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Christian Lycke Bladh
Fredrik Starling

Abstract

IKEA is currently in the progress of integrating Business Process Management (BPM) into the current functional organization. In order to investigate how to increase the accuracy of the capacity planning, IKEA saw a need of examining the processes connected to Plan & Secure Capacity, a sub process to the main process Supplying.

The purpose of this master thesis is to by using Network Planning map existing timelines for activities within the process Plan & Secure Capacity as well as for processes connected to it. In cases where information regarding processes is inadequate an "as is" description of the flow is to be mapped. Furthermore the planning cycle within Plan & Secure is to be reviewed and recommendations of how to make it quicker, leaner and simpler shall be given.

A descriptive and normative methodology approach was chosen in order to primarily explain and examine how the current situation is, and secondarily to suggest future recommendations. Information gathering was done in an inductive way combined with qualitative methods. Primary data was gathered mostly via interviews and in order to sustain a high level of reliability validation protocols were sent out. Secondary data was mostly used to form the theoretical framework and has been gathered from research reports and literature originating from well established universities or organizations.

The theory in the master thesis focuses on Network planning in order to determine possible time savings and to illustrate connections and critical paths via timelines and precedence relations. In order to create and understand process maps in a proper way the theoretical framework also includes Process Management.

The Capacity planning and the processes connected to it represents a complex context with a lot of factors influencing the outcome. The mapping of processes connected to Plan & Secure Capacity has shown that the outcome of a planning cycle has no further connection to the next planning cycle taking place. This enables some possible changes in the timelines and these can be further studied in *Conclusions and Recommendations* together with highlighted problems and suggested solutions.

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1 Introduction

This chapter provides the background of the master thesis and a problem discussion is clarified. Further on the purpose of the master thesis is defined, followed by a description of focus and delimitations. In this chapter the intended target groups are also presented.

1.1 Background

In the current business world companies face constant challenges to modify and streamline their operations. This because of factors such as market globalization, more intense competition and technological evolution.[1] The need of flexibility and communication is today essential in order to survive and therefore many companies are moving from the traditional function oriented organization towards process orientation.[2]

To facilitate cooperation within the organization in order to increase customer satisfaction a decision was taken within IKEA to integrate Business Process Management (BPM) into the current functional organization. The project for this implementation is called "One IKEA" and focus is on "togetherness" in order to increase business results. Three main processes were declared:[3]

- *Creating the home furnishing offer*
- *Supplying*
- *Communicating & Selling*

Within the Supplying process the overall goals are to make the IKEA product range available for the customers. This by buying, producing and distributing the goods at the highest possible customer experienced quality, under good social and environmental conditions at the lowest total cost.[4]

[1] (Dicken, 2003)
[2] (Ljungberg & Larsson, 2001), p.21
[3] (Supplying, 2009), p.16
[4] Ibid

1.2 Problem discussion

One purpose of ”One IKEA” within Supplying is to optimize the whole supply chain by integrating processes with current functions. This creates an organization where processes link functions together and increases communication between them. Even though this is leading to greater possibilities of crossing boarders and working more together there are still cases where parallel working methods and routines occur. Occasionally this leads to sub-optimization between functions, high operational costs and unnecessary overlaps.[5]

To secure awareness of milestones, deadlines and responsibilities IKEA has developed a concept called Year Cycle. The way a Year Cycle is constructed has a major impact on how work is planned and executed within the processes. Events in the IKEA Supply Planning Year Cycle work as triggers and start a chain of processes within Supplying. There are many objects and a lot of information that needs to be processed in time for the next event in the Year Cycle. A problem has been that it is hard to know how long time it takes to process different objects and how well the processes are coordinated time wise. Without this knowledge it can be difficult to distribute available time between different parts of the company that are affected by the Year Cycle. This also affects the possibility to secure quality in the planning process since the quality of the outcome decreases with increased time span.[6]

1.3 Purpose

As a consequence of the discussion mentioned above IKEA saw a need of examining current processes affected by the IKEA Year Cycle connected to the Supplying process in general and one of its core processes, Plan & Secure Supply, in particular. Within Plan & Secure Supply the sub process Plan & Secure Capacity will be used as a starting point for the investigation. The purpose of this master thesis is accordingly to:

1. a) By using Network Planning map existing timelines for activities within the sub process Plan & Secure Capacity as well as for processes within

[5] (Supplying, 2009), p.15
[6] (Björnsson, 2009)

the frame, from creating Group Sales Forecast until the financial reporting to IKEA Group.

b) In cases where information regarding processes or activities within the frame is inadequate, an "as is" description of the flow is to be mapped.

