

*Master Thesis*

# **Development of Key Performance Indicators for the Product Launch Process at IKEA Industry**

*Dennis Widmark & Rasmus Axenram*

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*Division of Machine Design • Department of Design Sciences  
Faculty of Engineering LTH • Lund University • 2015*



**LUND UNIVERSITY**



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## Preface

This master thesis was made in the end of our education to receive our master degree in Mechanical Engineering with Industrial Design, which is an education in product development. The master thesis was performed at the Division of Machine Design at LTH and in collaboration with IKEA Industry.

Since the subject of this master thesis not only included product development, but also processes and process management, the project started with developing an understanding of these two subjects. On recommendation of Hana Hulthén, PhD student at Engineering Logistics at LTH, we directly found the book *Improving Performance* from Geary A. Rummler and Alan P. Brache which saved us a lot of time. We would therefore like to thank her for the recommendation.

We would also like to thank IKEA Industry for giving us the possibility to do our master thesis in collaboration with the industry. We would especially like to thank our supervisor's, Daniel Åström at IKEA Industry and Damien Motte at LTH, for always taking their time to discuss about our thoughts and answering our questions. Without them the result would not have been the same.

Lund, June 2015

Dennis Widmark

Rasmus Axenram



## Abstract

The purpose of the project was to develop key performance indicators (KPIs) to measure and easily communicate the performance of IKEA Industry's new product development process; Product Launch Process (PLP), and their new products, NEWS. This to enable improvements of the process and the products.

The projects objectives were:

1. What performances of PLP should be measured?
2. What performances of NEWS should be measured?
3. How should the measurements be carried out?
4. When during the process should the performance be measured and followed up?

This project does not include improving PLP or setting goals for the developed KPIs.

The base for the used method was Rummler and Braches four step method *Develop Sound Measures* for finding measures. Due to the lack of a process map a different way of visualizing the most significant outputs and the critical dimensions was used. The creation of this visualization was added as a step, and the method was modified as followed:

1. Identify the most significant outputs of the Product Launch Process
2. Identify the critical dimensions of performance for each of these outputs
3. Visualize the most significant outputs and critical dimension
4. Develop the measures for each critical dimension

The main approach for the execution of the steps was to find what is important according to the literature and what IKEA Industry think is important and then combine the two. Methods used in the execution of the steps was based on product development methodology, literature studies, personal conversations, and questionnaires.

In this project, the developed KPIs are together measuring the five most significant outputs; *Resources, Time, Sustainability, Low Price, Form, and Function*. This, by measuring the critical dimensions communication efficiency, precision at sales start, less material, and easy assembly. The KPIs developed by IKEA Industry is measuring *Growth* and the most significant outputs *Time, Sustainability, and Quality*. All KPIs combined are therefore measuring Growth and all most significant outputs except for Continuous Improvement.

The project resulted in the following recommendations. IKEA Industry should start with implementing the recommended KPIs. After the KPIs is fully implemented, new KPIs can be developed and implemented to cover all most significant outputs in the goal map. However, to minimize the amount of KPIs used, it is recommended to only use one KPI per critical dimension, and strive for only one KPI per most significant output. To confirm that the KPIs are measuring what is meant it is recommended to evaluate them after a year.

**Keywords** Product Development, Key Performance Indicators, Measurement, Process Performance, Goal Visualization.

## Sammanfattning

Syftet med projektet var att utveckla nyckeltal för att mäta och lätt kunna kommunicera prestandan utav IKEA Industrys produktutvecklingsprocess Product Launch Process och deras nya produkter, NEWS. Detta för att möjliggöra förbättringar utav Product Launch Process.

Frågeställningarna för projektet var följande:

1. På vilket sätt bör Product Launch Process prestanda mätas?
2. På vilket sätt bör NEWS prestanda mätas?
3. Hur ska mätningarna genomföras?
4. När under processen ska mätningarna göras och följas upp?

Projektet inkluderar ej att förbättra själva processen Product Launch Process. Målsättning för nyckeltalen inkluderas heller inte i projektet.

Basen till metoden som användes i projektet var Rummler och Braches fyrstegsmetod *Develop Sound Measures* för att hitta mätetal [1, p. 185]. På grund av avsaknaden av en processkarta användes dock ett annat sätt att visualisera de mest betydelsefulla outputen och de kritiska dimensionerna. Skapandet utav denna visualiseringsmetod lades till som ett steg i den modifierade fyrstegsmetoden, vilken kan ses nedan:

1. Identifiera de mest betydelsefulla outputens i Product Launch Process
2. Identifiera de kritiska dimensionerna för prestandan för de mest betydelsefulla outputen
3. Visualisera de mest betydelsefulla outputen och kritiska dimensionerna.
4. Utveckla mätetal för varje kritisk dimension.

Det huvudsakliga tillvägagångssättet för genomförandet av de olika stegen var att jämföra vad som ansågs vara viktigt enligt litteraturen med vad IKEA Industry ansåg vara viktigt. Dessa kombinerades sedan med varandra. Metoderna som används i genomförandet utav de olika stegen baserades på produktutvecklingsmetodik, litteraturstudier, personliga samtal och enkäter.

De, i detta projekt, utvecklade nyckeltalen mäter tillsammans de sex mest betydelsefulla outputens; *Resurs, Tid, Hållbarhet, Lågt Pris, Form* och *Funktion*. Detta genom att mäta de kritiska dimensionerna; kommunikationseffektivitet, säljstartsprecision, mindre material och enkel montering. Nyckeltalen utvecklade utav IKEA Industry mäter Tillväxt och de mest betydelsefulla outputen Tid, Hållbarhet och



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## Acronyms and Abbreviations

<b>CEPQ</b>	Customer experienced product quality
<b>COPQ</b>	Cost of poor quality
<b>CRPQ</b>	Customer returned product quality
<b>DFP</b>	Develop Final Product
<b>DPOP</b>	Develop the Product Offer Process
<b>EQR</b>	Engineering Quality Requirement
<b>II</b>	IKEA Industry
<b>IID</b>	IKEA Industry Investment and Development
<b>IoS</b>	IKEA of Sweden
<b>KPI</b>	Key Performance Indicators
<b>PDA</b>	Product development assignment orders
<b>PDC</b>	Product Development Centers
<b>PDOC</b>	Product Documentation
<b>PIA</b>	Product Information App
<b>PLP</b>	Product Launch Process



# 1 Introduction

*In this chapter a short introduction of the IKEA Industry and the challenge they are facing is described. The chapter also introduces the purpose, objectives, and constraints of the project. Lastly the outline of the report is presented.*

## 1.1 Background

When optimizing the industrial operations inside the IKEA Group, more integrated ways of working between the IKEA Groups different companies were developed. Consequently, former Swedwood, Swedspan, and IKEA Industry Investment and Development (IIID) became IKEA Industry in 2013 [2, p. 3].

Even though the name IKEA Industry is new, Swedwood has produced furniture containing wood in different forms since 1991 and always with IKEA as a customer [3]. Hence, IKEA Industry contributes to the IKEA Group's effort achieving their vision "To create a better everyday life for the many people" by developing production capacities and with their industrial know-how in general [4, p. 2].

IKEA of Sweden is the company within the IKEA Group who owns and develops the products which the IKEA stores sell [4, p. 3]. IKEA Industry is competing with other suppliers to get contracts from IKEA of Sweden. To be IKEA of Sweden's preferred partner when developing and sourcing new products, which they call NEWS, IKEA Industry has developed, and recently implemented, a new product development process model called Product Launch Process (PLP) [5, p. 5].

IKEA Industry now needs to develop key performance indicators (KPIs) to measure and easily communicate the performance of the new Product Launch Process and NEWS, and in that way enable improvements of the Product Launch Process.

## 1.2 Purpose

The purpose of the project was to develop key performance indicators to measure and easily communicate the performance of the Product Launch Process and NEWS, and in that way enable improvements of the Product Launch Process.

## 1.3 Objectives

1. What performances of Product Launch Process should be measured?
2. What performances of NEWS should be measured?
3. How should the measurements be carried out?
4. When during the process should the performance be measured and followed up?

## 1.4 Constraints

This project does not include improving the Product Launch Process or setting goals for the developed KPIs. These activities are done by IKEA Industry itself.

The existing KPIs developed by IKEA Industry had to be considered. They needed to be included when stakeholders evaluated the KPIs.

## 1.5 Outline

This report is aimed for people who have a background in, or have good knowledge of the subjects taught in *Master of Science in Engineering, Mechanical Engineering with Industrial Design* and the stakeholders for the project at IKEA Industry. In the appendixes extra information regarding the developed KPIs can be found.

The report's outline is based on the modified four-step method *Developing Sound Measures* [1, p. 185] for finding measures, which is described in the method chapter. Note that there are some differences between the outline of the report and the composition of the method. Before the first step in the used method, IKEA, and the product development processes within IKEA of Sweden and IKEA Industry, is described. Then the four steps in the method follow in chronological order. However, step one and two are described in the same chapter. The last two chapters in the report are conclusion and recommendation, and discussion.

The report structure is as following:

### 1.5.1 Introduction

In this chapter a short introduction of the IKEA Industry and the challenge they are facing is described. The chapter also introduces the purpose, objectives, and constraints of the project. Lastly the outline of the report is presented.

### 1.5.2 Method and Process

In this chapter the overall method is described, as well as the theory it is based on. In the section *approach from literature* it is explained what measures should contribute with and how to find them. This is summarized in Rummler and Brache's [1, p. 185] four-step method for finding measures, which is then modified to better suit the project. The modified method can be seen in the section *modified approach*. In the last section, *actual process*, it is described how the project actually proceeded.

### 1.5.3 The IKEA Group and its Development Processes

In this chapter an overview of the IKEA Group, the IKEA Groups processes, IKEA Industry, and PLP is presented. IKEA of Sweden's development process Develop the Product Offer Process (DPOP) is introduced. A deeper explanation of all the steps in IKEA Industry's process Product Launch Process is also included in this chapter.

#### *1.5.4 Identify the Most Significant Outputs and Critical Dimensions*

This chapter describes what the most significant outputs and critical dimensions in a product development process should be according to literature. It corresponds to the first two steps of the method Developing Sound Measures [1, p. 185]. It also describes IKEA Industry's most significant outputs and critical dimensions based on internal IKEA documents. The most significant outputs and critical dimensions is then identified and presented.

#### *1.5.5 Visualize the Most Significant Outputs and the Critical Dimensions*

In this chapter the goal map is presented. The goal map can be described as a visualization of the connection between the most significant outputs and the critical dimensions, but also PLP' connection with IKEA's vision.

#### *1.5.6 Develop the Measures for Each Critical Dimension*

In this chapter criteria for assessing the measures are presented and compiled in a product specification list. The procedure and result of the generation and selection of KPIs is also explained. However, this should not be read as a method but as a way to present the result without showing all brainstorming material and generated KPIs. The further developed KPIs is then explained in detail.

#### *1.5.7 Conclusion and Recommendation*

This chapter includes conclusion of the result and recommendations for the proceeding work with the KPIs.

#### *1.5.8 Discussion*

In this chapter a discussion about the time plan, collaboration, method, information sources, and project information gathering is held.



## 2 Method and Process

*In this chapter the overall method is described, as well as the theory it is based on. In the section approach from literature it is explained what measures should contribute with and how to find them. This is summarized in Rummler and Brache's [1, p. 185] four-step method for finding measures, which is then modified to better suit the project. The modified method can be seen in the section modified approach. In the last section, actual process, it is described how the project actually proceeded.*

### 2.1 Approach from Literature

According to Rummler and Brache [1] an organization is like an ecosystem where every internal and external part of the organization is connected with each other. They mean that to improve organization and individual performance, an understanding of these connections must be established. One way to establish a connection is to describe the ecosystem with the *Three Levels of Performance*. The different levels are the *Organization Level*, the *Process Level* and the *Job/Performer Level*. The Organization Level emphasizes the relationship between the organization and its market. The Process Level describes the cross-functional processes within the organization. It is through the processes the organization produce its output in the form of products and services. The actual activities are performed in the Job/Performer level [1, pp. 4-5, 12-14].

To meet the customers' expectations of the organization's products, service quality, timeliness, cost, and quantity, goals in each Level of Performance are required [1, p. 15]. One type of organizational goals are strategic objectives. Strategic objectives are the goals of an organization, which are viewed as the most important for an organization's health [6]. These objectives are always in some way connected with the vision and strategy of the organization [7, p. 493]. The goals in the Process Level and the Job/Performer Level should be derived from the organizational goals and reflect the functions' expected contribution to the organization. If not, the functions within the organization can become "enemies" and not see that they work to achieve a common goal [1, pp. 15-21].

Measures used to measure the organization's goal fulfillment is called key performance indicators, which is a part of an organization's performance measurement system. Compared to production, product development is a process with a high information flow rather than material flow. Developing measures for product development therefore becomes harder [8, pp. 27-28]. The amount of information for developing measures for product development is much smaller than for production, where KPIs have been used

for a long time. Due to the differences between production and product development, the approach and measures used in production cannot be used directly.

When developing measures, it is important to quantify all relevant actions by individual metrics, together forming a system able to quantify the whole picture of actions. The individual metric is called performance measure and is able to quantify the effectiveness and/or the efficiency of an action. The quantification of actions' effectiveness and efficiency at an aggregated level is however delivered by the performance measurement system [9, p. 80]. A performance measure can in itself be a KPI, but not all performance measures are counted as KPIs.

Measures affect the employee's way of working and decision making. The relationship between measures and the organization's overall goal is therefore of highest importance [1, pp. 182-192] and [9, p. 83]. If the relationships between the goals and the measures are clarified, the measures will contribute to reaching the desired level of performance. On the other hand, if they only are related to the optimization of a specific part of the organization, or if the measures interfere with each other, it will lead to sub optimization of the organization's performance. An organization without measures will also have trouble reaching the desired level of performance [1, pp. 182-184].

