual and automatic production and there are differences in the attitude towards the project. The suppliers with more manual production do not have the same motivation to get along with the project since they feel that it is more difficult to measure correct figures. On the other hand, the suppliers with more automatic production and line production say that they have a better control of their production and capacities.

Suppliers with a high amount of production that is dedicated to IKEA have been more motivated to implement the ONE Supplier Capacity Process. There has been more work with the suppliers with less IKEA dedication and the feeling is that the smaller IKEA dedication at a supplier, the more difficult it is to make the suppliers to understand why they should implement ONE Supplier Capacity Process and why it is a good idea. Since the implementation takes time and needs some effort from the suppliers' management in form of time and interest, they do not have the same motivation to do this if IKEA just have a small share of the production.

Investments of machines are expensive and it is important to utilize them well. Generally, labor is easier to add or remove, which makes a workforce's size flexible to adjust to current demand. This makes that manual work in China partly can be seen as a variable cost. It is clear that it looks like this. Suppliers with much automatic production do often have their bottlenecks in a machine while the suppliers with more labor-intensive production do not.

7.2.2 Case Study analysis

The analysis of the different suppliers' case studies is made from the completed Resource group capacity tables that have been filled in by the suppliers. Since the data collected is based on the current production set up, the analysis and some of the possible reallocations and other suggested changes in the production would lead to restructuring of the suppliers' manufacturing processes. The discussions are mostly about moving the bottlenecks from the manual parts of the production to the machines. All Product groups and Resource group are not mentioned in the analysis since the authors see small or no possibilities for capacity improvements. Due to limited time, the Resource group capacity tables for Supplier F and Supplier G has not been handled over yet and will not be analyzed further in this thesis. The Resource group capacity tables with exact numbers are presented in Appendix A.

Supplier A

Supplier A has a complex production flow map. There are three Product groups of NYTTJA, and the bottlenecks for two of them have the bottleneck type machine. NYTTJA_SMALL, the third Product group has the bottleneck in the Resource group *Packaging*. In Theory of Constraints, Goldratt says that it is often a good idea to have the bottleneck in the machine that is least flexible and most expensive to shift. The packaging machine is according to the production manager easy to shift to other sizes. *Packaging* is a Resource group that is divided between five different Product groups and with the current allocation there is capacity available and it is therefore a good idea to reallocate some capacity. If some capacity could be reallocated to *Packaging* for NYTTJA_SMALL, the bottleneck would move. The new bottleneck would be *Four Side Molding*, which is a machine that is complicated to shift. The capacity for NYTTJA_SMALL would with this operation increase with 306 pieces per week.

Labor, especially in China is very flexible and it is easy for Supplier A to add more workers. The production manager for Supplier A states that it would take him 20 days to double his workforce. This is an operation that would increase capacity for MAHULT. The bottleneck right now is in the *Assembly*. Since *Assembly* for MAHULT is not a shared Resource group it is not possible to reallocate any capacity. If Supplier A could increase the capacity by adding an extra hour in this Resource group, add more labor or increase the efficiency the capacity would be higher. If they could raise the capacity with 200 pieces per week, the bottleneck would move to *Packaging*, which is more favorable to have as a bottleneck since it is less flexible than *Assembly*.

Supplier B

Supplier B has a more simple production flow map than Supplier A. The bottleneck for RIBBA_PF, RIBBA_WF and ERIKSLUND is in the Resource group *Wrapping*. This machine is the most expensive and least flexible in the system and it is not possible to reallocate any capacity here. If they need to increase capacity here they need to invest in more machines.

For NYTTJA_MEDIUM and NORRLIDA, the bottleneck is in the Resource group *Assembling A*. NYTTJA_MEDIUMs current capacity in the bottleneck is 64.152 pieces per week. The average need for NYTTJA_MEDIUM for Supplier B is 55.918 pieces per week, which means that they have a utilization rate of 87%. This is a high utilization rate, and it would be a good idea to increase the capacity to secure availability. *Assembling A* is shared between five Product groups and it should definitely be possible to reallocate some of the capacity to NYTTJA_MEDIUM. If they would be able to increase the capacity with 16.848 pieces per week to 81.000 pieces per week the bottleneck moves to *Corner Cutting* and this would be an operation that would secure the capacity for NYTTJA_MEDIUM. The same operation could be made for NORRLIDA. The utilization rate is not as critical as for NYTTJA, but if they could increase the capacity by reallocation of capacity or hiring more workers in the *Assembling A*, the bottleneck would move to the *Corner Cutting* and increase the capacity to 9072 pieces per week, 1.296 pieces per week higher capacity than before.

Supplier C

Supplier C does not have any capacity issues at the moment. All Product groups have low utilization rates and there is right now no need to increase the capacity.

The Product groups made of pine have their bottlenecks in the machinery. HEMNES_BLACK has its bottleneck in the *Fingerjointing* that is a Resource group, which is shared with HEMNES_WHITE. In the Resource group capacity tables it is visible that the *Fingerjointing* is close to maximum capacity and this is the case for HEMNES_WHITE as well. This means that reallocation of the resources in *Fingerjointing* is not preferable.

The bottleneck for PS is in *Water Spraying*. *Water Spraying* is not shared with any other Product groups, which means that no reallocation of capacity is possible. *Water Spraying* is manual work and if Supplier C can add more labor or increase the productivity they could move the bottleneck to the *Sawing B*. This operation would increase the capacity with 487 pieces per week. The average need for PS is only 355 pieces per week so this operation is not necessary right now but if the need elevates, this could be a good thing to do.

MALMA is the Product group with the highest production volume for Supplier C, more than the other 5 together. The bottleneck for MALMA is in *Edge Sanding B* and since there are currently no capacity problems for Supplier C, no changes are necessary at the moment.

Supplier D

In the production flow map for Supplier D it is clear that all bottlenecks for Product groups that are manufactured in the factory are in *Weining Multi Blade Rip Saw*. Reallocation of the capacity is not possible and if Supplier D would like to increase their capacity they need to invest in new machines. The utilization rates are low at the moment and they do not have any capacity problems but if that would be the case in the future, one or more Rip saw machines are needed.

Supplier E

Supplier E is a very small supplier and do not have any capacity issues today. The production is only up and running for three weeks per year for IKEA and the rest of the year the frames are stored. The frames that can be analyzed are the Product groups FJALLSTA_PF and FJALLSTA_WF. The bottleneck at the moment is *Packaging* for both product groups. Reallocation of capacity cannot be done, and if the supplier wants to increase the capacity they have to add more labor, increase the efficiency on the current working stations or have the production running longer. *Packaging* is only manual work in this factory and if they could increase the capacity with 13 pieces per week, the bottleneck would change to *Sanding*.

7.3 Evaluate & prove savings

With ONE Supplier Capacity Process, IKEA will have a much better overview of all suppliers' total capacity than today. IKEA can faster react when a capacity limit is being approached at a supplier and prevent situations with unavailable products, see Theoretical Framework. A security concerning the registered capacities in the Global Purchasing System can avoid capacity fire fighting.