2. Review and develop the planning cycle within Plan & Secure Capacity.
3. Suggest recommendations of how to make the planning cycle within Plan & Secure Capacity quicker, leaner and simpler.

1.4 Focus and delimitations

Within the main process Supplying there are four core processes, two within planning and two within execution. Because of time and capacity restraints the focus on this master thesis is on the planning process Plan & Secure Supply. The other two main processes are not included in this project. When mapping the timelines and flow connected to Plan & Secure Capacity, some processes outside the Supplying process are included in order to cover both downstream and upstream flow. Regarding the downstream flow, the focus is on the financial reporting. The following review, development and recommendations primarily consider the planning process Plan & Secure Capacity.

1.5 Target group

The primary target group for this master thesis is IKEA personnel within the main process Supplying in general and the core process Plan & Secure Supply in particular. The secondary target group for this master thesis is engineering students focusing on supply chain management and process orientation, and lecturers as well as professors at Lund University, Faculty of Engineering (LTH), within the Department of Industrial Management and Logistics. Since the target groups are well familiar with the nomenclature, concept and words that these groups are expected to know will not be explained.

1.6 Company description

IKEA is a Swedish world leading Company within the home furnishing business. The company develops, manufactures and market its products in most parts of the world, operating in over 39 countries with 123000 co-workers and a net turnover of 21.5 billion euro.[7] IKEA is divided into three different groups, The IKEA Group, The Inter IKEA Group and the IKANO Group. The IKEA Group is what most people refer to when thinking about IKEA and encompasses all operations from raw material to finished and delivered products. The Inter IKEA Group owns everything that has to do with the concept and trademarks and The IKANO Group primarily deals with financial services.[8]

IKEA was founded in 1943 by Ingvar Kamprad in a small Swedish town called Agunnaryd. In 1951 the company moved to Älmhult, which is seen as the heart of IKEA and where IKEA of Sweden (IoS) has its headquarter. Since 1982, The IKEA Group has been owned by a foundation because Ingvar Kamprad wanted to create an organization that stands for independence and a long-term approach.[9] IKEA's vision is: "To create a better everyday life for the many people". This statement is supported by their business idea: "We shall offer a wide range of well-designed, functional home furnishing products at prices so low that as many people as possible will be able to afford them".[10] Since September 1st, 2009 Michael Olsson is the new Group CEO, replacing Anders Dahlvig who resigns after 10 years of presidency.[11]

[7] (IKEA webpage, 2009)
[8] (Peterson, 2009)
[9] (IKEA webpage, 2009)
[10] Ibid
[11] Ibid

2 Methodology

This chapter describes methodology and methods that can be used in order to fulfill the purpose. The procedures used in this master thesis are presented and motivated. Different ways of data gathering are presented and the validity, reliability and objectivity of the master thesis are discussed.

2.1 Research Methodology

Methodology is the fundamental working method that sets frames and principles for how a study is conducted. The purpose of methodology is not to describe the exact procedure but to step by step help getting in the right direction towards fulfilling the purpose. Depending on the purpose of the study different methodological approaches can be used and the amount of knowledge within a research area can be of significance when deciding on type of study.[12] There are four types of studies with distinct differences and each of them represents a certain way of work.

- *Exploratory studies* - Used when there is little knowledge of the research area and basic understanding of a problem and its context is to be attained.[13]

- *Descriptive studies* - Used when there is basic knowledge and understanding of the research area. The purpose of the study is to find out and describe how something works or is executed.[14]

- *Explanatory studies* - Used when deeper knowledge and understanding of a research area is sought. In this type of study the goal is to describe, explain and find cause-effects aspects of the problem.[15]

- *Normative studies* – Used when there is basic knowledge and understanding of the research area. The purpose of the study is to give guidance or recommendations for future operations.[16]

[12] (Höst, Regnell, & Runeson, 2006), p.29
[13] Ibid
[14] (Björklund & Paulsson, 2003), p.58
[15] (Wallén, 1996), p.46

This master thesis is best seen as a mix of a descriptive and normative study. A descriptive study was used in order to map existing timelines for activities within the sub process Plan & Secure Capacity. In cases where processes connected to this cycle were not already mapped by IKEA they were described as well. In order to suggest recommendations of how to make the planning year cycle within Plan & Secure Capacity more lean and simple the use of a normative study was needed.

The relationship between the theoretical framework and empirical data, and the perception of the two, has a major impact on how research is conducted. There are three methodology approaches when researching and each of them represents a certain way of working.