Generally, it is important that measures are output-driven, customer focused, and reflect the reality that outputs most often are multidimensional. For example, if the customer requirements include both quality and quantity, the measures must reflect this [1, p. 186].

A method considering the theory above is Rummler and Brache's four step method *Develop Sound Measures* [1, p. 185] for finding measures, which can be seen below:

1. Identify the most significant outputs of the organization, process or job.
2. Identify the critical dimensions of performance for each of these outputs. Critical dimensions of quality include accuracy, ease of use, novelty, reliability, ease of repair, and appearance. Critical dimensions of productivity include quantity, rate, and timeliness. Critical dimensions of cost include labor, material, and overhead. Critical dimensions should be derived from the needs of the internal and external customers who receive the outputs and from the financial needs of the business.
3. Develop the measures for each critical dimension. For example, if "ease of use" has been identified as a critical dimension of quality for a given output, one or more measures should answer this question: "What indicators will tell us if our customers find our product or service (output) easy to use?"
4. Develop goals, or standards, for each measure. A goal is a specific level of performance expectation. For example, if a measure for ease of use is "number of customer questions/complaints regarding product use," a goal may be "no more than two questions/complaints per month." As continuous improvement efforts bear fruit, goals should become more ambitious.

The four step method used is based on the assumption that a process map is available, or can be developed. A process map is Rummler and Brache's way of visualizing the process. It shows the connections between its functions and activities, which make it

possible to allocate the critical dimensions at specific activities. The process map, with its critical dimensions, explains what contributes to the fulfilment of the most significant outputs [1, pp. 42-61].

## 2.2 Modified Approach

Due to the constraints of the project, the lack of a process map, and lack of time and resources to develop one, the four step method was modified to better suit the project. Furthermore, PLP is visualized in a different way than a process map and therefore a different way of visualizing the most significant outputs and the critical dimensions was used. This visualization method is called goal map and is described in detail in Chapter 5.1. This was added as a step in the modified four step method. The modified four step method can be seen below:

1. Identify the most significant outputs of the Product Launch Process
2. Identify the critical dimensions of performance for each of these outputs
3. Visualize the most significant outputs and critical dimensions
4. Develop the measures for each critical dimension

## 2.3 Actual Process

*In the project the supervisor at IKEA Industry is referred as the Project Engineer at IKEA Industry.*

The project started with gathering information about KPIs, organizational structures, the IKEA Group's organizational structure, processes, and the processes within the IKEA Group.

An overviewing understanding of the PLP was gathered during a presentation at the Product Development Center (PDC) in Goleniów, Poland, which was necessary for the continued work with the project. During the presentation relations with key stakeholders within IKEA Industry was established to enable future conversations and feedback.

To see how KPIs could be used within an organization, a field trip to the Toyota factory in Mjölby, Sweden, was made. Information and inspiration about KPIs suitable for product development, and the usage of them, was gathered during the field trip.

To develop a deeper understanding of KPIs and organizational structures, a literature study was conducted. The literature studied was gathered from books and articles from databases. The different literature sources was used to receive a broad spectra of information. The literature study resulted in a method for developing KPIs, which then was used during the project.

To identify PLP's most significant outputs and critical dimensions, a deeper understanding of the IKEA organization and its process had to be attained and anchored in the literature. This was made by searching for strategic objectives by analyzing internal documents at the IKEA Group's intranet IKEA Inside and conducting personal conversations with key stakeholders within IKEA Industry. By using both documents and personal conversations, different views of the organization was received, which

broadened the understanding of the organization. The description of the critical dimensions was then confirmed by the Project Engineer at IKEA Industry.

Next step in the project was to develop a goal map. The purpose of the goal map was to visualize the connections between the vision of IKEA, the most significant outputs and the critical dimensions.

When creating the goal map, most significant outputs and critical dimensions was connected back and forth with each other to create a suggestion of the goal map. The goal map suggestion was then presented for the Leader at Technique and PDC IKEA Industry and the Project Engineer at IKEA Industry who gave feedback and validated the content. The feedback and improvements was an iterative process which led to the final goal map.

After establishing the goal map a product specification list was established. The function analysis was based on demands from IKEA Industry and requirements from literature. When the different functions was established, they were graded based on their importance. The reason for developing a product specification list, was to have an objective selection of which KPIs to develop further.

The creation of the product specification list was an iterative process. When the first draft of the product specification list was created the Project Engineer at IKEA Industry was consulted to give feedback. Based on the feedback the product specification list was updated and again reevaluated by the Project Engineer.

After establishing the product specification list, a field trip to IKEA of Sweden was made. At IKEA of Sweden personal conversations with employees with different areas of responsibility was executed. This was made to investigate what they thought would be important to measure within the product development process, and what they did not think worked properly within DPOP and the PLP today.

After the field trip, the generation of KPIs started with brainstorming. The brainstorming consisted of four phases. The purpose with the different phases was to produce as many ideas as possible, develop chosen ideas, and develop chosen ideas, respectively.

Based on the critical dimensions in the goal map and IKEA Industry's goal *Growth*, as many KPIs as possible were generated in the first brainstorming phase. The brainstorming was based on input from four different sources: literature, personal conversations with employees within IKEA, and current KPIs within IKEA. In the first brainstorming as many ideas as possible were generated.

The list of KPI suggestions was then reduced by discussing which KPIs best fulfilled the functions. They were discussed based on all functions, but the focus was on the functions with importance four (on a scale 1-5). However, at least one KPI suggestion per critical dimension was selected. The KPIs not fulfilling the five functions well enough were then developed further to a more realistic version or disregarded completely. The more realistic versions of the developed KPIs were added to the list. This list of KPIs was then used as input in the brainstorming phase two, which included brainstorming with the Project Engineer at IKEA Industry.

To get a better understanding of which KPIs the stakeholders within IKEA Industry would like to use, a questionnaire was executed with seven stakeholders at IKEA Industry. These were the Product Technician at IKEA Industry, the Product Developer at IKEA Industry, the Technician at Trading Material Area IKEA Industry, the Team Leader at IKEA Industry, the Business Development Manager at IKEA Industry, the Project Leader at Technique and PDC IKEA Industry, and the Project Engineer at IKEA Industry. The questionnaire focused on what the stakeholders thought was a successful product development process, what they thought was crucial for a successful product development process, and what they thought would be good to measure. The stakeholders also suggested suitable KPIs. Based on the answers brainstorming phase three was executed. From the brainstorming and the KPI suggestions from the stakeholders, more KPIs were added to the KPI suggestion list.

Before the next step, the KPIs that were developed by IKEA Industry prior and in parallel to this project was added to the KPI suggestion list. The KPIs were presented to the key stakeholders within IKEA Industry during a workshop. These stakeholders were the Project Leader at Technique and PDC at IKEA Industry, the Project Engineer at IKEA Industry, the Technical Manager at IKEA Industry, the Business Development Manager at IKEA Industry, and the Supply Chain Manager at IKEA Industry. In the workshop the KPIs were discussed and developed further. This was brainstorming phase four, which resulted in the final KPI suggestions.

Based on the feedback during the workshop, the Project Engineer at IKEA Industry selected seven KPIs measuring four critical dimensions. These KPIs was then developed further to be ready for implementation in PLP.

The final development included a more detailed explanation of how to gather the input data and when to measure. It also included to see if it was possible to develop a baseline for the KPIs, where the baseline would be based on historical data from previous projects. The facts in the explanations of the further developed KPIs comes from personal conversations with the Project Leader at EQR (engineering quality requirement) Development IKEA of Sweden, Project Leader at Technique and PDC IKEA Industry, Business Analyst at Industrial Strategies IKEA Industry, and Technician at Trading Material Area IKEA Industry.

Lastly, a final selection of the three suggestions of KPIs measuring less material was executed. This selection was based on reasoning about the KPIs pros and cons.



## 3 The IKEA Group and its Development Processes

*In this chapter an overview of the IKEA Group, the IKEA Groups processes, IKEA Industry, and the PLP is presented. IKEA of Sweden's process Develop the Product Offer Process (DPOP) is introduced. A deeper explanation of all the steps in IKEA Industry's process PLP is also included in this chapter.*

### 3.1 The IKEA Group and its Processes

The IKEA Group is the parent company of the IKEA organization. It consists of three main “legs”: Production, Range & Supply, and Retail & Expansion, see Figure 3.1. The Range and Supply leg is operated by the company IKEA of Sweden. IKEA of Sweden's purpose is to develop new products and make sure these are produced. They are also the owner of IKEA's product range. IKEA Industry operates in the production leg, and the IKEA stores operate in the Retail & Expansion leg, [3] and [10].

IKEA of Sweden introduced, and fully implemented, a new way of working within the organization in December 2014. This process is called Develop the Product Offer Process (DPOP) and contains two sub processes: Develop the Final Product Offer (DFP) and Develop Shared Solutions, see Figure 3.2. The new process enables more closely collaborations with team members and the production [4, p. 3].

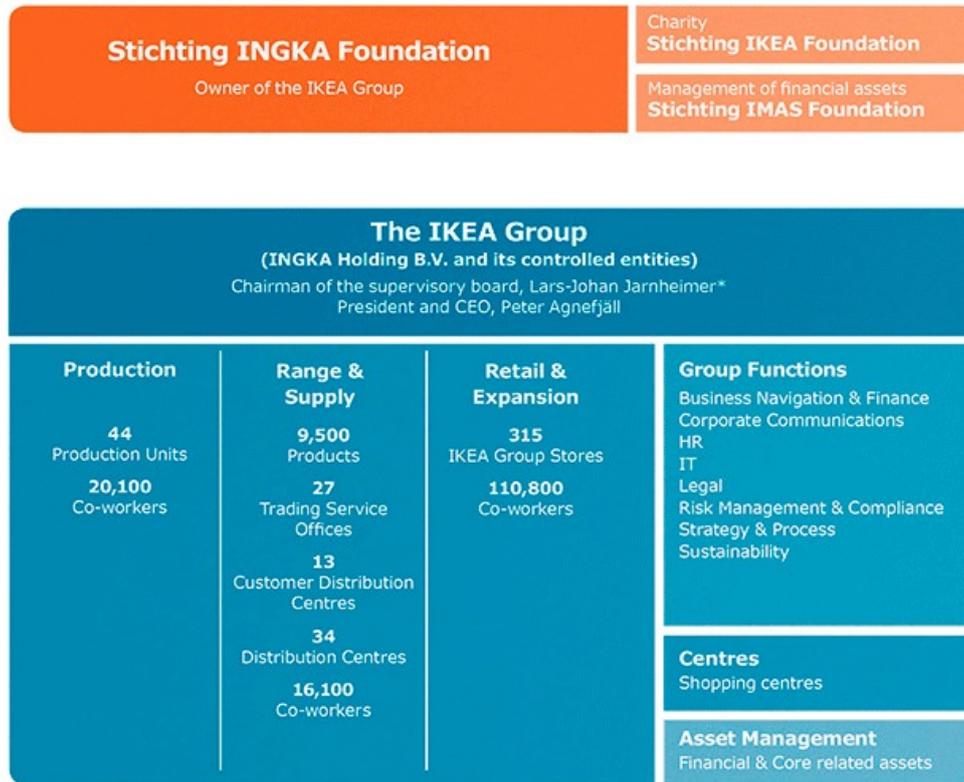
DFP is the product development process within IKEA. Its purpose is to develop and deliver the products to IKEA's customers, and take actions needed for communication and production of the products. The process is developed to make the products best meet all dimensions of Democratic Design<sup>1</sup> [4, pp. 3, 7].

### 3.2 IKEA Industry

IKEA Industry is one of the companies included in the IKEA Group. When optimizing the industrial operations inside the IKEA Group, more integrated ways of working was developed. Consequently, former Swedwood, Swedspan, and IIID became IKEA Industry in 2013, with closer collaboration between them and IKEA of Sweden as a result [2, p. 3]

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<sup>1</sup> Democratic Design is further described in chapter 4.2.



**Figure 3.1** The IKEA Group structure [10]



**Figure 3.2** Develop the Final Product Process [4, p. 3]

Even though the name IKEA Industry is new, Swedwood has produced furniture containing wood in different forms since 1991 and always with IKEA as a customer. Hence, IKEA Industry contributes to the IKEA Group's effort achieving their vision *"To create a better everyday life for the many people"* by developing production capacities and with their industrial know-how overall. They have 44 production units in eleven countries [4, p. 2].

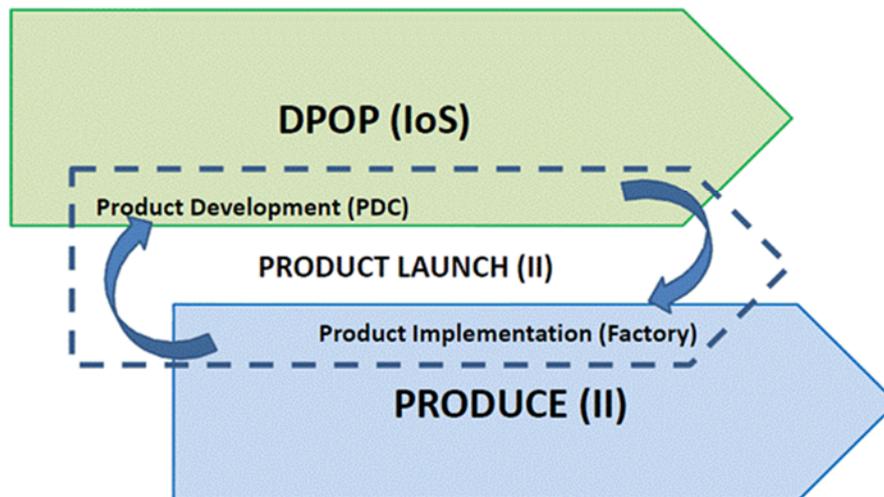
The divisions of IKEA Industry are Flatline, Solid Wood, Division Board, and Purchase. When developing new products the divisions have a support function, which is called Product Development Center. Solid Wood has the responsibility for the products made of solid wood, while Flatline has the responsibility for developing products made of the materials board on frame or board. The boards used in Flatline should be innovative, durable, lightweight, and based on sustainable wood. Division board are the producer of the boards [3].