With more knowledge about capacity planning and its benefits, the suppliers will have the possibility to adapt to a changed product demand from IKEA since they know how and where to allocate the capacity to create an efficient production as mentioned on page 24. Local IKEA Trading offices will on top of this be able to help the supplier to restructure the production between shared Resource groups by allocating capacity and the supplier can avoid canceling orders.

ONE Supplier Capacity Process needs to be updated regularly to stay relevant, since the suppliers' production will change and look differently from year to year. Discussions on how often the concept should be updated have been held. A suggestion is to update three times a year, but this depends on the specific supplier and a dialog is necessary. In some cases, the production will look the same and no changes need. Then, there is not much work to do, but it is important to sort this out and state that the data still is correct. When the production is changed, the mapping and calculation of the capacities have to be updated. This requires a continuous maintenance work from the local IKEA Trading office.

Savings will be visual when a supplier can use ONE Supplier Capacity Process to allocate capacity between Product groups in the Resource groups. The template used during this implementation shows where the bottleneck is in today's production and the total size of the production capacity. Manual calculations are required to connect the Product groups and find the system bottleneck in cases where Resource groups are shared between Product groups. The information can be used to allocate capacity when the product need is changed and this will result in savings for both IKEA and the supplier in for example time to deliver and product availability. The template is simple and can be further improved by connecting the different

Product groups to each other and simplify the calculations. It does not automatically allocate the optimal allocation, instead it suggest where the reallocation could be made and then suppliers can, as mentioned in the Theoretical framework, get a better utilization of their capacity. However, the template provides the data for possible optimal reallocation.

The capacity figures received in the implementation are very difficult to compare to the old figures in GPS. The reason is the implementation of the new Product groups that are very different from the old way of dividing products. It is difficult to see if the suppliers have more capacity now than before, but security of the figures are more accurate according to the ONE Supplier Capacity Process.

7.4 Contribute to improve the ONE Supplier Capacity Process

Even though a project is planned in detail before implementation, there are situations impossible to foresee and prepare for. The implementation of ONE Supplier Capacity Process has just started and there are many chances to improve the upcoming implementation. The authors have found some areas of improvement and analyzed these further. Most of the suggestions are concerning the implementation of the project and based on the theory from chapter *3.4 How to implement a project.*

Create secureness for Supply Planners to implement and educate suppliers in the project

The supplier's main contact with IKEA is the Supply Planner at IKEA Trading office and most of IKEA's information goes through this person. Lots of responsibility is put on the Supply Planner to truly understand the concept and explain it to the supplier. Therefore it is important to support, encourage and help the Supply Planner to feel secure enough to question and push the supplier to the common way of working. Another benefit is to be able to answer the supplier's questions concerning the practical work.

Find a standardized way of working with supplier and avoid too much "friendship" between supplier and Supply Planner

Due to the lack of standardized ways of working with the suppliers, the Supply Planners does not know whether today's data from the suppliers are correct or not. The trust is based on experience and "gut feeling". When new concepts and projects are rolled out, all suppliers get different types of education and information. This can create information invalidity and confusion of in which direction the project is heading. With ONE Supplier Capacity Process the Supply Planner can assure true capacity data and it is easier to establish a two-way communication concerning the supplier's capacity.

Prepare the local team at IKEA Trading office

Due to the project's wide concept, everyone in the team has to be aware and susceptible of the mindset. Since the basic knowledge concerning capacity planning varies, some employees might have bigger concerns or a higher level of skepticism when it comes to acceptance of the new way of working. It is therefore important to involve the whole local team to "get everyone onboard" the project.

The local team in IKEA Trading office has to have a good understanding of the project before an implementation can start. The Business Developer needs to be aware of the time the team will have to spend on the project in the future and be supportive. If too little time is dedicated to the project and too many other projects are running, the project will not be carried out to the suppliers the way it is supposed to. The local team also has to read through the material and understand the overall concept in advance to make the most out of the kick-off week. It is important to implement the concept and the need of the concept within the team at an early stage.

Improve the level of knowledge concerning capacity planning to increase the understanding of the project concept.

During the interviews with Supply Planners, Need Planners and suppliers the authors detected that different levels of capacity planning knowledge is common. For involved with lower level of knowledge, it might be difficult to fully understand the concept, which might impair the outcome of the implementation. More education within the area can stimulate the interest of "what's in it for me?" Lack of knowledge creates the thinking of "I prefer the way we used to work", "I do not see the benefits of the concept" and

"How will this simplify IKEA's way of working?" with a better total understanding, knowledge can be shared and more see-through for everyone.

Simplify education material and translate it to mother tongue

IKEA's business language is English and most of the suppliers' employees in China do not speak or read English. To be able to inform and educate the employees, the material has to be easy to understand. Many of the suppliers asked for material to keep and to be able to read through and review on their own for higher understanding. Some suppliers expressed unwillingness to call the Supply Planner and ask for help with the given tasks, which creates an unnecessary gap in information. Instructions for the daily work and easy step-by-step information can simplify and shorten the time for implementation. A too difficult and long implementation plan can create inattentive work and mislead the focus.

Project Plan with time plan to involve the whole team

Due to the fact that the implementation needs deposited time from other work tasks and a permanent support from the local team leader at IKEA Trading office, a project plan is essential for everyone to see the individual responsibilities. A time plan will simplify the coordination with other tasks and show intended time for each and everyone in the team. The project plan should show gate checks and follow up meetings to clarify what is supposed to be done at what time. The team needs to share experiences along the way and compare results. This will trigger discussions to further improvements during the implementation and make it easier to meet the suppliers' questions as an aligned team with answers and experience. It is important to share identified problems to avoid the same mistakes in the future. All team members need to be involved even though not everyone is responsible for a big supplier.

Participation of the whole team in kick-off week to have everyone on board

To increase the success factor for the implementation a high degree of participation during the kick-off week is to recommend. It creates a common understanding of the project and a team spirit of how to carry it through with the best results possible. A common kick-off meeting will avoid that some members of the team fall behind the rest in terms of knowledge, since not everyone gets the same educational platform. It can also endanger the final results if not everyone has worked in the same way to reach the same results.

Make the benefits visible

It is easier to motivate and encourage people to work if the benefits are visible and the goal is clear. In this case, the suppliers need to be motivated to work together with IKEA, but they also need to be familiar with the amount of workload and the savings. Therefore, it is important to show the suppliers the benefits and how they can receive a better and more efficient production if they do their part of the work. Creating a spirit and feeling of "one team" with the supplier will help and create a better understanding of the main purpose of the project from a supplier point of view. Further, support and practical arrangements and expectations on the supplier should be clarified from IKEA.

Simplified information and tables to the suppliers

To make it easy for the suppliers, it is preferable that the initial information is simple and summarized on just a few pages. Too heavy material will not be read by the supplier and the main purpose might get lost. The tables to fill in have to be simple and short with instructions that are easy to follow. The supplier should not get the same education material as the employees at IKEA, since they do not need the same depth of understanding about capacity planning.