### 3.3 Product Launch Process

IKEA Industry has developed, and recently implemented, a new way of working when developing NEWS. NEWS are all new article numbers developed and produced by IKEA Industry until six months after sales start date [3].

The developed process is called Product Launch Process. This process describes how IKEA Industry's Product Development Centers and Factories should work. It also describes how IKEA Industry wants to connect DPOP with Produce, where Produce is the production at IKEA Industry, see Figure 3.3 [5].

#### Launch – IKEA Context



**Figure 3.3** PLP connects DPOP with Produce, where IoS is IKEA of Sweden and II is IKEA Industry [5, p. 5]

PLP's main goal is to better fulfill the deliverables given from IKEA of Sweden. IKEA Industry has a specific strategic plan with goals for improving the product development, called Product Development Plan. PLP is one of the steps in IKEA Industry's way towards reaching their goals [11]. One of the goals with PLP is to do as much as possible in the beginning of the projects. This due to the rule of ten, which describes how the costs for changes increases exponentially in every process step [5, p. 58].

The two main functions involved in PLP are PDC Furniture and Factory, where Factory is the umbrella term for IKEA Industries factories. The two main types of projects in PLP are the Development Project and the Implementation Project. Development Projects is led by PDC Furniture while Implementation Project is led by Factory. Nevertheless, there should be close collaboration between the two functions throughout the whole project [12, p. 4].

PLP consist of six different process steps, which all includes activities, tollgates, input and outputs to the activities, and actions. The six different process steps in PLP are *Pre-study*, *Create Democratic Design*, *Product Development*, *Product Industrialization*, *Production Start-up* and *Follow-up* [12, p. 4].

#### 3.3.1 *Pre-study*

The purpose of Pre-study is to identify what is needed to be done, and influence the project scope to fit IKEA Industry's capability by giving input to IKEA of Sweden. To do this, an overall picture of the procedure to accomplish the project scope is created, and input to IKEA of Sweden about design, materials, production techniques, cost, and time plan is given. The complexity and already existing knowledge of the product decides if a pre-study needs to be performed or not [3] and [12, p. 4]. One important activity in Pre-study is for Division Flatline or Division Solid Wood to decide if they are interested in developing and producing the product [12, p. 6].

#### 3.3.2 *Create Democratic Design*

In Create Democratic Design IKEA of Sweden's designers and IKEA Industry's PDC project team collaborate to create a design which fulfill the requirements related to production, packaging, and quality. The designers comes with product design proposals including form, function, and material, which the PDC project team then concretize by building several prototypes. When building the prototypes, the PDC project team also work on how the product should be assembled. The PDC Project team then evaluates the prototypes and gives feedback to IKEA of Sweden [3] and [12, p. 9].

#### 3.3.3 *Product Development*

Before starting the process step *Product Development*, a participating factory is assigned. IKEA of Sweden has also approved the design, solutions, and business case before this process step. During Product Development the product's construction, package, and easiness and fastness of assembly is developed and finalized. Furthermore, materials are identified, technical solutions are created, and tests of the product's properties and risk assessments are done. All this lead to a pre-0-series which is then approved by Purchase operations, which is a company within IKEA Group [12, p. 16].

#### 3.3.4 *Product Industrialization*

The main goal in the process step Product Industrialization is to make the whole product suitable for mass production and handling in the supply chain. Material, tools, and machines get sourced, and the preparation and production of the 0-series get performed.

The 0-series is then approved by Purchase operations to be sent for production [3] and [12, p. 27].

### *3.3.5 Production Start-up*

In the process step Production Start-up the first unit load is produced and checked. The first unit load is then delivered to the IKEA stores. However, it is not necessarily IKEA Industry who is manufacturing the product. IKEA of Sweden may assign an external factory to produce the product. By using PLP IKEA Industry hopes to be IKEA of Sweden's first choice in producing the developed products [3] and [12, pp. 40-41].

### *3.3.6 Production and Follow-up*

When the product has been produced and has been in sale for six months the project is followed up. To have information to base the follow-up on, information during the production and sales is gathered and compared with the targets of the project. If problems are identified based on deviations between targets and performance, a problem solving activity starts. Important information from the finished project is documented to be used as lessons learned in coming projects [12, pp. 43-46].



## **4 Identify the Most Significant Outputs and the Critical Dimensions of the Product Launch Process**

*This chapter describes what the most significant outputs and critical dimensions in a product development process should be according to literature. It also describes IKEA Industry's most significant outputs and critical dimensions based on internal IKEA documents. The most significant outputs and critical dimensions is then identified and presented.*

### **4.1 Most Significant Outputs and Critical Dimensions in a Product Development Process According to the Literature**

Ulrich and Eppinger describes product development as "*the set of activities beginning with the perception of a market opportunity and ending in the production, sale, and delivery of any product*" [13, p. 2]. The purpose with product development processes is therefore to develop a profitable product, which can be produced efficiently. Hence, to know if the product was successful or not, information about the profitability of the product is important. However, measures of the profitability often are indirect and hard to determine during product development. To determine the performance of product development, other factors therefore are more suitable to assess. These factors includes product quality, product cost, development time, development cost, and development capability, which are easier to determine and strongly related to the profitability [13, pp. 2-3]. These factors can be described as a product development process' most significant outputs.

As mentioned, the five factors enable the product development process to be profitable. However, more factors can be important for an organization. Two of those factors are industrial design, and design for environment [13, pp. 2-3, 211, 231].

Product quality includes the products quality in form of robustness, reliability, function, value, and appearance, which are quality factors the customer regards when purchasing products. Product cost includes the manufacturing cost in form of machinery, tooling, and material. Development time includes the time it takes to develop the product. It also determines the organizations ability to respond to competitors and new technologies. Development cost includes the amount of money the organization has to spend on the development of the product. This dimension usually have a big impact on the total investment needed to enable a profitable product. Development capability includes the organizations ability to develop future products more efficiently and

cheaper. The output of Industrial design includes the products function, value, and appearance, which is valuable both for customers and manufactures. Industrial design has a big part of the successfulness of a product, due to its big impact on customer perception of a product. Design for environment includes sustainability factors like material usage, material type, recyclability, and emissions. Considering design for environment is something that can both reduce costs and increase product quality [13, pp. 2-3, 210-211, 230-231]. The details for the most significant outputs can be described as the product development process' critical dimensions.

As previously described, the performance of the product development process depends on how well the requirements of the customers are met, which is the effectiveness, and how economically the company's resources are used, which is the efficiency. This means, if the effectiveness and efficiency is measured, it is the same as the performance is measured, [8, p. 29] and [9, p. 80]. This is in line with what Rummmler and Brache say. They say that a process consumes resources and should therefore not only be assessed based on the value it adds, but also on the resources in form of people, material, capital, and equipment it consumes [1, p. 43].

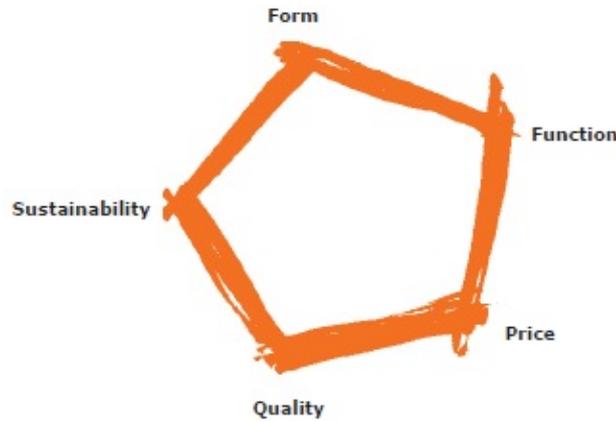
Based on the definition of effectiveness and efficiency, the different product development process' factors can be grouped. Development time, development capability, and development cost is grouped under efficiency. Product quality, product cost, industrial design, and design for environment are grouped under effectiveness.

#### **4.2 Most Significant Output According to IKEA**

IKEA's product philosophy is based on what they call *Democratic Design*, see Figure 4.1. Democratic Design consists of five factors: *Form*, *Function*, *Low Price*, *Quality*, and *Sustainability*. These five factors are equally important to be considered by the designers, product developers, and producers. However, each developed product can have different ambitions for the different factors, [3] and [14].

For IKEA Form means to create beautiful things, while Function means to ease the everyday life. The Form is mainly developed by IKEA of Sweden but IKEA Industry is contributing. Price is an important factor for IKEA. If they have a low price on their products it means more people can afford them. IKEA can in that way create a better everyday life for more people than if the products would cost more. In Quality both customer quality requirements as well as the quality requirements by law is included. Among other things Quality is about how long the products last [15, pp. 124-125]. Further, IKEA Industry's ambition is to be the leader in sustainable furniture production. They want all their products to be made from wood from recycling or well-managed forests. Economical usage of resources and making more from less is focus areas in the production, [16, pp. 23, 25] and [17].

Besides democratic design, IKEA has a goal considering growth. Growth means more sold products to more people, which is in line with IKEA's vision [18].



**Figure 4.1** Democratic Design [4, p. 4]

**4.3 Most Significant Outputs in the Product Launch Process**

Based on the literature and Democratic Design, eight most significant outputs for PLP were identified. Five of them are both included in Democratic Design and the literature, while three only exists in the literature. The three in the literature has been renamed to better suit the IKEA terminology. In table 4.1 the eight most significant outputs, and each output’s corresponding output in Democratic Design and literature, is presented.

Growth is strongly related to Low Price. However, all most significant outputs contribute to IKEA’s growth, which leads to that growth is not suitable to be set as a most significant output.

**Table 4.1** The most significant outputs and their corresponding output in Democratic Design and literature

Most significant outputs	Democratic Design	Literature
Continuous Improvement	---	Development capability
Resources	---	Development cost
Time	---	Development time
Quality	Quality	Product quality
Low Price	Low Price	Product cost
Sustainability	Sustainability	Design for environment
Form	Form	Industrial design, Product quality
Function	Function	Industrial design, Product quality

#### 4.4 Critical Dimensions in the Product Launch Process

The critical dimensions are identified in IKEA documents and by personal conversations and are based on strategic objectives. In this section the critical dimensions are listed. The connection between the critical dimensions and most significant outputs are visualized in the next chapter. The critical dimensions are:

1. Continuous improvement by follow-up [5, p. 36]
2. Learnings are taken, shared and used [5, p. 36]
3. Satisfied co-workers [5, p. 36]
4. Optimal usage of resources [13]
5. Communication Efficiency [19]
6. Precision at sales start [4, p. 4]
7. Lead time [11, p. 4]
8. Standardized ways of working. [11, p. 4]
9. Improve customer perception of quality [4, p. 4]
10. Better quality - Product always comply to requirement [5, p. 36]
11. Less material [16, pp. 23, 25]
12. Raw material utilization [16, pp. 23, 25]
13. Production efficiency [3]
14. Smooth ramp up in production [5, p. 36]
15. More sustainable products [16, p. 23]
16. Improve customer perception of the range [4, p. 4]
17. Create innovative solutions including industrialization to fulfill all aspects of Democratic design [5, p. 36]
18. Easy assembly [20, p. 4]

## 5 Visualize the Most Significant Outputs and Critical Dimensions

*In this chapter the goal map is presented. The goal map can be described as a visualization of the connection between the most significant outputs and the critical dimensions, but also PLP's connection with IKEA's vision.*

### 5.1 Goal Map

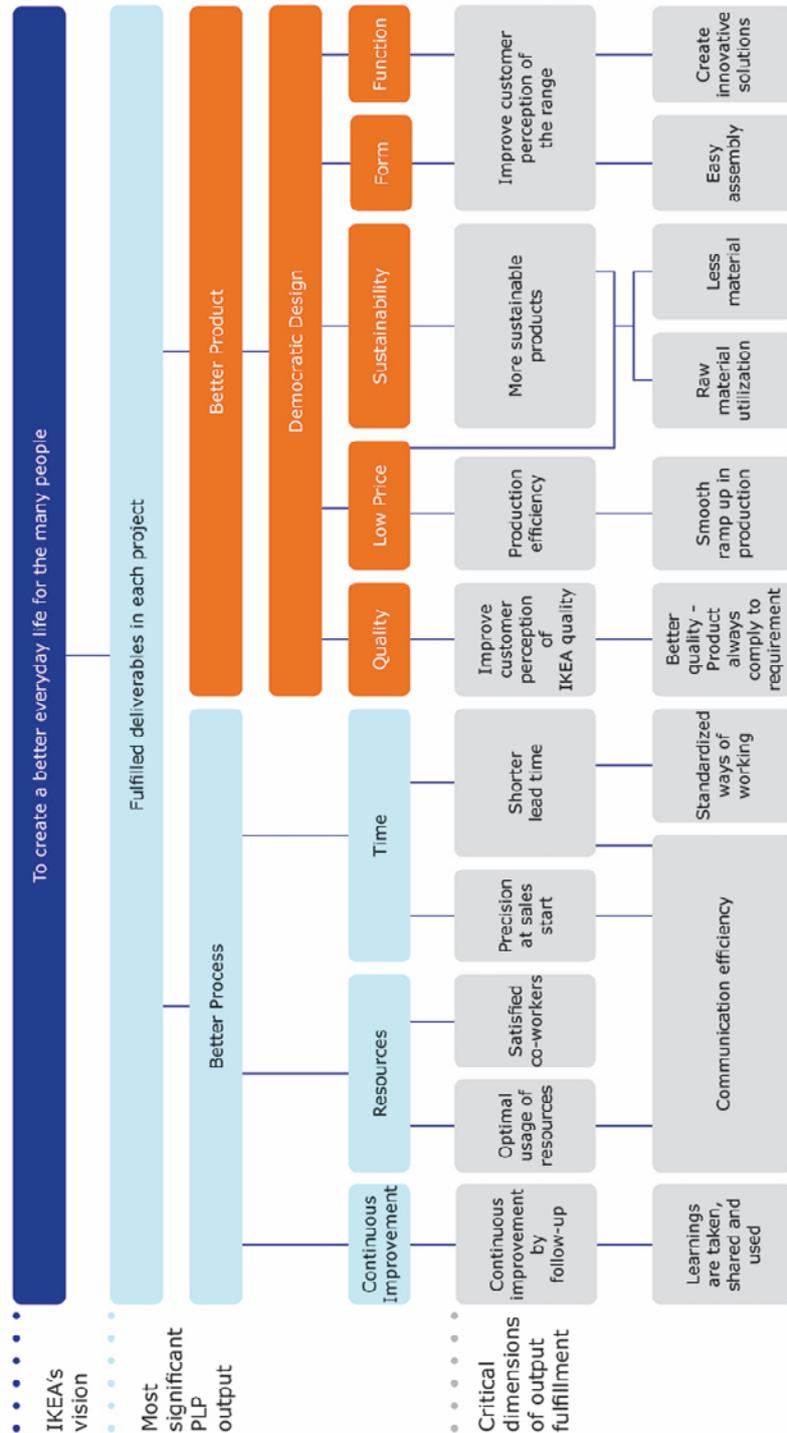
The goal map can be described as a visualization of the connection between the most significant outputs and the critical dimensions, but also PLP's connection with IKEA's vision, see Figure 5.1. The vision is the box in dark blue. The goal map should be interpreted as the lower boxes being dimensions contributing to the performance of the boxes above.

PLP contribute to IKEA Industry's pursuit of fulfilling the vision by contributing in the development of NEWS. Hence, PLP's most significant outputs are the deliverables, which can be divided into two groups, Better Process and Better Product. Better Process mostly describes the efficiency of the process, while Better Products mostly describes the effectiveness of the process. Most significant outputs are the boxes in light blue and orange.

Better Process includes the most significant outputs Continuous Improvement, Recourses, and Time and Better Product includes the most significant outputs Quality, Low Price, Sustainability, Form, and Function, which is the dimensions included in Democratic Design.

All critical dimensions are contributing to the fulfillment of the outputs. The critical dimensions are the boxes in gray.

## 5 Visualize the Most Significant Outputs and Critical Dimensions



**Figure 5.1** A goal map visualizing the connection between the most significant outputs and the critical dimensions, but also PLP' connection with IKEA's vision

## 6 Develop the Measures for Each Critical Dimension

*In this chapter criteria for assessing the measures are presented and compiled in a product specification list. The procedure and result of the generation and selection of KPIs is also explained. However, this should not be read as a method but as a way to present the result without showing all brainstorming material and generated KPIs. The further developed KPIs is then explained in detail.*

### 6.1 Criteria of Measures

According to Dombrowski, Schmidtchen, and Ebentreich, when developing performance measurement systems, seven criteria, when choosing indicators, should be used. They are: relevance for the enterprise targets, quality of data, compatibility to the hierarchy, variability, periodicity, visualization, and effort [8, pp. 28-29].

Relevance for the enterprise targets means that even if an amount of possible measures exists, it is important the used measures are synchronized with the target system of the organization. This will help the employees to work in a direction, which supports the targets [8, p. 28].

Quality of data contains two different main requirements, which are important to the measures of effectiveness. The two requirements are the validity and the timeliness, which together determinates the quality of data. The validity is determined by the employee's, working with the measures, and understanding of how his /her work affects the measures. To create this understanding it is important the measures is influenced directly by the employee's performance. This understanding will support the validity of the measures. The timeliness refers to how often the data needs to be gathered and how much effort the data gathering takes [8, p. 28].

Compatibility to the hierarchy means that the measures should be monitored with information relevant for the persons it is showed for. Some measures need to be modified to show relevant information while others can be used at all levels [8, p. 28]. This is important so that the employees within the organization clearly can see how their work efforts affects the measures.

Variability means that it must be possible to change the weight of the measures importance when the goals are changing due to the organization's environment [8, p. 28].

An indicator's periodicity depends on what it is used for. The periodicity for measures for the current state and targets, needs to be less than a month. Measures indicating the future state are based on long-term goals and can therefore have longer periodicity. The periodicity is often different on different levels in the business. On corporate level, summarized information is often needed, which makes the periodicity longer. The periodicity on operational level is however shorter because they need to know the current state. In other words the feedback needs to be more frequent the closer the measures are to the value creating activities [8, p. 28].

Visualization means that the measures should be visualized in a way that makes it possible for the involved people to see the status and direction of them. To communicate the importance, the visualization should also be near the involved employees [8, p. 28]. According to Neely, Gregory, and Platts, a measure is best visualized if presented as a ratio [9, p. 97]. This is connected with what Brache and Rummmler say about the importance of a measurement system which make it clear where improvements of the process can be made, either by managers or employees. Due to the risk of becoming overwhelmed by too many measures, Brache and Rummmler says that the measurement system should rather focus on few important measures than a big amount of measures [1, pp. 191, 207].

Effort means that there always is effort involved in using measures, and that they have to be evaluated in how much benefit they contribute with in comparison with the cost. Examples of efforts connected with the usage of measures are generation of measures, data gathering and processing, and representation and feedback [8, p. 28].

Another description of how "sound measures" should be is that they should be SMART - specific, measurable, actionable, relevant, and timely. Specific means that it should be clear what each measure is measuring, and also that the differences between the measures should be clear. Measurable means that measure should be measureable with good data. Actionable means that it should be clear and easy to see if the measure indicates if it is going good or bad. Relevant means that the measures should be relevant for the process it measures, and if they are not, they should not be used. Timely means that the data should be presented when it is needed [21, p. 7]. Dombrowski, Schmidtchen, and Ebentreich's criteria for measurement systems and SMART together enable the organization to compare measures with different divisions within the organization, as well as with other companies [9, p. 97].

### **6.2 Criteria of Measures from IKEA**

According to the Project Engineer at IKEA Industry, an existing baseline of data for the KPIs is wanted but not required. A baseline is data showing the historical performance making it possible to evaluate the performance of today and set goals for the future. The Project Engineer thinks it is better to find and develop suitable KPIs without existing baseline than semi-suitable KPIs with existing baseline. It is also a desire from IKEA Industry's point of view to be able to present the KPI results in the computer software QlikView. The Project Engineer also emphasizes that the KPI system IKEA Industry will use cannot be in conflict with the KPI system IKEA of Sweden uses [3].

### 6.3 Visualization and Ranking of Measure Criteria

To anchor a product in the customer needs, it is important to identify the needs by interacting with the customers. When customer needs are identified, it is necessary to establish the relative importance of the needs. The importance of the needs could be visualized in a product specification list, where every need's importance is ranked from one to five. Five indicate that the need is of highest importance and one indicates low importance [13, pp. 80-93]. The same system is used for the KPIs where the different criteria described in the two previous sections are the needs and the KPIs are the solutions.

#### 6.3.1 Product Specification List

Based on the purpose of the project and in collaboration with the Project Engineer at IKEA Industry, the main function of the developed KPI system was decided to be "*Communicate current process and/or product performance*".

Based on the criteria of measures from literature and IKEA documents a product specification list was developed, see Table 6.1.

### 6.4 Generation and Selection of KPIs

In the first brainstorming phase as many ideas as possible were generated. KPI suggestions for all critical dimensions were generated. In the selection of KPI suggestions, they were discussed based on the product specification list, where the focus was on the functions with importance four.

After the first selection of KPIs, the KPIs were all equally good according to the function analysis. To find out which KPIs IKEA Industry liked more than the others, the next selection was made by the Project Engineer at IKEA Industry. This resulted in that the KPI suggestions for the critical dimension create innovative solutions were discarded.

Before making the decision, the Project Engineer received input based on literature studies, personal conversations, and a questionnaire. The literature studies argued for a system of measures together measuring all critical dimensions, while the questionnaires and personal conversation argued for measuring the critical dimension Communication Efficiency. In the answers from the seven participants in the five question questionnaire, 21 answers were relating to Communication Efficiency, see Appendix A. Three personal conversation said Communication Efficiency was a strong factor in the successfulness of PLP. Together with the Project Engineer at IKEA Industry the newly selected KPI suggestions were further developed in a new brainstorming session.

To get input from the stakeholders a workshop was performed. IKEA Industry has in an earlier project decided to use four KPIs developed by the Project Engineer in the next three years, which the stakeholders had to consider during the workshop. These KPIs are *Retail gross margin NEWS Index* measuring *Growth*, *Precision at Sales Start Index* measuring *precision at sales start*, *COPQ NEWS Index* measuring *better quality – product always comply to requirement*, and *Sustainable NEWS Index* measuring *more*

*sustainable products*. The stakeholders also approved the final goal map. For more information, see Appendix B.

In the workshop the participants gave their opinion of the KPIs. They also tried to come up with new ideas. When the participants gave their opinion they had consider both the KPIs developed in this project and the already decided KPIs.

After the workshop the most significant outputs Low Price and Sustainability were measured by two KPI suggestions each. Three KPI suggestions measured growth. The rest of the KPI suggestions measured the critical dimensions, which can be seen below. An explanation of the KPIs can be seen in Appendix B.

- Continuous Improvements by Follow-up
- Increase NEWS contribution to growth
- Learnings are taken, shared and used
- Communication Efficiency
- Precision at sales start
- Lead time
- Standardized ways of working
- Better quality – Product always compliance to requirement
- Improve customer perception of IKEA quality
- Raw material utilization
- Smooth ramp up in production
- Less material
- Assembly time
- Customer perception of rang

Based on the feedback during the workshop the Project Engineer at IKEA Industry selected six KPIs measuring four critical dimensions. The selected KPIs were: Unwanted changes in implementation project, Precision at sales start, Product density, Product area density, Product weight index, and Easy assembly. The critical dimensions were: Communication efficiency, precision at sales start, less material, and easy assembly.

### **6.5 Further Development**

The selected KPI suggestions was developed to pin down how the input data would be gathered and how the different terms within the KPIs would be defined.

To develop the KPIs, measurable outputs and inputs was gathered from PLP and connected with the critical dimensions. To understand how the KPIs should be measured, the following terminology had to be explained, see Table 6.2.

**Table 6.1** KPI product specification list where MF is the main function and Imp. is the importance

No.	Function	Note	Imp.
<b>MF</b>	Communicate current process and/or product performance	Communicate IKEA Industry's current process and product performance to enable improvements	5
<b>1</b>	Be specific	KPIs is specific and targeted to the area being measured	4
<b>2</b>	Be measurable	Collected data is accurate and complete	4
<b>3</b>	Be actionable	Metrics are easy to understand, and show where the organization is heading	4
<b>3.1</b>	Assure validity	Clearly show how employees work efforts affects the KPI	3
<b>3.2</b>	Assure compatibility with the organization hierarchy	Adjust KPI depending on where in the organization it is used to ensure relevance for the employees	2
<b>3.3</b>	Simplify visualization	Clearly chart performance over time	2
<b>3.4</b>	Enable ratio presentation	The KPI should be presented in ratio	1
<b>4</b>	Be relevant	Measure what is relevant and important for the organization based on the organization goals, and avoid metrics that are not	4
<b>4.1</b>	Provide work direction	The KPI helps the employees to work in a direction which supports the targets	3
<b>5</b>	Be timely	Ensure that metrics produce data when it is needed	4
<b>6</b>	Based on resource efficient measurements	Data gathering for measures is resource efficient	3
<b>7</b>	Enable benchmarking possibility within IKEA	The KPI should be able to be compared with other divisions and suppliers	3
<b>8</b>	Provide QlikView visualization	The KPI can be visualized in QlikView	1
<b>9</b>	Has existing baseline	The KPI has an existing baseline	2

6 Develop the Measures for Each Critical Dimension

**Table 6.2** Terminology used in PLP

<b>Process Step</b>	<b>Term</b>	<b>Explanation</b>
---	Article number	An article number is a specific product. For example a blue Billy shelf and a white Billy shelf have two different article numbers
---	NEWS	NEWS is all new article numbers developed and produced by IKEA Industry until six months after sales start date [3].
---	Regulars	All existing products which is not NEWS [3].
---	Tollgate	A control point in the process where specific things has to be fulfilled for the project to proceed in the process [3].
Pre-study	Project scope	Document including the deliverables and time plan from IKEA of Sweden in DFP [12, p. 6]
Create Democratic Design	PDA	Product Development Assignment Order, which is a contract between IKEA of Sweden and the Product Development Center
Product Development	Handshake	The official agreement between PDC and Factory, which includes all information needed for Factory to start the Implementation Project. [3]
Product Development	Assembly time	The assembly time is the time it takes to assemble an article number from the opening of the package till fully assembled.
From Product Development and onwards.	PDOC	All essential product information like the product's assembly instructions, specifications, drawings or measured images, get registered in the system Product Documentation (PDOC). PDOC is a compilation of several documents [22, p. 1]
Production Start-Up	Service level	Percentage of stores having the product available of the stores planned to have the product available. Depending on the

6 Develop the Measures for Each Critical Dimension

		importance of the product, the product can have different targeted service levels [23].
Production Start-Up	Sales start date	The date the product is planned to have its sales start. The sales start date is decided in the project scope. However, the sales start date can be changed during the whole project [3]. The sales start date used for the KPIs is the sales start date set in PDA.
Production Start-Up	First buy	Amount of units of a new products which need to be produced to cover the global need of the product in the stores at sales start [3].
Production Start-Up	First delivery approval	A tollgate in PLP which purpose is to have an approval to deliver the produced product [12, p. 42].