Select suitable suppliers for implementation of ONE Supplier Capacity Process

Naturally, some suppliers are more suitable for an introduction of the project than others. Reasons can be different levels of knowledge concerning capacity planning, contrariwise management or problematic production setup. Experience from the ONE Supplier Capacity Process indicates that automatic production is more suitable for this project mindset and a standardized way of implementing it can be used. With automatic production lines, the maximum capacity will be the same at all times, compared to manual production where workers have different work pace and the production speed can vary from day to day.

Definition of *capacity*

Depending on the type of Resource group in the production flow, the capacity looks different. Shared machines have start up time in the morning and need switch time between the products, which needs to be included in the average production capacity. To make the most of the project, clear definitions of which parameters should be included in the calculations is necessary. If every supplier calculates their maximum capacity considering different parameters, the reported result to IKEA will still not be comparable to the suppliers' capacities. Different parameters can be set up time, lunch breaks, worker performance and switching times. Throughout this thesis and during the implementation of ONE Supplier Capacity Process the calculation of different types of down times has been included in the allocated capacity, for all suppliers. Since there is no common definition of capacity the results might have a weakness in the numbers. The local team is aware of this and can easily adjust it.

ONE Supplier Capacity Process – a tool

It is important to remember that ONE Supplier Capacity Process is a tool to help IKEA and its supplier be better prepared for the customer demand. ONE Supplier Capacity Process will not solve demand fluctuations or sudden increased sales, but it can help IKEA to prepare the suppliers and create secureness for everyone involved in product availability process. It takes some time to adjust a new way of working. On top of this, the Resource group capacity tables are based on weekly forecast data from the SPI, which means that the average need is a forecast. The true average need is not visible until the order is sent. Therefore, a tool based on forecast is unlikely to be 100% correct, but as mentioned previously, unusual patterns might be detectable at an earlier stage than before.

8. Conclusions

The eighth chapter is the concluding chapter, which will provide guidance and recommendations for how the process could be implemented in the organization in the future. The chapter presents the deliverables and a discussion regarding advantages, disadvantages and possible improvements.

8.1 Conclusions and recommendations

Map and analyze how IKEA is working with capacity planning today
During the documentation of IKEA's way of working with supplier capacity planning today, many observations were made. There is no standardized way of working with collecting the suppliers' capacities and it would be helpful to do this in a common way for IKEA. The suppliers agree and think that ONE Supplier Capacity Process can contribute to a better control of the capacity in the future. IKEA employees also agree and describe different working methods, where clearer guidelines would improve their work. As mentioned in the analysis, the registered capacities in SPI can hopefully be more trustful.

Implement "to-be", the common way of working with ONE Supplier Capacity Process
In the analysis, possible areas of improvements for the local suppliers were identified. According to the Theory of Constraints, the bottleneck in a production line should be in the least flexible and often in expensive machine in the factory. Some of the bottlenecks right now are in the manual sections in the factories and the conclusion will be based on this fact and the recommendations is mostly about to change this.

Supplier A, which is the largest supplier in the category, has some areas where the capacities in the sections with more flexible Resource groups can be modified. NYTTJA_SMALL, which is the Product group with the highest average need, has its bottleneck in the Packaging section and with some reallocation of capacity, the bottleneck can be moved to *Four side molding* instead. This would lead to, except for a marginal increase of the capacity, to a more controlled knowledge of the capacity.

The authors have a similar recommendation for the second largest supplier, Supplier B. The utilization rate for NYTTJA_MEDIUM is very high and the bottleneck is *Assembling*. The Resource group *Assembling* is mainly manual work and if Supplier B is able to reallocate some capacity from the other Product groups that also share the Resource group *Assembling*, they will be able to increase the capacity, cut down the utilization rate significantly and change the bottleneck to *Corner cutting*. This would lead to a better control of the capacity and a possibility to react faster to a higher IKEA need.

The other suppliers that have been a part of this implementation have received a better understanding of their capacities in the production. This mindset, to strive for a more stable production with greater possibilities to react faster to fluctuations in IKEA's product need, will help the suppliers to a great extent.

Evaluate and prove savings
ONE Supplier Capacity Process is an ongoing implementation process at IKEA Trading office in Qingdao and the implementation will further continue to other IKEA sites worldwide. During the implementation in Qingdao, lots of questions came up concerning the concept and the "next step". It is important to answer and follow up these questions since visible improvements will encourage people to keep working with and maintain the concept.
Another area of interest is the hard factors and what result IKEA will see in the future from the project implementation. The results will be measureable when ONE Supplier Capacity Process has become a daily working method and this can further encourage an improved implementation of it.

A saving is the possibility to move the bottlenecks by allocating capacity. Since the production output will increase without investing any money, this can be measured as a hard factor saving. As mentioned in Analysis, recommendations for some suppliers are to move the system bottleneck to machinery instead of labor intense Resource groups. It is also a suggestion to have the bottleneck in the same Resource group for Product groups that share a Resource group.

Contribute to improve the ONE Supplier Capacity Process supported by appropriate theory

For the actual implementation, a few minor changes can make a large difference to smoothen the maintenance of the project and simplify the upcoming categories' implementations. The learning material has to be translated into local languages for a better understanding and to encourage reviews of the material from the suppliers. The learning material for the suppliers shall include a "sales pitch", describing the benefits for the supplier in a clear and motivating way. This is to stimulate their work and support them to further work with improvements. When the suppliers see the benefits, the willingness and eagerness to achieve better results will be stronger.

A learning material for the local IKEA Trading office to use when visiting the suppliers is helpful and will create a feeling of security in the team. The learning material should be simple with clear definitions and directions to follow and it should not be the same learning material for the suppliers as for IKEA Trading offices. In addition to this, a deeper describing material should be available for IKEA Trading offices where they can find answers to the questions from the suppliers during the implementation. This material can be written with more details than the supplier learning material with connecting theory to encourage thinking of future developments of the concept. The material should give hands-on instructions of how the concept is supposed to be implemented. Since the local IKEA Trading offices will be working a majority of the time with the maintenance of ONE Supplier Capacity Process, their opinions and thoughts are important for the whole project. Looking at a long-term perspective, further education of the IKEA Trading offices in capacity planning might be useful. The information can be brought back to the office and implemented at the suppliers as well. More knowledge in the area will give a wider perspective of IKEA's capacity problems and open minds towards new possibilities.

Other materials to develop are the templates. To be well functioning templates, the suppliers need simple templates to fill in. The suppliers should not have to spend too much time with this work, since they will lose interest if the work is too time consuming. Parameters to calculate have to be very well defined and deviations between the productions should be explained. It is preferable to have an automatic template that calculates switch time, set up time and breaks to avoid any miscalculations. The labor parameter, where an average is commonly calculated, needs a clear definition of what to consider such as lunch breaks and different working pace. A correct time plan is necessary to receive all data on time and not risk a delay in the project. The time plan should also include roles and responsibilities as a second security.

Looking at the project as a worldwide implementation, it is meaningful to compare and share experiences from different sites' implementations. When similarities are detected, better templates can be created and an improved, common way of working is possible. Occurred problems are important to share to avoid the same mistakes again and the implementation of ONE Supplier Capacity Process can be more streamlined. For example, a common platform where IKEA employees can share thoughts and ask questions might be a suggestion for the future. This will create a continuous communication channel even though everyone involved in the project is globally spread and an overview of the current progress.