6.5.1 Communication Efficiency

The KPI for communication efficiency indicates how many changes in PDOC are made during the process steps Product Industrialization and Production Start-Up, see Equation (1). The product properties included in PDOC should be set in handshake, and all changes made after handshake are therefore unwanted. Changes made earlier in the project are necessary to develop a good product. The definition of the terms in the KPI is explained in Table 6.3.

$$(1) \text{ Unwanted changes in implementation project} = \text{Number of PDOC changes [No.]}$$

**Table 6.3** Definition of the terms in the KPI unwanted changes in implementation project

Number of PDOC changes	Changes in PDOC between contract review and first delivery. Are measured per project.
PDOC change	A new version of PDOC. A change of PDOC can mean both a small change in one document or changes in all documents.

During the development it was found that Purchase operations is developing a similar KPI. This KPI has therefore not been developed further.

### 6.5.2 Precision at sales start

Precision at sales start is a KPI measuring the performance of the process and its implementation project, see Equation (2). It shows the percentage of the NEWS fulfilling the planned service level at the sales start date. In theory this mean that the KPI precision at sales start can be 100 percent even though first buy is not fulfilled. However, this never happens in reality. The definition of the terms in the KPI is explained in Table 6.4.

(2) Precision at sales start =

$$\frac{\text{Number of NEWS reached targeted service level at planned sales start date}}{\text{Number of NEWS}} [\%]$$

**Table 6.4** Definition of the terms in the KPI precision at sales start

Number of NEWS reached targeted service level at planned sales start date	Number of NEWS in IKEA Industry's current range which reached targeted service level at planned sales start date.
---	---

Number of NEWS	Number of NEWS in IKEA Industry's current range.
----------------	--

Today service level is measured per store, and the measurement is performed every day. The data is gathered and stored in IKEA's data warehouse and is used in different follow ups and analyzing tools. This approach can be used for this KPI as well, since it is possible to select products based on planned sales star date.

### 6.5.3 Less Material

For less material three suggestions were developed, namely density NEWS index, area density NEWS index, and weight NEWS index. They all focus on a specific way of measuring the reduction of weight in products. Only article numbers completely made of wood is included in these KPIs. The calculation of the KPIs should be done in the tollgate first delivery approval.

#### 6.5.3.1 Less Material - KPI Suggestion 1

The KPI density NEWS index's purpose is to indicate the fulfillment of the goals connected to less material. It shows if the average NEWS density is lower or higher than the average reference product density of the Regulars when introducing the KPI, see Equation (3). The definition of the terms in the KPI is explained in Table 6.5.

$$(3) \text{ NEWS density index} = \frac{\text{Average NEWS density}}{\text{Average reference Regular density}} [\%]$$

**Table 6.5** Definition of the terms in the KPI NEWS density index

Average NEWS density	The average density of all NEWS.
Average reference Regular density	The average density of the Regulars when introducing the KPI.

To calculate this KPI, the product density for each and every article number is calculated according to Equation (4). The calculation of the KPI should be done in the tollgate first delivery approval. The KPI information will be saved in the data warehouse and updated every time new NEWS is registered, when NEWS become Regulars, or when Regulars no longer are a part of the range. Today the average reference regular density does not exist and must therefore be calculated before the KPI can be used.

Equation (4) is calculated in two different ways. For solid article numbers the measurement of the density can easily be done in the CAD-software SolidWorks, which IKEA Industry already uses. That is, article number density for solid article numbers is based on Equation (4), but calculated directly by SolidWorks. However, all materials are not registered in SolidWorks. In difference to solid article numbers, the data for non-solid article numbers needs to be gathered manually.

To calculate Equation (4) for non-solid parts, the article number's weight and volume is calculated by summing up all its part's weight and volume. This will be made by registering the parts outer dimensions and weight in an excel sheet, which then automatically calculates Equation (4). The definition of the terms in Equation (4) is explained in Table 6.6.

$$(4) \text{ Article number density} = \frac{\text{Article number weight}}{\text{Article number volume}} \left[ \frac{\text{Kg}}{\text{m}^3} \right]$$

**Table 6.6** The definition of the terms in Equation (4)

Article number weight	The article number's total weight
Article number volume	The article number's total volume based on its outer dimensions

### 6.5.3.2 Less Material - KPI suggestion 2

Area density NEWS index is a KPI used to measure the goals for the products connected to less material. It shows if the average area density of the NEWS is lower or higher than the average Regular area density of the existing Regulars when introducing the KPI, see Equation (5). The definition of the terms in the KPI is explained in Table 6.7.

$$(5) \text{ Area density NEWS index} = \frac{\text{Average NEWS area density}}{\text{Average reference Regular area density}} [\%]$$

**Table 6.7** The definition of the terms in the KPI area density NEWS index

Average NEWS area density	Average area density of all NEWS.
Average reference Regular area density	Average area density of all the Regulars when introducing the KPI.

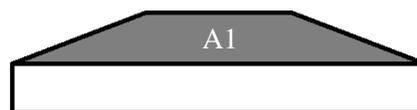
To calculate this KPI, the article number area density for each and every article numbers calculated according to Equation (6). The calculation of the KPI should be done in the tollgate first delivery approval. The KPI information will be saved in the data warehouse and updated every time new NEWS is registered, when NEWS become Regulars, or when Regulars no longer are a part of the range. Today the average reference regular area density does not exist and must therefore be calculated before the KPI can be used.

The data for the article numbers need to be gathered manually. To calculate equation (6) for the article number's weight and area is calculated by summing up all its part's weight and area. This will be made by registering the parts outer dimensions and weight in the data warehouse, which then automatically calculates Equation (6). Before the KPI can be calculated a compilation of the Regulars' area density has to be made. The definition of the terms in Equation (6) is explained in Table 6.8.

$$(6) \text{ Article number area density} = \frac{\text{Article number weight}}{\text{Article number area}} \left[ \frac{\text{Kg}}{\text{m}^2} \right]$$

**Table 6.8** The definition of the terms in Equation (6)

Article number weight	The article number's total weight
Article number area	The area of the biggest flat surface of the all the parts are summed up.
Part area	Area of the biggest flat surface of the part. A1 is the area of the biggest surface. An example can be seen in Figure 6.1.



**Figure 6.1** Explanation of part area, A1.

### 6.5.3.3 Less Material - KPI suggestion 3

Weight NEWS index is a KPI used to measure the article numbers' goals connected to less material. It shows if the average weight of all NEWS is lower or higher than the average weight of the existing Regulars when introducing the KPI, see Equation (7). The definition of the terms in the KPI is explained in Table 6.9.

$$(7) \text{ Weight NEWS index} = \frac{\text{Average NEWS weight}}{\text{Average reference Regular weight}} [\%]$$

**Table 6.9** The definition of the terms in the KPI weight NEWS index

Average NEWS weight	Average weight of all NEWS.
Average reference Regular weight	Average weight of all the Regulars when introducing the KPI.

To calculate this KPI, the product weight for each and every article number is measured, which can be done in CAD. However, all materials are not registered in SolidWorks. The article numbers using these materials has to be scaled. A compilation of the Regulars' weight has to be made before the denominator can be calculated. Today the average reference regular weight does not exist and must therefore be calculated before the KPI can be used.

The KPI information will be saved in the data warehouse and updated every time new NEWS is registered, when NEWS become Regulars, or when Regulars no longer are a part of the range.

### 6.5.4 Easy assembly

The KPI easy assembly NEWS index measures how easy the NEWS are to assemble compared with the existing Regulars when introducing the KPI. The definition of the terms in the KPI is explained in Table 6.10.

$$(8) \text{ Easy assembly NEWS index} = \frac{\text{Average NEWS assembly time}}{\text{Average reference Regular assembly time}} [\%]$$

**Table 6.10** The definition of the terms in the KPI easy assembly NEWS index

Average NEWS assembly time	The average assembly time of NEWS.
Average reference Regular assembly time	Average assembly time of all the Regulars when introducing the KPI.

The assembly time for the article numbers are measured by using the tool Assembly Time Prediction Tool, which estimate the assembly time. The calculation of the KPI should be done in the tollgate first delivery approval.

The estimation is based on the article number's weight, fitting assembly time, and number of parts and their sizes. These parameters can be found in the Product Information App (PIA), and should be registered in the data base enabling the calculation of the KPI. The registered parameters should automatically calculate the KPI. Today the assembly time of 195 of IKEA Industry's 1955 article numbers is measured by using the tool Assembly Time Prediction Tool. Hence, the average reference regular assembly time partially exists but must be totally calculated before the KPI can be used, [24] and [25].

### 6.6 Final Selection of Measures

To make sure that the KPIs are not in conflict, one KPI was selected from each critical dimension. These were: unwanted changes in implementation project, precision at sales start, weight NEWS index, and easy assembly NEWS index.

Unwanted changes in implementation project, precision at sales start, and easy assembly NEWS index were chosen due to the previously used selection method. Weight NEWS index was selected based on reflections and reasoning.

The three less material KPIs showed how PLP is performing in fulfilling the more from less goal. By using a fix reference in time, and not a dynamic reference, the KPIs' performance will be intuitive, due to more intuitive presentation of historical data.

The KPI weight NEWS index encourage developing and producing lighter products, and shows in an intuitive way when products' weight decreases. It considers the connection between both the goals more from less [16, pp. 23, 25] and reducing weight [20, p. 4]. Further, it is not limited by the products design or the chosen material. It only focus on the weight, which is what the goals request. However, the KPI is based on the assumption that the compilation of product types and sizes are the same from year to year.

The KPI density NEWS index encourage developing and producing non-solid products, which uses less material than a solid alternative, if the dimensions and raw material are constant. The connection between this KPI and the goal more from less [16, pp. 23, 25] is intuitive. On the other hand, the connection with the goal of reducing weight [20, p. 4] is not as obvious, due to bigger products with much air in its construction can have a lower density but still weigh more and have a higher raw material usage.

The KPI area density NEWS index encourage developing and producing light products with big areas, which not necessarily uses less material than alternatives with smaller areas. This must be considered when using this KPI. Due to IKEA Industry's limitations in the dimension of the products, this will not be a problem in reality. The area density KPI does not limit the material choice as the density KPI does. A thin material with a high density can have the same KPI performance as a low density material with the area density KPI. With the density KPI the thin high density material would have

performed much worse. Area Density is not a generic term, which lead to that the KPI is not that intuitive to understand.

The article number area density can be used to compare product suggestions' performance with already existing similar products' performance during the product development. This to evaluate the product suggestion.

The baseline in all three KPI suggestions is the denominator. To calculate the denominator in weight NEWS index, a compilation of the article numbers' weight has to exist, which it does today. The KPI is therefore ready to be implemented. To calculate the denominator for density NEWS index and area density NEWS index, a compilation of the article numbers' density respective area density has to exist, which they do not today. However, the data for measuring density is available today, and the calculations can therefore easily be made. The data for the article numbers area is not as obvious. The biggest area has to be chosen manually, and then measured in the CAD software. It is also hard to decide which area to measure when the article numbers' parts do not have flat surfaces.

Based on the reasoning, weight NEWS index is considered as the best choice. Weight NEWS index measures both less material goals and has an existing baseline. Of the three suggestions it is also most intuitive and easiest to measure.



## 7 Conclusion and Recommendations

*This chapter includes conclusion of the result and recommendations for the proceeding work with the KPIs.*

### 7.1 Conclusions

It was discovered that most significant outputs and critical dimensions had to be identified to be able to measure the performance of PLP and NEWS. Eight most significant outputs and 19 critical dimensions was found to be connected with PLP and NEWS.

The further developed KPIs are together measuring the five most significant outputs *Resources, Time, Sustainability, Low Price, Form, and Function*. This, by measuring the critical dimensions *communication efficiency, precision at sales start, less material, and easy assembly*. The KPIs developed by IKEA Industry is measuring *Growth* and the most significant outputs *Time, Sustainability, and Quality*. All KPIs combined are therefore measuring *Growth* and all most significant outputs except for *Continuous Improvement*, see Figure 7.1.

By the fact that the critical dimensions are IKEA Industry's strategic objectives, and that strategic objectives are derived from the vision, the KPIs are measuring the overall goals. Further, the most significant outputs are connected with both what literature and IKEA think is important in product development. This also proves that the KPIs are measuring the purpose of product development.

The *communication efficiency* KPI effectively indicates the communication flow within the organization. If the communication went well the KPI performance should be zero. The KPI itself therefore easily shows if the communication has worked within a project. However, even though it is intuitive that PDOC changes should be zero it is not intuitive that *communication efficiency* should be zero. To be intuitive *communication efficiency* would rather be 100 %.

Information about data and baseline for the KPI is not fully developed due to the lack of information from IKEA. However, a similar KPI is under development by Purchase operations.

The KPI for Precision at Sales Start is easy to understand and use. It is also intuitive due to the fact that 100 % is the best.

Easy assembly NEWS index easily shows the article numbers' assembly time and therefore very intuitively visualizes the fulfillment of the easy assembly goal. The

Assembly Time Prediction Tool can also indicate the article number's assembly time during the development project, which enable comparison with already existing products. The tool enables a development of a baseline for the KPI. However, data is not available for all article numbers but can easily be calculated with the tool. By using a fix reference in time, and not a dynamic reference, the KPIs' performance will be more intuitive. This due to more intuitive presentation of historical data.

The KPI weight NEWS index is considered to intuitively measure the less material goals. The input data is also easy to understand and gather. The KPI assumes that the NEWS consists of a constant composition of product types. However, it is under discussion to define NEWS as all new article numbers developed and produced by IKEA Industry until one year after sales start date. This would minimize the risk of differences in the product type composition during the different measuring periods.