8.2 Reflections

Finally, the authors would like to state some reflections on the master thesis work. It has been instructive to be a part of the implementation of ONE Supplier Capacity Process. As self-criticism, it is worth to mention that ONE Supplier Capacity Process was developed and established before the authors became a part of the project. The authors have been educated in the project by IKEA and this might have led to a subjective point of view on the concept.

Since benchmarking with other companies is outside the thesis's scope, this has not been made. It is an area for further investigation to see how other large, multinational companies handle capacity planning and secure product availability.

The authors have been located on IKEA Trading office in Qingdao and the thesis is based on the experience from that area. Other Trading offices might have different daily working methods, which can contribute in additional improvements during their implementations.

Only benefits and savings have been evaluated in the scope, but negative effects can also occur. ONE Supplier Capacity Process increases workload for both IKEA employees and IKEA's suppliers, which can be seen as a negative effect and continuous support will be needed. It is also important to remember that the suppliers sometimes refuse to share some information since IKEA is their customer. IKEA's purpose is not to be a part of the suppliers' production planning. Therefore, it is critical to distinguish between capacity planning and production planning.

9. References

Literature

Brown, S., Blackmon, K. and Cousins, P. (2001): *Operations Management,* United Kingdom, Butterworth-Heinemann Ltd

Darmer, P. and Freytag, P. (1999): *Företagsekonomisk undersökningsmetodik,* Lund, Studentlitteratur

Denscombe, M. (2006): *Forskningshandboken*, Lund, Studentlitteratur

Galloway, L., Rowbotham, F. and Azhashemi, M. (2007): *Operations Management in Context*, Oxford, Butterworth-Heinemann

Höst, M., Regnell, B. and Runesson, P. (2010): *Att genomföra examensarbete,* Malmö, Studentlitteratur

Jonsson, P. and Mattsson, S-A. (2011): *Logistik: läran om effektiva materialflöden,* Lund, Studentlitteratur

Ljungberg, A., Larsson, E. (2001): *Processbaserad verksamhetsutveckling,* Lund, Studentlitteratur.

Nahimas, S. (2008): *Production and Operations Analysis,* USA, McGraw Hill Higher Education

Paulsson, U. and Björklund, M. (2003): *Seminarieboken*, Lund, Studentlitteratur

Vollman, T., Berry, W. and Whybark, D. (2004): *Manufacturing Planning & Control Systems for Supply Chain Management,* Fifth edition, USA, McGraw-Hill Professional

Wetterauer , U. and Meyr, H. (2005): *Supply Chain Management and Advanced Planning,* Berlin, Springer Berlin Heidelberg

Articles

Accenture: *Profit, Sales & Operations Planning: A Key Component of Supply Chain Mastery,* (2008)

Balachandran, B., Balakrishnan, R. and Sivaramakrishnan, K. (1997): "Capacity Planning with demand uncertainty", *The Engineering Economist,* Vol 43: 1, 49 – 72

Bitran, G., Haas, E. and Hax, A. (1982): "Hierarchical Production Planning: A Two-Stage System", *Operation Research,* Vol. 30: 2, 232 - 251

Bitran, G. and Hax, A. (1977): "On the design of hierarchical planning systems", *MIT*

Bloodgood, J. and Katz, J. (2004): "Manufacturing capacity, market share and competitiveness", *CR,* Vol. 14:1, 60 - 71

Colwyn Jones, T. and Dugdale, D. (1998): "THEORY OF CONSTRAINTS: TRANSFORMING IDEAS?", *British Accounting Review*, Vol. 30, 73–91

Hammesfahr, J., Pope, J. and Ardalan, A. (1992): "Strategic Planning for Production Capacity", *International Journal of Operations & Production Management,* Vol 13:5, 41 - 53

Howard, A., Kochhar, A. and Dilworth, J. (2002): "A rule-base for the specification of manufacturing and control system activities", *International Journal of Operations & Production Management,* Vol22:1, 7 - 29

Huang, George Q., Lau, Jason S. K. and Mak, K. L. (2003): "The impacts of sharing production information on supply chain dynamics: A review of the literature", *International Journal of Production Research*, Vol. 41:7, 1483 — 1517

Olhager, J., Rudberg, M and Wikner, J. (2001): "Long-term capacity management: Linking the perspectives from manufacturing strategy and sales and operations planning”, *International Journal of Production Economics*, Vol. 69, 215-225

Olhager, J. and Johansson, P. (2012): “Linking long-term capacity management for manufacturing and service operations”*, Journal of Engineering and Technology Management*, Vol. 29, 22-33

Rajagopalan, S. and Hung-Liang, Y. (2001): “Capacity planning with congestion effects”, *European Journal of Operational Research,* Vol 134, 365 - 377

Sellstedt, B. (2002): “METODOLOGI FÖR FÖRETAGSEKONOMER: Ett försök till positionsbestämning”*, SSE/EFI Working Paper Series in Business Administration*, No 2002:7

Towill, D.R. and Childerhouse, P. (2010): “Industrial engineering priorities for improved demand chain performance”, *International Journal of Productivity and Performance Management,* Vol 60:3, 202 - 221

Verma, R. (1996): “Management Science, Theory of Constraints/Optimized Production Technology and Local Optimization”, *OMEGA – The International Journal of Management Science*, Vol. 25 No.2, 189-200

Watson, K. J., Blackstone, J. H. and Gardiner, S. C. (2007): “The evolution of a management philosophy: The theory of constraints”, *Journal of Operations Management*, Vol. 25, 387–402

Internal IKEA documents

IKEA Focus avaliability document, Process Team C (2010)

IKEA ONE Supplier Capacity Process v. 0.999 (2012)

IKEA Supplying BPM Manual, A supporting document for Plan & Secure Logistics, v. 0.98 (2009)

Oral sources
Andrukiewicz, Piotr, Plan & Secure Capacity, IKEA of Sweden, Älmhult (2012-01-27)

Astom, John, Logistics Manager Greater China, IKEA Trading Office, Shanghai (2012-03-22)

Björnsson, Paul, Plan & Secure Capacity, IKEA of Sweden, Älmhult (2012-01-23 – 2012-02-10)

Ding, Jessie, Supply Planner, IKEA Trading Office, Qingdao (2012-03-21)

Karlsson, Jens, Category leader *Frames and Mirrors with frames,* IKEA of Sweden, Älmhult (2012-02-13)

Nilsson I, Bertil, Department of Industrial Management and Logistics, Faculty of Engineering, Lund University (2012-01-16 – 2012-01-26)

Rosqvist, Henrik, Need Planner, IKEA of Sweden, Älmhult (2012-05-15)

Zhang, Kevin, Business Developer Manager, IKEA Trading Office, Qingdao (2012-05-22)

Zhang, Ruby, Supply Planner, IKEA Trading Office, Qingdao (2012-03-21)

Electronically sources
www.ikea.se

Appendix A: Capacity resource tables

Supplier A

NYTTJA_LARGE								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Consumption rate	5. Max working time in hours	6. Production capacity (pcs)	7. Allocated hours	8. Allocated capacity	
cutting	Y	2	193.6m/min	108	570240	10	116160	52800
four side molding	Y	1	120 m/min	96	314182	15	108000	49091
wrapping	Y	6	55 m/min	432	648000	33	108900	49500
cutting	Y	5	2.5 sec/pcs	336	483840	34	48960	48960
assembling	Y	12	6 sec/pcs	1152	691200	83	49800	49800
V-nailing	Y	14	8.3 sec/pcs	1344	582940	114	49446	49446
packaging	Y	6	3 sec/pcs	576	691200	41	49200	49200

NYTTJA_MEDIUM								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity (pcs)	7. Allocated hours	8. Allocated capacity	
cutting	Y	2	193.6 m/min	108	883470	23	267168	188146
four side molding	Y	1	120 m/min	96	486761	37	266400	187606
wrapping	Y	6	55 m/min	432	1003944	79	260700	183592
cutting	Y	5	1.42 sec/pcs	336	851831	73	185070	185070
assembling	Y	12	5 sec/pcs	1152	829440	255	183600	183600
V-nailing	Y	14	5 sec/pcs	1344	967680	255	183600	183600
packaging	Y	6	1.7 sec/pcs	576	1219765	88	186353	186353

NYTTJA_SMALL								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity (pcs)	7. Allocated hours	8. Allocated capacity	
cutting	Y	2	193.6 m/min	108	889736	30	348480	247149
four side moulding	Y	1	120 m/min	96	490213	48	345600	245106
wrapping	Y	6	55 m/min	432	1011064	105	346500	245745
cutting	Y	5	2.41 sec/pcs	336	501909	165	246473	246473
assembling	Y	12	8 sec/pcs	1152	518400	545	245250	245250
V-nailing	Y	14	5.4 sec/pcs	1344	896000	368	245333	245333
packaging	Y	6	2.5 sec/pcs	576	829440	170	244800	244800

RIBBA_BOX								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
cutting	Y	2	44 m/min	15,4	40656	9	23760	14622
gluing	Y	2	18.8 m/min	192	216576	20	22560	13883
four side moulding	Y	3	15 m/min	288	259200	25	22500	13846
wrapping	Y	6	10.8 m/min	432	279936	35	22680	13957
cutting	Y	5	8.49 sec/pcs	384	162827	33	13993	13993
assembling	Y	12	14 sec/pcs	1152	296229	54	13886	13886
packaging	Y	6	9.1 sec/pcs	576	227868	35	13846	13846

RIBBA_ALU								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
cutting	Y	2	108.4 m/min	10,2	66341	6	39024	22955
gluing	Y	1	15.8 m/min	192	182016	35	33180	19518
four side moulding	Y	6	15 m/min	288	259200	37	33300	19588
wrapping	Y	5	14.8 m/min	432	383616	38	33744	19849
cutting	Y	12	12.3 sec/pcs	384	112390	67	19610	19610
assembling	N	2	19.8 sec/pcs	192	34909	108	19636	19636
packaging	Y	6	11.14 sec/pcs	576	186140	61	19713	19713

STAVE								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
cutting	Y	2	88 m/min	36	190080	21	110880	27720
gluing	Y	2	18.8 m/min	192	216576	96	108288	27072
four side moulding	Y	3	15 m/min	288	259200	61	109800	27450
wrapping	Y	6	21.7 m/min	432	562464	84	109368	27342
cutting	Y	2	5.5 sec/pcs	192	125217	42	27391	27391
assembling	N	3	16 sec/pcs	288	64800	123	27675	27675
packaging	Y	2	9.6 sec/pcs	192	72000	73	27375	27375

BILLY_OLSBO								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
cutting	Y	2	45.6 m/min	17,2	47059	10	27360	9120
four side moulding	Y	3	9.2 m/min	288	158976	50	27600	9200
wrapping	N	2	5.1 m/min	192	58752	92	28152	9384
coating	N	1	18.5 sec/pcs	48	9153	48	9341	9341
assembling	N	1	18 sec/pcs	48	9600	47	9400	9400
packing	N	1	15 sec/pcs	48	11520	39	9360	9360

MAHULT								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
cutting	Y	2	170.5 m/min	5,2	53196	3	30690	38363
four side moulding	Y	1	60 m/min	96	345600	6	21600	27000
hot stamping	N	1	6 m/min	96	34560	59	21240	26550
cutting	N	1	5.6 sec/pcs	48	30857	40	25714	25714
assembling	N	3	17.1 sec/pcs	144	30316	120	25263	25263
packing	N	1	4.1 sec/pcs	48	42146	29	25463	25463

LEVANGER_SQUARE								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity (pcs)	7. Allocated hours	8. Allocated capacity	
cutting	N	1	24.4m/min	96	35136	8	2928	2928
wrapping	N	1	15m/min	96	21600	12	2700	2700
hot stamping	N	1	3.7m/min	48	2664	46	2553	2553
cutting	N	1	4.4m/min	96	24	44	2904	2904
assembling	N	2	89sec/pcs	96	3883	73	2953	2953
packing	N	1	35sec/pcs	48	4937	29	2983	2983

LEVANGER_OVAL								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
cutting	N	1	198 sec/pcs	48	873	35	636	636
assembling	N	1	166.8sec/pcs	48	1036	29	626	626
circular milling	N	2	274.2 sec/pcs	48	630	47	617	617
pargetting by hand	N	1	1046 sec/pcs	192	661	176	606	606
hot stamping by hand	N	2	1008 sec/pcs	192	686	170	607	607
painting	N	1	187.2 sec/pcs	48	923	32	615	615
packing	N	1	30 sec/pcs	48	5760	6	660	660

Supplier B

RIBBA_PF								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Board Cutting	Y	2	0,018	54	3067	21	1166	69932
Profile Glue	Y	1	0,025	54	2200	15	594	35637
Matcher	Y	2	0,043	54	1257	36	830	49779
Foil Wrap	Y	1	0,025	54	2200	15	594	35637
Corner Cutting	Y	2	0,050	54	1080	39	778	46656
Framing	Y	12	0,200	54	270	156	778	46656
Nail Punch	Y	6	0,100	54	540	87	875	52488
Assembly	Y	3	0,065	54	828	41	621	37260

RIBBA_WF								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Board Cutting	Y	2	0,042	54	1278	27	639	38340
Profile Glue	Y	1	0,059	54	918	19	330	19826
Matcher	Y	2	0,103	54	525	48	462	27694
Foil Wrap	Y	1	0,059	54	918	19	330	19826
Corner Cutting	Y	2	0,100	54	540	42	421	25272
Framing	Y	12	0,366	54	148	156	425	25505
Nail Punch	Y	6	0,188	54	288	91	484	29030
Assembly	Y	3	0,109	54	495	37	342	20493