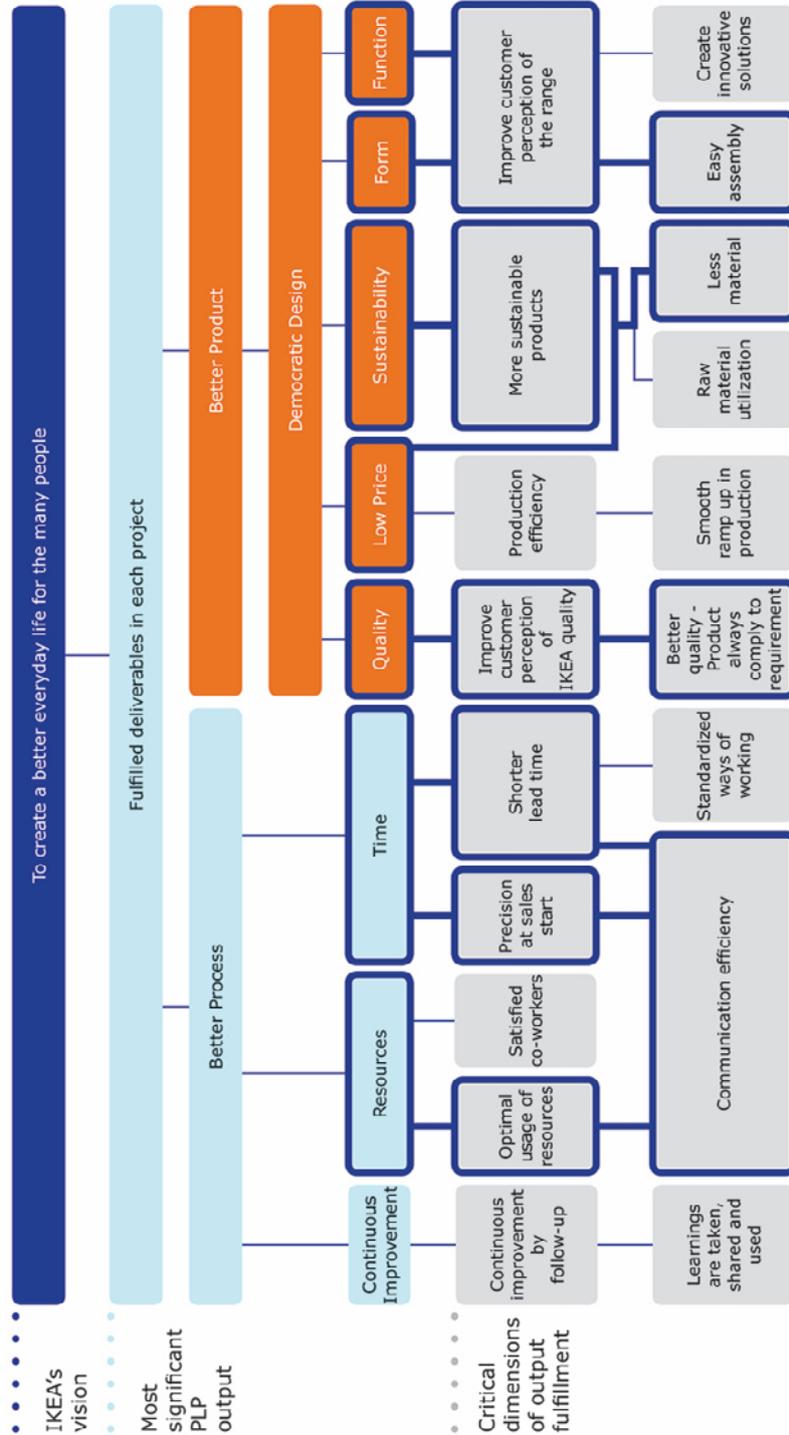
### **7.2 Recommendations**

IKEA Industry should start with implementing the recommended KPIs. After the KPIs are fully implemented, new KPIs can be developed and implemented to cover all most significant outputs in the goal map. However, to minimize the amount of KPIs used, it is recommended to only use one KPI per critical dimension, and strive for only one KPI per most significant output. Due to the fact that two different KPIs are measuring precision at sales start and two are measuring Sustainability, it has to be decided which of them to use. It is recommended to implement both and then evaluate which is indicating the performance the best.

To confirm that the KPIs are measuring what is meant, and to see which KPI performs the best when measuring a specific critical dimension, it is recommended to evaluate them after a year. This first year should be considered as a trial period, and not as a way to receive quality data from the KPIs. This due to the fact that the KPIs have not been tested with previous projects, but also to see which KPI to use of the KPIs measuring the same critical dimension.

Purchase operations is developing a KPI for PDOC changes. It is recommended to use the same KPI for measuring communication efficiency. It is also recommended to investigate further if it is possible to design the KPI to have an intuitive optimal performance both for PDOC changes and for communication efficiency.

To make the KPIs easy to understand it is recommended to have the same index definition in all KPIs. It is recommended to decide whether a fix reference or a time dependent reference is preferable.



**Figure 7.1** The most significant outputs and critical dimension in bold blue frames is covered by the developed KPIs.



## 8 Discussion

*In this chapter a discussion about the time plan, collaboration, method, information sources, and project information gathering is held.*

The project objectives 1 and 2 are answered in chapter 4 and the project objectives 3 and 4 are answered by the result in chapter 6.

The time plan for the project has continuously been changed during the project. At first a time plan was developed based on the knowledge gathered in the subject before the project. However, when the knowledge about processes and KPIs increased, new activities had to be added to the plan to make it more detailed, see Appendix C.

The development of the goal map was essential to understand the connections between the most significant outputs and the critical dimensions and thereby what to measure. However, the development of the goal map was the hardest and most time consuming of the activities executed through the project. Due to the inexperience in developing KPIs much effort was put in the beginning of the project. This due to believing later project activities would be more time consuming than they actually were. As a result of this, a gap in the time plane emerged and enabled the presentation to be held one week earlier than expected.

In the development of the KPIs, information from different employees was needed. Mostly answers on our questions was received in a timely manner. However in the further development of the KPIs the stakeholder at Purchase operations with information about PDOC changes was not reachable. This led to that the KPI was not developed to the extent that was hoped for.

It would have been better if the KPIs could have been tested on historical data from previous projects. This could unfortunately not be done due to lack of a previous project with data suitable for the developed KPIs.

With no earlier knowledge in executing a similar project, the choice of method was only based on literature. However, this may have led to that the used method was not the most suitable. For example, the need of creating a goal map could maybe have been avoided with a different method.

Due to the lack of a process map it was not easy to connect critical dimensions to specific activities within PLP. This may have led to missed KPI opportunities.

The collaboration with IKEA Industry has mostly worked smoothly. Our supervisor at IKEA Industry has always been able to help us when we needed help, and the employees within IKEA has mostly answered our questions by email when we had

questions. However, some cultural clashes between IKEA Industry's way of working and us as student's way of working have emerged. These have however been discussed and solved. In the end these clashes resulted in a deeper understanding of the subject and increased motivation to use the used method.

The developed KPIs are not only contributing to IKEA Industry, but they also have scientific value. Today it does not exist many KPI suggestions for creative processes. This project therefor contributes to incensement of the amount of KPI suggestions for creative processes. This project also describes how measures can be developed in creative processes for future projects, and present a new way of visualizing goals.

If the project was started over, several activities would have been planned and done differently. The project is based on the performance measuring method KPIs. However, it exists other methods measuring the performance of processes and products. It would therefore have been interesting to have done some more research in the different performance measuring methods to better understand the pros and cons of KPIs. Contacting key stakeholders in the development of the KPIs would also have been done earlier in the project to receive important information before the project ended. Finally, the writing of the report would have been organized differently: for this final version of the report approximately 30 pages with text mostly related to the description of the theory have been deleted.

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## **Appendix A: Questionnaire**

### **A.1 Questions**

1. How would you define a successful PLP?
2. According to you, what is important for PLP to work smoothly?
3. Which key factors do you consider as important for a new product to be successful?
4. What activities do you consider as important to measure for the development of a successful product? Why?
5. Do you have any suggestions of KPIs suitable for measuring PLP and its generated products?

### **A.2 The Participants in the Questionnaire**

- Product Technician at IKEA Industry
- Product Developer at IKEA Industry, Lda
- Technician at Trading Material Area IKEA Industry
- Team Leader at IKEA Industry Sp. z o.o
- Business Development Manager at IKEA Industry
- Project Leader at Technique and PDC IKEA Industry
- Project Engineer at IKEA Industry



## Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

Appendix B shows all KPI suggestions presented at the workshop. Equation numbers marked with a star [...\*] are KPIs already under discussion within IKEA Industry and are not KPIs developed or found during this project. The terms used in the definition of the KPIs is described in Table B.1

**Table B.1** Terminology used in PLP

Process Step	Term	Explanation
---	Article number	An article number is a specific product. For example a blue Billy shelf and a white Billy shelf have two different article numbers
---	NEWS	NEWS is all new article numbers developed and produced by IKEA Industry until six months after sales start date [3].
---	Regulars	All existing products, completely made of wood, which is not NEWS [3].
---	Tollgate	A control point in the process where specific things has to be fulfilled for the project to proceed in the process [3].
Pre-study	Project scope	Document including the deliverables and time plan from IKEA of Sweden in DFP [12, p. 6]
Create Democratic Design	PDA	Product Development Assignment Order, which is a contract between IKEA of Sweden and the Product Development Center
Product Development	Handshake	The official agreement between PDC and Factory, which includes all information needed for Factory to start the Implementation Project. [3]

## Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

Process Step	Term	Explanation
Product Development	Assembly time	The assembly time is the time it takes to assemble an article number from the opening of the package till fully assembled.
From Product Development and onwards.	PDOC	All essential product information like the product's assembly instructions, specifications, drawings or measured images, get registered in the system Product Documentation (PDOC). PDOC is a compilation of several documents [22, p. 1]
Production Start-Up	Service level	Percentage of stores having the product available of the stores planned to have the product available. Depending on the importance of the product, the product can have different targeted service levels [23].
Production Start-Up	Sales start date	The date the product is planned to have its sales start. The sales start date is decided in the project scope. However, the sales start date can be changed during the whole project [3]. The sales start date used for the KPIs is the sales start date set in handshake.
Production Start-Up	First buy	Amount of units of a new products which need to be produced to cover the global need of the product in the stores at sales start [3].
Production Start-Up	First delivery approval	A tollgate in PLP which purpose is to have an approval to deliver the produced product [12, p. 42].

### B.1 Growth

This is not a most significant output. It is measuring the overall performance of the process and product.

#### *B.1.1 Increase NEWS contribution to growth*

This KPI indicates how much the NEWS contribute to IKEA Industry's overall growth. Compared with estimated turnover this KPI has the advantage of showing the actual outcome. The KPI is relevant because growth is one of the main goals in IKEA.

## Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

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$$[1] \text{ NEWS contribution to growth} = \frac{\text{Turnover from NEWS}}{\text{Total turnover}} [\%]$$

*Turnover NEWS* = IKEA Industry's turnover for all NEWS.

*Total turnover* = IKEA Industry's turnover from all products developed or produced by IKEA Industry

---

This KPI indicates how much of the estimated turnover from NEWS contributes to IKEA Industry's overall estimated turnover of the projects in the pipeline. The Divisions are more interested in the estimated turnover than the actual turnover. The KPI is relevant because growth is one of the main goals in IKEA.

$$[2] \text{ NEWS estimated contribution to growth} = \frac{\text{Estimated turnover from NEWS}}{\text{Estimated total turnover}} [\%]$$

*Turnover NEWS* = IKEA Industry's estimated turnover for all NEWS in the pipeline.

*Total turnover* = IKEA Industry's estimated turnover for all products developed and/or produced by IKEA Industry in the pipeline.

---

To measure our performance to live up to form, function and low price Retail Gross Margin is measured. This KPI will measure the comparison between new products and regular products. Due to variations between different product types the comparison will be done on PA level and weighted depending on the turnover for NEWS.

$$[1 *] \text{ Retail gross margin NEWS index} = \frac{\text{Gross margin NEWS}}{\text{Gross margin Regular}}$$

### **B.2 Continuous Improvements by Follow-up**

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This KPI is meant to encourage the execution of follow-up in projects, which is important for establishing the continuous improvements culture. However, it does not measure the quality of follow-up. The KPI may also be better as an alarm (warning) when the follow-up is not executed, because the KPI should be 100 percent.

$$[3] \text{ Follow up} = (\text{Number of projects with follow - up})/(\text{Number of projects}) [\%]$$

*Number of projects with follow-up* = Number of projects actually performing follow-up.

*Number of projects* = Number of projects that should have executed follow-up during the last year. The last year is always counted from today.

### **B.3 Learnings are Taken, Shared and Used**

---

Follow-up encourage improvements of the process and the next similar product by generating lessons learned. The KPI encourage the documentation of lessons learned.

## Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

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However, it does not say anything about the quality of the lessons learned, only the quantity. It indicates how alive the process is and how well it works.

$$[4] \text{ Follow up} = \frac{\text{Number of lessons learned documented}}{\text{Number of projects}}$$

*Number of lessons learned documented* = Number of lessons learned documented in the projects executed during the last year.

*Number of projects* = Number of projects executed during the last year. The last year is always counted from today.

### **B.4 Communication Efficiency (Resources and Time)**

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The KPI is a measure of the communication between IKEA of Sweden and IKEA Industry. A low number of changes indicates a successful communication, due to, according to IKEA of Sweden, the changes IKEA Industry experience actually are miscommunication. Today product development assignment orders (PDA) are not updated even though changes are made. Instead the changes are handled in a separate document. Communication is the single most important factor in Product Launch Process according to questionnaires and interviews.

$$[5] \text{ Changes} = \text{Number of PDA changes}$$

*Changes* = Unwanted changes

*Number of PDA changes* = Number of PDA changes per project.

PDA = Product Development Assignment Order

---

This KPI indicates how many changes are made during an implementation project in the product's material, drawings, assembly instructions, and packaging drawings. Changes made earlier in the project is necessary to develop a good product. PDOC changes affect lead time and cost by the rule of ten. However, it has to be considered that a PDOC change is the same as a new version of PDOC. A change of PDOC can mean both a small change in one document or changes in all documents. Communication is the single most important factor in Product Launch Process according to questionnaires and interviews, hence a KPI measuring this is important.

$$[6] \text{ Unwanted changes in implementation project} = \text{Number of PDOC changes [No.]}$$

*Number of PDOC changes* = Changes in PDOC between contract review and first delivery. Are measured per project.