ERIKSLUND								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Board Cutting	Y	2	0,050	54	1080	31	626	37584
Profile Glue	Y	1	0,062	54	871	20	322	19335
Matcher	Y	2	0,054	54	995	24	438	26278
Foil Wrap	Y	1	0,062	54	871	20	322	19335
Corner Cutting	Y	1	0,100	54	540	39	389	23328
Framing	Y	12	0,333	54	162	136	408	24494
Assembly	Y	3	0,100	54	540	32	324	19440

NORRLIDA								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Board Cutting	Y	2	0,05	54	1080	12	238	14256
Matcher	Y	1	0,072	54	747	20	276	16573
Foil Wrap	N	1	0,109	54	498	54	498	29862
Corner Cutting	Y	1	0,100	54	540	15	151	9072
Framing	Y	12	0,500	54	108	78	156	9331
Nail Punch	Y	6	0,250	54	216	45	181	10886
Assembly	Y	3	0,100	54	540	13	130	7776

NYTTJA_MEDIUM								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Consumption rate	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Board Cutting	Y	2	0,008	54	6696	16	2009	120528
Matcher	Y	1	0,014	54	3937	33	2441	146448
Foil Wrap	N	1	0,031	54	1722	54	1722	103341
Corner Cutting	Y	2	0,020	54	2700	27	1350	81000
Framing	Y	12	0,083	54	648	117	1400	83981
Nail Punch	Y	6	0,067	54	810	97	1458	87480
Assembly	Y	3	0,036	54	1485	39	1069	64152

STROMBY								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Corner Cutting3	N	3	0,154	54	350	162	1049	62964
Buckle3	N	3	0,146	54	370	162	1111	66651
Framing3	N	3	0,173	54	311	162	934	56052
Corner3	N	3	0,159	54	339	162	1017	61020
Glue3	N	3	0,141	54	382	162	1146	68734
Assembly3	N	3	0,141	54	382	162	1146	68734

Supplier C

HEMNES_WHITE								
Resource group	Shared machine (Y/N)	Resource group information				Capacity allocation		Final allocated capacity: total amount of pieces per week
		Nbr. Of machines in this RG	Production speed	weekly Max working time in hours	Production capacity	Allocated hours	Allocated capacity	
cutting machine	Y	2	0.125m/s	120	54000m	40	18000m	big3766pcs, small6000pcs
fingerjoint machine	Y	2	0.06m/s	240	51840m	70	15120m	big3163pcs, small5040pcs
wooden plate plying machine	Y	1	0.005m3/s	60	1080m3	10	180m3	big12000pcs, small15000pcs
four-sider moulder	Y	2	0.08m/s	120	34560m	30	17280m	big3615pcs, small 5760pcs
rip-saw	Y	1	0.26m/s	60	56160m	30	28080m	big5874pcs, small 9360pcs
HF wooden plate plying machine	Y	1	0.12m/s	120	51840m	30	12960m	3134 pcs
four side moulder for shaping	Y	1	0.15m/s	60	32400m	30	16200m	big3389pcs, small 5400pcs
coater machine	N	1	0.13m/s	60	28080m	60	28080m	big5874pcs, small 9360pcs
irregular shape sander	Y	2	0.18m/s	120	77760m	60	38880m	big8133pcs, small12960pcs
assembly flow line	Y	1	28.80s/pcs	60	7500pcs	30	3750pcs	3750pcs
site painting line	Y	1	0.13m/s	120	51840m	30	14040m	big2937pcs, small4680pcs
packaging line	Y	4	31.30s/pcs	240	27604pcs	32	3000pcs	3681pcs

HEMNES_BLACK								
Resource group	Shared machine (Y/N)	Resource group information				Capacity allocation		Final allocated capacity: total amount of pieces per week
		Nbr. Of machines in this RG	Production speed	weekly Max working time in hours	Production capacity	Allocated hours	Allocated capacity	
cutting machine	Y	2	0.125m/s	120	54000m	60	27000m	big5648pcs, small9000pcs
fingerjoint machine	Y	2	0.06m/s	240	51840m	70	15120m	3654 pcs
wooden plate plying machine	Y	1	0.005m3/s	60	1080m3	10	180m3	big12000pcs, small15000pcs
four-sider moulder	Y	2	0.08m/s	120	34560m	30	17280m	3615pcs, small 5760pcs
rip-saw	Y	1	0.26m/s	60	56160m	30	28080m	big5874pcs, small 9360pcs
HF wooden plate plying machine	Y	1	0.12m/s	120	51840m	40	17280m	big3615pcs, small 5760pcs
four side moulder for shaping	Y	1	0.15m/s	60	32400m	30	16200m	big3389pcs, small 5400pcs
vacuum praying machine	N	1	0.14m/s	60	30240m	60	30240m	big6326pcs, small10080pcs
irregular shape sander	Y	2	0.18m/s	120	77760m	60	38880m	big8133pcs, small12960pcs
site painting line	Y	1	0.13m/s	120	51840m	40	17280m	big3615pcs, small 5760pcs
assembly flow line	Y	1	28.80s/pcs	60	7500pcs	30	3750pcs	3750pcs
packaging line	Y	4	31.30s/pcs	240	27604pcs	32	3000pcs	3681pcs

LUNS								
Resource group	Shared machine (Y/N)	Resource group information				Capacity allocation		Final allocated capacity: total amount of pieces per week
		Nbr. Of machines in this RG	Production speed	weekly Max working time in hours	Production capacity	Allocated hours	Allocated capacity	
small saw	Y	2	59.03s/pcs	120	7318pcs	60	3659pcs	3659pcs
big sander	Y	2	24.05s/pcs	120	17963pcs	24	3593pcs	3593pcs
edge sander	Y	2	77.69s/pcs	120	5560pcs	80	3707pcs	3707pcs
top roll machine	Y	2	18.26s/pcs	120	23658pcs	20	3943pcs	3943pcs
groove broacher	Y	3	7.2s/pcs	180	90000pcs	8	4000pcs	4000pcs
drilling machine	Y	15	123.17s/pcs	900	26305pcs	113	3303pcs	3303pcs
electrostatic painting line	N	2	62.6s/pcs	120	6901pcs	60	3451pcs	3451pcs
packaging line	N	4	12.86s/pcs	240	67185pcs	13	3639pcs	3639pcs

PS								
Resource group	Shared machine (Y/N)	Resource group information				Capacity allocation		Final allocated capacity: total amount of pieces per week
		Nbr. Of machines in this RG	Production speed	weekly Max working time in hours	Production capacity	Allocated hours	Allocated capacity	
big saw	N	1	0.18m/s	60	38880m	18	11664m	1731pcs
small saw	Y	2	110.69s/pcs	120	3903pcs	40	1301pcs	1301pcs
big sander	Y	2	18s/pcs	120	24000pcs	7,5	1500pcs	1500pcs
edge sander	Y	2	79.66s/pcs	120	5423pcs	35	1582pcs	1582pcs
groove broacher	Y	3	47.52s/pcs	180	13636pcs	20	1515pcs	1515pcs
drilling machine	Y	15	132.79s/pcs	900	24399pcs	60	1627pcs	1627pcs
router	N	2	38.4s/pcs	120	11250pcs	16	1500pcs	1500pcs
site painting line	Y	1	40s/pcs	120	10800pcs	10	900pcs	900pcs
water curtain painting machine	N	2	531.13s/pcs	120	814pcs	120	814pcs	814pcs
roller painting line	Y	2	124.46s/pcs	120	3471pcs	36	1041pcs	1041pcs
packaging line	Y	4	24s/pcs	240	36000pcs	10	1500pcs	1500pcs