### **B.5 Precision at Sales Start**

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This KPI will measure how many of our new products that will reach the wished sales start date. Wished sales start date is defined in the project scope from IKEA of Sweden in the early stage of the development. Actual sales start date is the global sales start date which is set in the later stage of development.

[2 \*] *Precision at sales start index =*

$$\frac{\text{Amount of NEWS where wished sales start date is equal to actual sales start date}}{\text{Amount of all NEWS}}$$

---

This KPI shows the percentage of the NEWS that fulfill the planned service level at sales start date. For each NEWS a targeted service level is set. In theory this mean that precision at sales start can be 100 percent even though First Buy is not fulfilled, but not in reality.

[7] *Precision at sales start =*

$$\frac{\text{Number of NEWS reached targeted service level at planned sales start date}}{\text{Number of NEWS}} [\%]$$

Number of NEWS = Number of NEWS, measured per article number and year, where the year is measured from today.

*Service level* = Percentage of stores having the product

*Sale start date* = Sale start date decided in Handshake

---

This KPI shows to which rate First buy is fulfilled. To attain full precision at sales start the rate has to be one or more. The KPI is measured per article number. This is indirect measured in the previous KPI, due to the way the deliveries works in reality.

$$[8] \text{ Precision at sales start accuracy NEWS} = \frac{\text{Number of units produced}}{\text{First buy}} [\%]$$

*Number of units produced* = Number of units produced to planned first buy

### **B.6 Lead Time**

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This KPI shows how well the project fulfills each tollgate, and therefore how good the project's planning was. A negative number shows the number of days overdue, and a positive number shows number of days it was fulfilled in advance. The KPI will be measured separately for all tollgates within Product Launch Process. When using this KPI it is important to remember that the goal is to optimize the lead time, and not the

## Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

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individual tollgate time. If a tollgate time is optimized it can lead to a longer lead time due to lack of documentation, solutions complicate later tollgate activities, etc.

[9] *Fulfillment of tollgates* =

$$\text{Estimated tollgate days} - \text{Actual tollgate days [days]}$$

*Estimated tollgate days* = Number of estimated days needed to fulfill the activities before the tollgate and the tollgate.

*Actual tollgate days* = Actual number of days needed to fulfill the activities before the tollgate and the tollgate.

---

This KPI shows average lead time within IKEA Industry for the development of an article number. One goal within IKEA Industry is to be involved as early as possible in DFP, which contradicts with the KPI, which strives for a shorter lead time.

$$[10] \text{ Average lead time} = \frac{\text{The sum of all projects' lead times}}{\text{Number of NEWS}} [\text{days}]$$

*Average lead time* = average lead time for all new article numbers the last year, where the year starts from today.

*Number of NEWS* = number of article numbers developed the last year, where the year starts from today.

### **B.7 Standardized Ways of Working**

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This KPI indicates the usage of shared solutions in a product. A bigger rate of shared solutions decreases the development time of the product due to fewer parts that need to be developed. This will be measure per product. Due to shared solutions is not defined this KPI is saved for the future.

$$[11] \text{ Shared solution} = \frac{\text{Number of shared solutions parts}}{\text{Number of parts}} [\%]$$

Number of shared solutions parts will be measure per product. Number of parts will be measure per product.

### **B.8 Better Quality – Product Always Compliance to Requirement**

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An existing KPI to measure performance in quality is cost of poor quality (COPQ). To contribute to the overall goal for COPQ there is a need that our NEWS are performing better than our current range. This KPI will measure the comparison between new products and regular products. Due to variations between different product types the comparison will be done on product article level and weighted depending on the turnover for NEWS.

## Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

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$$[3 *] \text{ COPQ NEWS index} = \frac{\text{COPQ NEWS}}{\text{COPQ REGULAR}} [\%]$$

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This KPI shows how well the product fulfills the COPQ ambition, but it is not only PLP that affects the COPQ. COPQ is a well-known KPI within the IKEA organization.

$$[12] \text{ Quality deviation index} = \frac{\text{Actual COPQ}}{\text{Ambition COPQ}} [\%]$$

*Actual COPQ* = Final COPQ after six months

*Ambition COPQ* = COPQ ambition in PDA

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This KPI show how well the gate checks are fulfilled. It can be used both as an indicator during the project as well as after finished project. This KPI should always be 100 percent, and show if all activities that should have been done have been done before production start-up.

[13] *Successful Gate Check validations* =

$$\frac{\text{Number of Gate Checks successfully validated}}{\text{Number of Gate Checks submitted}} [\%]$$

*Number of Gate checks successfully validated* = Number of requirements fulfilled

*Number of Gate Checks submitted* = Number of requirements

### **B.9 Improve customer perception of IKEA quality**

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This KPI show NEWS performance in customer returned product quality (CRPQ). The KPI does not include logistic damages on the products in the same way as COPQ does, due to CRPQ only includes damages found by customers. This KPI therefore better show flaws in the production than COPQ does, and in that way have a better connection to Product Launch Process.

An existing KPI to measure customer perception of quality is CRPQ. Due to variations between different product types the comparison will be done on PA level and weighted depending on the turnover for NEWS.

$$[14] \text{ CRPQ NEWS index} = \frac{\text{CRPQ NEWS}}{\text{CRPQ REGULAR}} [\%]$$

*CRPQ* = Customer returned product quality

### **B.10 Low Price**

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The KPI indicates if the products developed in Product Launch Process contributes to reaching these goals. It is measured per product. This KPI was seen as badly constructed and not connected to reality.

$$[15] \text{ Price deviation} = \frac{\text{Actual sales price}}{\text{Sales price ambition}} [\%]$$

*Actual sales price* = Price to IKEA of Sweden

*Price ambition* = The price necessary for the fulfillment of the price decreasing goal

#### ***B.10.1 Raw material utilization (Low price, Sustainability)***

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Product Raw Material Utilization is measuring how optimal the raw material is used to produce a specific product. It visualizes the material waste, which is connected with reducing costs and increase sustainability.

This KPI was seen as too complicated and not worth developing further.

$$[16] \text{ Product raw material utilization} = \frac{\text{Product Weight}}{\text{Weight of raw material}} [\%]$$

*Product Weight* = The total weight of the product

*Weight of Raw Material* = The total weight of the raw material before production, and is measured per product

Product = Parts developed and produced by IKEA Industry

#### ***B.10.2 Smooth ramp up in production***

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This KPI indicates how well the smooth ramp up is, which is if the product and factory is suitable to start manufacturing. The KPI is measured per project. This KPI was seen as interesting but nothing we as students should continue working with.

$$[17] \text{ Smooth ramp up} =$$

*Number of days from start until production works as wished* [days]

*Start* = Production start-up (First Production Batch)

*Wished* = Production KPI targets met

### **B.11 Sustainability**

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Sustainability scorecard is used to classify if the product in combination with supplier is a “more sustainable product”. To be classified as a more sustainable product you need to score at least 120p in the sustainable scorecard. This KPI will measure how many of our new products are more sustainable.

## Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

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$$[4 *] \text{ Sustainable NEWS index} = \frac{\text{NEWS classified as more sustainable products}}{\text{All NEWS}} [\%]$$

### B.11.1 Less material

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Product Density is a KPI used to measure the degree of lightweight in products, and is measured per product. The measurement can easily be done in CAD-software and can therefore both be an indicator used during and after projects. Furthermore, it gives really quick feedback.

The KPI encourage developing and producing non-solid products, which not necessarily uses less material than a solid alternative.

$$[18] \text{ Product density} = \frac{\text{Product weight} \left[ \frac{\text{kg}}{\text{m}^3} \right]}{\text{Product volume}}$$

*Product density* = Average density of the product

*Product weight* = Products total weight

*Product volume* = Products volume

*Product* = All product parts developed and produced by IKEA Industry

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Product area density is a KPI used to measure the degree of lightweight in products, and is measured per product. The measurement can easily be done in CAD-software and can therefor both be an indicator used during and after projects. Furthermore, it gives really quick feedback.

The KPI encourage developing and producing light products with a big area, which not necessarily uses less material than alternatives with smaller areas.

$$[19] \text{ Product area density} = \frac{\text{Product weight} \left[ \frac{\text{Kg}}{\text{m}^2} \right]}{\text{Product area}}$$

*Product area density* = Average area density of the product

*Product weight* = Products total weight

*Product area* = Area of the biggest surface of the part

*Product* = All product parts developed and produced by IKEA Industry

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Product weight index is a KPI used to measure the degree of lightweight in products, and is measured per product. The measurement can easily be done in CAD-software and can therefor both be an indicator used during and after projects. Furthermore, it gives really quick feedback.

The KPI encourage developing and producing lighter products.

## Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

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$$[20] \text{ Product weight index} = \frac{\text{Average product weight}}{\text{Average reference product weight}} [\%]$$

*Average product weight* = Average weight of the products in a specific product category developed during current measuring period.

*Average reference product weight* = Average weight of the products in a specific product category developed during previous measuring period and in the same product category

*Product* = All product parts in a specific product category developed and produced by IKEA Industry

### **B.12 Assembly time**

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Easy Assembly measures how easy each product is to assembly for the customers. However, the KPI does not consider the value adding assembly time.

$$[21] \text{ Easy assembly} = \frac{\text{Assembly time}}{\text{Reference Product Assembly Time}} [\%]$$

*Assembly time* = Time it takes to assemble a product from the opening of the package to the fully assembled product

*Reference product assembly time* = Time it takes to assemble a reference product in the same product category from the opening of the package to the fully assembled product

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Assembly time value adding ratio measures how much of the assembly time is adding value. This KPI is developed further by others within IKEA Industry.

$$[22] \text{ Assembly time value added ratio} = \frac{\text{Value adding assembly time}}{\text{Assembly Time}} [\%]$$

*Value adding assembly time* = Assembly time where value is added and not time spent on finding tools, part etc.

*Assembly time* = Time it takes to assemble a product from the opening of the package to the fully assembled product

### **B.13 Customer perception of range**

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This KPI is a version of customer experienced product quality (CEPQ), and shows how happy the customers are with the product. The question to be asked is “would you recommend the product to a friend”.

According to the workshop this KPI is nothing IKEA Industry should be measuring.

Appendix B: KPI Suggestions Measuring the Product Launch Process and its Outputs

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[23] *Customer perception of the range* =

$$\frac{\text{Number of negative answers in incoming questionnaires}}{\text{Number of incoming questionnaires}} \text{ [%]}$$

*Number of negative answers* = Number of no's



## **Appendix C: Work Distribution and Time Plan**

### **C.1 Work Distribution**

In the beginning of the project we started to read literature and write about them separately. This was however not a successful approach due to the unexperienced in developing KPIs, and we had to start doing things together. The things we had done separately does not even exist today and is not used in the project. It is therefore impossible to tell exact percentage of who did what due to the fact that we did everything together.