JONDAL								
Resource group	Shared machine (Y/N)	Resource group information				Capacity allocation		Final allocated capacity: total amount of pieces per week
		Nbr. Of machines in this RG	Production speed	weekly Max working time in hours	Production capacity	Allocated hours	Allocated capacity	
big saw	Y	1	0.18m/s	60	38880m	42	27216m	6804pcs
double-head saw	N	1	15.84s/pcs	60	13636pcs	60	13636pcs	13636pcs
groove broacher	Y	3	69.8 s/pcs	180	9284pcs	150	7736pcs	7736pcs
drilling machine	Y	15	16.44s/pcs	900	197080pcs	60	13138pcs	13138pcs
router	Y	2	39.61s/pcs	100	10906pcs	100	9089pcs	9089pcs
roller painting line	Y	2	9.47s/pcs	120	45617pcs	24	9126pcs	9126pcs
sewing machine	N	3	180s/pcs	360	7200pcs	480	7200pcs	7200pcs
flow line for fixing the PU and assembly	N	1	24s/pcs	60	9000pcs	60	9000pcs	9000pcs
flow line for surface treatment	N	1	30s/pcs	60	7200pcs	60	7200pcs	7200pcs
packaging line	Y	4	26.67s/pcs	240	32396pcs	50	6750pcs	6750pcs

MALMA								
Resource group	Shared machine (Y/N)	Resource group information				Capacity allocation		Final allocated capacity: total amount of pieces per week
		Nbr. Of machines in this RG	Production speed	weekly Max working time in hours	Production capacity	Allocated hours	Allocated capacity	
carving machine	N	6	12.45s/pcs	360	104096	360	104096	104096
multi-saw	N	1	1.64s/pcs	60	131707	60	131707	131707
big saw	N	1	1.44s/pcs	60	150000	60	150000	150000
automatic edge sanding line	N	1	1.40s/pcs	60	154286	60	154286	154286
Site spray paint line	Y	1	1.8s/pcs	120	240000	40	80000	80000
edge sander	N	2	3.6s/pcs	120	120000	80	80000	80000
primersander	N	1	2.25s/pcs	60	96000	60	96000	96000
roller painting	Y	2	2.25s/pcs	120	192000	60	96000	96000
packaging line	Y	4	2.57s/pcs	240	336187	60	84046	84046

Supplier D

RIBBA_PF								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Homag Panel Saw	Y	1	0,000054	36,0	662406	7,6	139841	139841
Weining Multi Blade Rap Saw	Y	1	0,000125	36,0	288743	9,2	73790	73790
Barbaran L Joint Machine	Y	3	0,000293	140,0	478322	59,0	201578	201578
HS Four Side Moulder	Y	2	0,000240	76,4	318881	18,0	75129	75129
Barbaran Paper Wrapping Machine	Y	3	0,000240	114,7	478322	31,0	129276	129276
V Groove Machine	Y	5	0,000850	210,0	246960	133,3	156761	156761
Assembling Machine A	Y	11	0,003333	495,0	148500	259,6	77880	77880
V-Nailing A	Y	6	0,001671	288,0	172368	150,7	90194	90194
Assembling Line A	Y	6	0,001754	288,0	164160	148,3	84531	84531
Shrink Film Machine A	Y	3	0,000877	144,0	164160	74,1	84474	84474

RIBBA_WF								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Homag Panel Saw	Y	1	0,000125	36,0	287774	10,0	79937	79937
Weining Multi Blade Rap Saw	Y	1	0,000287	36,0	125441	12,2	42510	42510
Barbaran L Joint Machine	Y	3	0,000670	140,0	209068	77,6	115883	115883
HS Four Side Moulder	Y	2	0,000548	76,4	139379	23,7	43237	43237
Barbaran Paper Wrapping Machine	Y	3	0,000549	114,7	209068	40,8	74368	74368
V Groove Machine	Y	5	0,000850	210,0	246960	76,7	90199	90199
Assembling Machine A	Y	11	0,005253	495,0	94234	235,4	44813	44813
V-Nailing A	Y	6	0,002646	288,0	108864	137,3	51899	51899
Assembling Line A	Y	6	0,002874	288,0	100224	139,7	48616	48616
Shrink Film Machine A	Y	3	0,001437	144,0	100224	69,9	48650	48650

BISPGARDEN								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Homag Panel Saw	Y	1	0,000293	36,0	122896	1,1	3755	3755
Weining Multi Blade Rap Saw	Y	1	0,000435	36,0	82710	0,9	2068	2068
Barbaran L Joint Machine	Y	3	0,000608	140,0	230303	3,4	5593	5593
HS Four Side Moulder	Y	2	0,000995	76,4	76768	2,1	2110	2110
Barbaran Paper Wrapping Machine	Y	3	0,000996	114,7	115152	3,6	3614	3614
Corner Cutting	Y	17	0,015130	816,0	53933	33,9	2241	2241
Assembling Machine B	N	2	0,013605	90,0	6615	90,0	6615	6615
V-Nailing B	Y	9	0,005079	432,0	85050	11,5	2264	2264
Assembling Line B	Y	10	0,007565	480,0	63450	16,7	2208	2208
Shrink Film Machine B	Y	3	0,003144	149,4	47520	6,8	2163	2163

VIRSERUM_PF								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Weining Multi Blade Rap Saw	Y	1	0,000095	36,0	379238	6,7	70580	70580
HS Four Side Moulder	Y	2	0,000262	76,4	291132	18,8	71640	71640
Barbaran Paper Wrapping Machine	Y	3	0,000263	114,7	436698	32,3	122976	122976
Corner Cutting	Y	17	0,004762	816,0	171360	367,4	77154	77154
V-Nailing B	Y	9	0,002755	432,0	156816	215,5	78227	78227
Assembling Line B	Y	10	0,002646	480,0	181440	200,8	75902	75902
Shrink Film Machine B	Y	3	0,000878	149,4	170100	65,7	74803	74803

VIRSERUM_WF								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Homag Panel Saw	Y	1	0,000254	36,0	141999	3,2	12622	12622
Weining Multi Blade Rap Saw	Y	1	0,000304	36,0	118333	2,0	6574	6574
HS Four Side Moulder	Y	2	0,000637	76,4	119911	4,3	6749	6749
Barbaran Paper Wrapping Machine	Y	3	0,000638	114,7	179866	7,4	11604	11604
Corner Cutting	Y	17	0,008591	816,0	94982	62,9	7322	7322
V-Nailing B	Y	9	0,005490	432,0	78693	40,8	7432	7432
Assembling Line B	Y	10	0,005241	480,0	91584	37,8	7212	7212
Shrink Film Machine B	Y	3	0,002280	149,4	65520	16,2	7105	7105

EKBY								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Homag Panel Saw	Y	1	0,000500	36,0	72000	14,1	28200	28200
Weining Multi Blade Rap Saw	Y	1	0,000047	36,0	769710	0,7	14967	14967
Cutting	N	1	0,000794	27,0	34020	27,0	34020	34020
HS Four Side Moulder	Y	2	0,000125	76,4	609354	1,9	15154	15154
Coating Machine	Y	3	0,000748	117,0	156347	17,5	23385	23385
Corner Cutting	Y	17	0,002778	816,0	293760	45,4	16344	16344
Straight-Nailing	N	1	0,002083	48,0	23040	48,0	23040	23040
Assembling Line B	Y	10	0,003005	480,0	159744	48,3	16074	16074

SONDRUM								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Weining Multi Blade Rap Saw	Y	1	0,000079	36,0	456563	4,2	53266	53266
HS Four Side Moulder	Y	2	0,000132	76,4	578313	7,2	54501	54501
Coating Machine	Y	3	0,001183	117,0	98922	99,5	84126	84126
Auto Spraying Machine	N	2	0,000657	92,0	140013	92,0	140013	140013
Corner Cutting	Y	17	0,005208	816,0	156672	306,3	58810	58810
V-Nailing B	Y	9	0,002755	432,0	156816	164,2	59605	59605
Assembling Line B	Y	10	0,002646	480,0	181440	153,0	57834	57834
Shrink Film Machine B	Y	3	0,000878	149,4	170100	50,1	57042	57042

UNG DRILL_MIRROR								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Assembling Line B	Y	10	0,004630	480,0	103680	18,8	4061	4061
Shrink Film Machine B	Y	3	0,001729	149,4	86400	6,9	3990	3990

UNG DRILL_FRAME								
1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Assembling Line B	Y	10	0,002347	480,0	204480	4,6	1960	1960
Shrink Film Machine B	Y	3	0,001729	149,4	86400	3,3	1908	1908

Supplier E

FJALLSTA_PF

1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Four side moulding	Y	2	6 meter/min	96	25263	25	6595	6595
Sanding machine	Y	2	15 meter/min	96	31579	9,7	6390	6390
Primer vacuum machine	Y	1	20 meter/min	48	42105	7,3	6475	6475
Frame forming machine	Y	2	4.3 pcs/min	96	24768	25,6	6605	6605
Nailing machine	Y	2	4.3 pcs/min	96	24768	25,7	6650	6650
Finishing coat on suspension wire	Y	1	5.55 pcs/min	48	15984	19,50	6500	6500
Packaging	Y	1	10 pcs/min	48	28800	10,6	6377	6377

FJALLSTA_WF

1. Resource group	2. Shared machine (Y/N)	Resource group information				Capacity allocation		9. Final allocated capacity: total amount of pieces per week
		3. Nbr. Of machines in this RG	4. Production speed	5. Max working time in hours	6. Production capacity	7. Allocated hours	8. Allocated capacity	
Four side moulding	Y	2	6 meter/min	96	11913	30,7	3815	3815
Sanding machine	Y	2	15 meter/min	96	14891	12,3	3805	3805
Primer vacuum machine	Y	1	20 meter/min	48	19855	9,2	3810	3810
Frame forming machine	Y	2	3.33 pcs/min	96	19181	19,1	3821	3821
Nailing machine	Y	2	3.33 pcs/min	96	19181	19,2	3842	3842
Finishing coat on suspension wire	Y	1	3.43 pcs/min	48	9878	18,5	3800	3800
Packaging	Y	1	5.87 pcs/min	48	16906	10,8	3794	3794

Appendix B: Interview guides

Supplier questionnaire

Supplier questionnaire: BEFORE IMPLEMENTATION

- How many customers do you have?
- How big part of your production is dedicated to IKEA? (%)
- Do you have any available capacity at the moment? (%)
- How many products do you produce for IKEA?
- Please specify the products:
- How many production lines do you have for IKEA's products?
- Divide your production in resource groups
- What is the bottleneck for the products?
- Please specify bottleneck for each product
- Specify the max capacity for every resource group
- Specify the type of bottleneck for each bottleneck according to the definition of bottleneck types
- How do you work with capacity planning today?
- How high is the cancellation approximately rate today?
- Is SPI a good tool for you?
- Do you think SPI gives accurate information to make a capacity plan?
- How many weeks of raw material safety stock do you have in general?
- Do you think it is too much or too little?
- How many weeks of product safety stock do you have in general?
- Do you think it is too much or too little?
- How easy it is to share production lines today?
- How easy it is to change production lines to another production today? And how long time does it take?

Supplier questionnaire: AFTER PRESENTATION

- Did you get enough information before the visit to prepare the tasks?
- Was the concept presentation clear?
- Can you see benefits for your company with an implementation of ONE Supplier Capacity Process?
- Do you think your capacity planning can get better with this concept?
- Do you think it will be worth the time to implement ONE Supplier Capacity Process?

Supplier questionnaire: AFTER IMPLEMENTATION

- Was it difficult to go from theory to reality?
- Which part of the implementation was most difficult to perform?
- Looking back, would you like to do anything different?
- Where can you see improvements?
- What kind of improvements?
- Can you see any future improvements?
- Would you have preferred any other information earlier in the implementation?
- Was there anything incorrect in the implementation?
- What support did you get from IKEA?
- Did you get the support you needed from IKEA?
- Are you satisfied so far with the implementation?
- Is this something you feel that you want to continue with?
- Was it difficult to create the supplier consumption table?

Supply Planner Interview

- Describe your tasks at IKEA. What are they and what do you do?
- Are you responsible for a number of specific suppliers?
- Do you corporate in your work with other supply planners?
- What systems do you work with? (SPI, Fulfillment, Cognos etc.?)
- Which numbers are you working with? Demand, need, orders, capacity etc.
- Explain SPI in short.
- Where do the figures come from?
- Describe how you work with capacity planning today.
- Daily
- Weekly
- Monthly

- How do you think the capacity planning is working today?
- Do you work the same way with all suppliers?
- If not, how do you adapt to different supplier needs?
- What differences are there between suppliers?

- How do you calculate lead-time?
- How do you calculate transport time?
- What is your main output from your work?
- Do you work in a specific structure to finish your tasks?
- How do you report your result?
- What is your specific result?
- What documents are used for reporting your work?
- What time frame are you working within?
- What is your opinion concerning the suppliers' knowledge in capacity planning?
- How well is the cooperation between IKEA and its suppliers working when it comes to capacity planning?
- Do you have a vision together with IKEA of which goals you are supposed to achieve?

- Do you experience that the suppliers are satisfied with IKEA as a customer?
- Show how you work with the figures from a supplier.
- Do you trust the figures?
- Do you think the figures are accurate?
- Can you tell, from the figures, that the supplier will be able to produce the order?
- How do you verify the figures?
- How much do you work together with Business Developers and Technicians?
- Would you like to change any routines to be able to get better results?
- Would you like to improve somewhere in your work?