Appendix C: Work Distribution and Time Plan

C.2 Time Plan

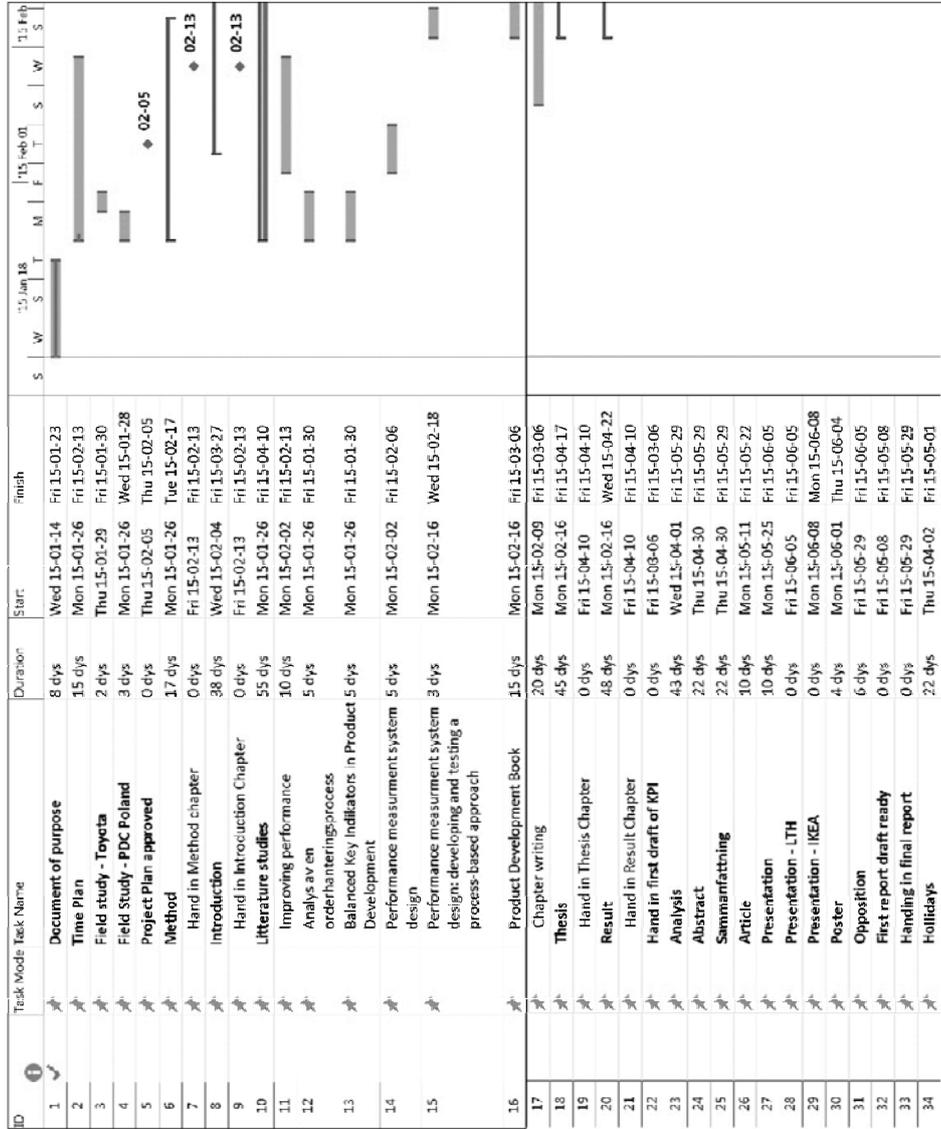


Figure C.1 Original Time Plan page 1

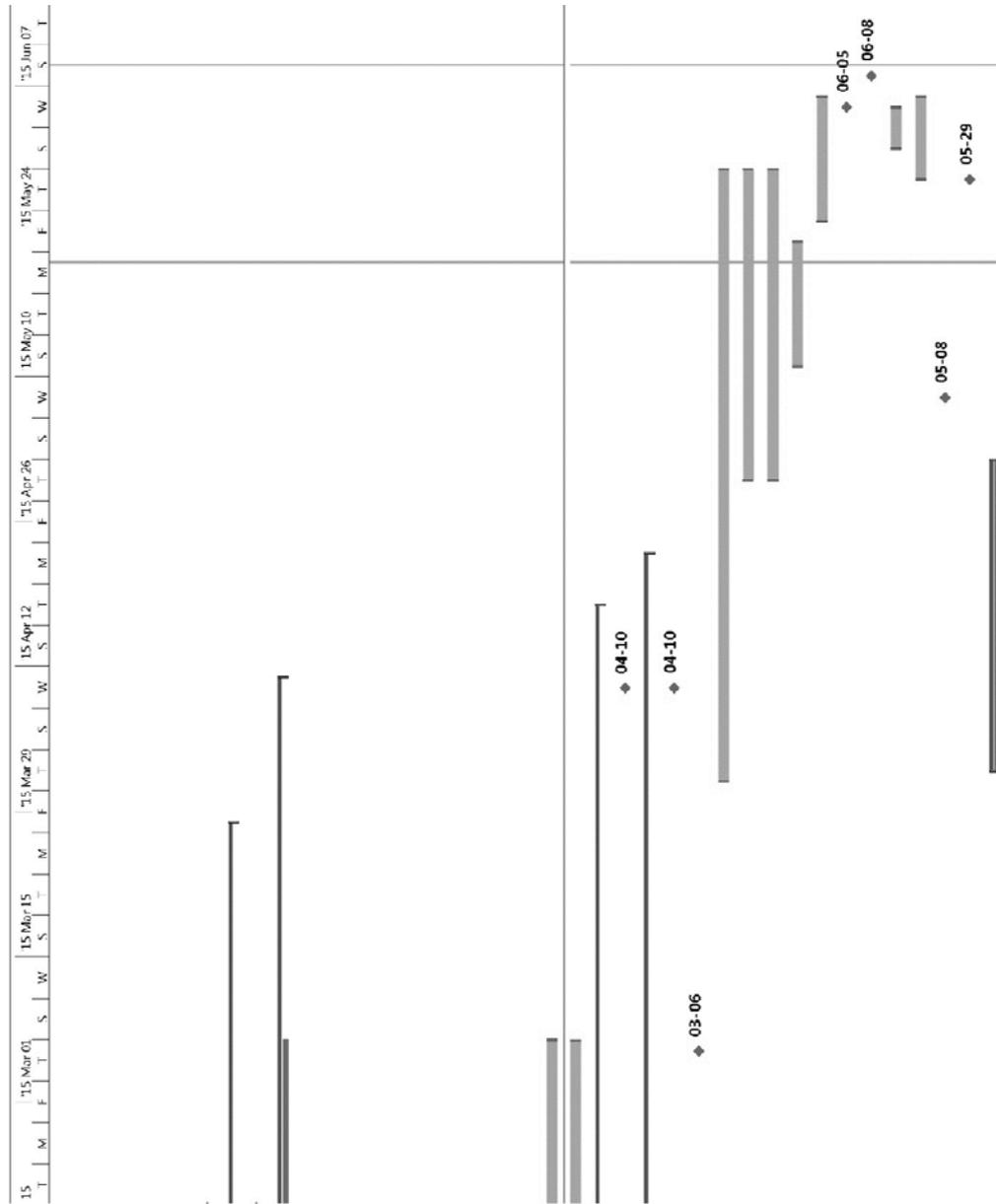


Figure C.2 Original Time Plan page 2

Appendix C: Work Distribution and Time Plan

Type	Name	Start date	End date	Duration	
1	Activity	Document of Purpose	2015-01-14	2015-01-23	10
2	Activity	Time Plan	2015-01-22	2015-02-08	16
3	Activity	Time Plan Update	2015-02-23	2015-02-23	1
4	Activity	Literature Studies	2015-01-26	2015-05-01	96
5	Activity	Theoretical description of KPIs	2015-01-28	2015-03-13	47
5.1	Activity	Define its mission statement	2015-02-09	2015-02-13	5
5.2	Activity	Identify its strategic objectives and goals	2015-02-13	2015-03-06	22
5.2.1	Activity	Theoretical description of strategic objectives	2015-02-13	2015-03-13	29
5.2.2	Activity	Strategic objectives and goals within IKEA	2015-02-16	2015-03-23	36
5.2.3	Activity	Interviews	2015-03-02	2015-03-06	5
5.3	Activity	Understand PLP	2015-01-26	2015-02-23	29
5.3.1	Activity	Theoretical description of a process, function and activity	2015-02-16	2015-03-13	26
5.3.2	Activity	Understand the activities in PLP	2015-01-26	2015-03-27	61
5.4	Activity	Develop KPIs for each function in PLP for top management	2015-03-09	2015-03-29	21
5.4.1	Activity	Develop Function Analysis for KPI	2015-03-09	2015-03-23	15
5.4.2	Activity	Concept generation and selection	2015-03-17	2015-03-18	2
5.4.2.1	Activity	Generation and Selection Workshop	2015-03-17	2015-05-05	50
5.4.4	Activity	Further development of the KPIs	2015-05-05	2015-05-21	
7	Activity	Writing Report	2015-02-04	2015-05-22	
7.9	Activity	Proofreading and improving report	2015-05-11	2015-05-22	12
9	Milestone	Workshop	2015-04-23		
9	Milestone	Presentation - LJH	2015-05-29		
10	Milestone	Presentation - IKEA	2015-06-08		
11	Milestone	Opposition of thesis project	2015-06-04		
12	Activity	Poster	2015-05-25	2015-05-28	4
13	Activity	Opposition	2015-05-29	2015-06-04	7
14	Activity	Presentation	2015-05-18	2015-05-29	12
15	Activity	Article	2015-05-18	2015-05-29	12
16	Milestone	Hand in first draft of report	2015-04-01		
17	Milestone	Hand in second draft of report	2015-05-10		
18	Milestone	Handing in final report	2015-05-22		

Figure C.3 Actual time plan page 1

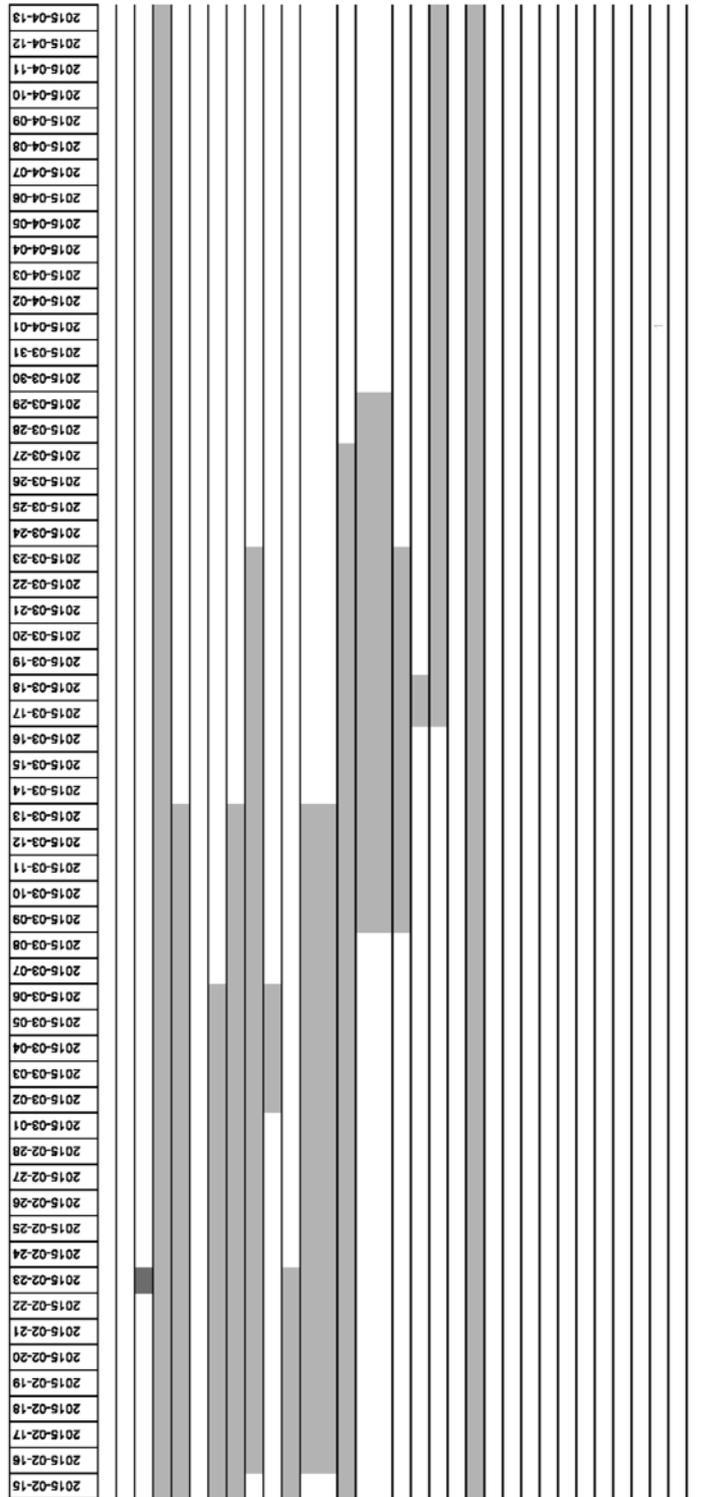


Figure C.4 Actual time plan page 2

Appendix C: Work Distribution and Time Plan

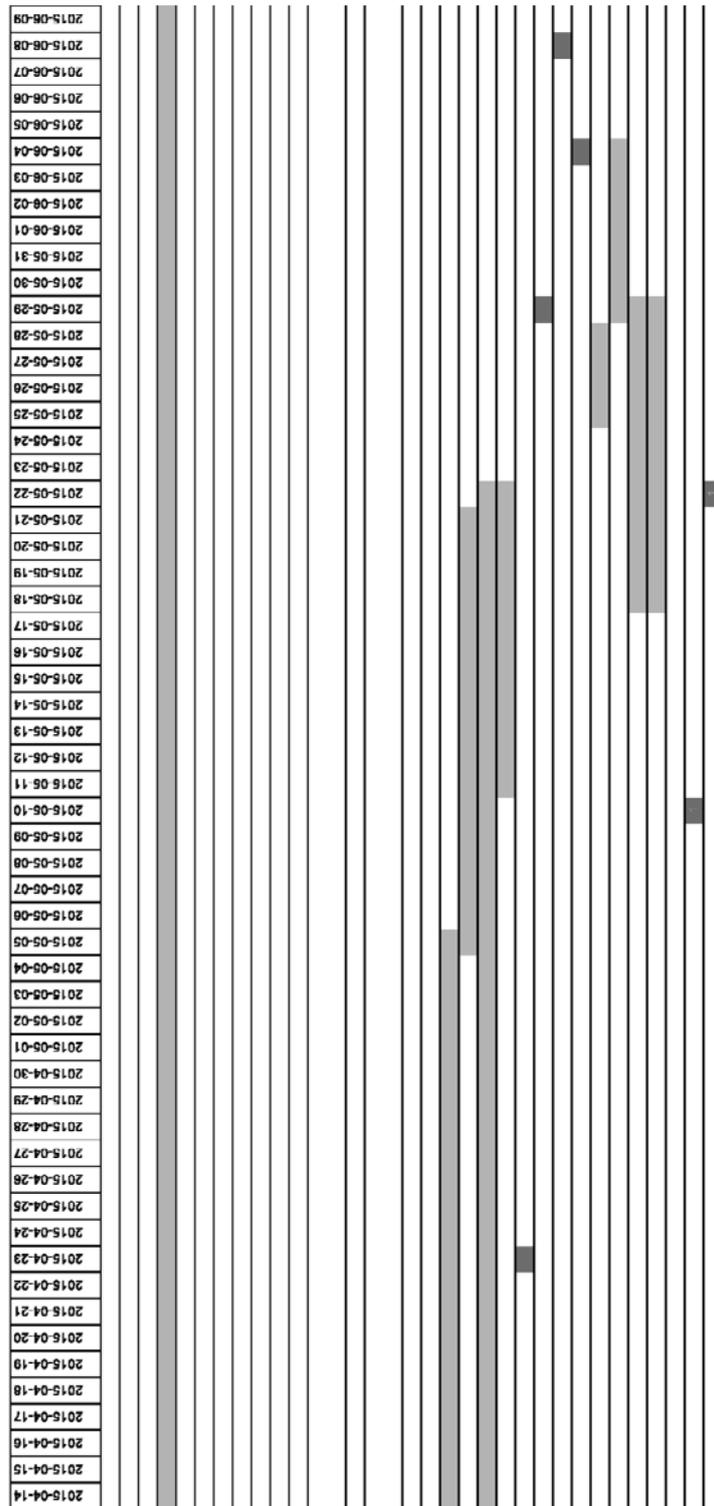


Figure C.5 Actual time plan page 3