2.1.1 Induction

When using the inductive approach a subject can be studied without first having looked at existing theory regarding the research area. The starting point is the gathering of empirical data and based upon that material, theoretical as well as general conclusions are drawn. An inductive approach is often needed when performing an exploratory study and a condition when gathering empirical data is that this should be done in an impartial way.[17]

2.1.2 Deduction

When using a deductive approach the foundation of the research lies in existing theories. From the theoretical framework predictions of the empirics are made which are then compared with the gathered empirical data. From the comparison conclusions are made based on existing theories.[18] The most known deductive approach is hypothetic-deductive where a hypothesis is derived from theory in order to be tested empirically. An ideal way to perform this test is to systematically vary influencing factors and simultaneously measure the effects.[19]

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[16] (Björklund & Paulsson, 2003), p.58
[17] (Wallén, 1996), p.47
[18] (Björklund & Paulsson, 2003), p.62
[19] (Wallén, 1996), p.48

2.1.3 Abduction

When trying to draw conclusions or find causes to observations abduction can be used. Unlike deduction, where factors are varied and effects measured, the cause to an effect is sought without having the possibility to manipulate influencing factors. This implies vast knowledge within the research area or experience of similar cases to be able come to a reasonable result. In order to make the conclusions drawn while using abduction logically valid further investigation in form of practical experiments is needed.[20]

In this master thesis an inductive approach was chosen. The collection of empirical data laid the foundation and the theoretical framework was only used as a tool in order to structure and present the empirical findings.

2.2 Quantitative and qualitative studies

A quantitative study encompasses information which can be measured or numerically valued. Methods to be most suited for quantitative studies are questionnaires, mathematical models and statistical analysis. Everything cannot be measured quantitative though, which sets boundaries for the amount of possible gathered information.[21]

Qualitative studies are used when trying to attain a deeper understanding for a specific subject, event or situation. In comparison to quantitative studies, the possibilities for generalizations are less with qualitative studies. Which study being used primarily depends on what the purpose is of the study. Observations and interviews are in general better suited for qualitative studies, though it is the practical procedure that determines what kind of information to be gathered.[22]

In this master thesis qualitative studies, mostly in form of interviews, have been used for gathering empirical data. Although some of the information gathered has been of numerical value this data has not been sufficient for statistical analysis.

[20] Ibid
[21] (Björklund & Paulsson, 2003), p.63
[22] Ibid

2.3 Data Gathering

There are many methods that can be used to collect and process data. In connection with choosing method it can also be appropriate to consider what kind of data that is of interest.[23] In this chapter different kinds of data and some of the most common studies and methods for collecting it are described.

2.3.1 Primary and secondary data

Primary data is data gathered in purpose to be used in a specific study. The data does not exist prior to the study and is usually gathered through interviews, questionnaires and case studies.[24]

Secondary data is often originally based on another purpose than in current study. It has been gathered prior to the study and is generally presented in literature or electronic format. When gathering secondary data it is important to be aware of that the information could be biased or not comprehensive.[25] Aspects to be considered critical are immediacy, objectivity and reliable sources.[26]

Primary data in this master thesis has mostly been gathered through interviews but some information has also been given after sending out interview protocols for validation. Empirical secondary data originates mainly from internal IKEA documents while the theoretical secondary data has been gathered from literature relevant for the master thesis.

2.3.2 Interviews

Interviews can be structured in different levels, *structured*, *semi-structured* or *unstructured*. The *structured* one is more or less an oral questionnaire with confined answers to fixed questions. Advantages with this are the opportunity to explain uncertainties and the risks for missing information decreases. It is way more time consuming than doing a written questionnaires though.

The contrary *unstructured* interview is based upon an interview guide with different question areas. With this technique, questions can be formulated in different ways and in different types of order. To assure that all areas get

[23] (Björklund & Paulsson, 2003), p.66
[24] (Björklund & Paulsson, 2003), p.68
[25] Ibid
[26] (Björklund & Paulsson, 2003), p.70

covered and somewhat equally distributed time wise, it could be a good idea to dispose time limits per area. The open character of an unstructured interview could mean that information about totally different areas than suspected becomes included and the interview should therefore be recorded.

A *semi-structured* interview is a combination of an unstructured and structured interview where open questions are mixed with fixed questions. It is important that the fixed questions with fixed answering alternatives are formulated in the same way and asked in the same order, to not risk affecting the interview person in different ways.[27]

Qualitative interviews are used to get perceptions as a result of the interviewed persons own understanding. Standardized question forms are therefore not used since this would steer the interview too much. The investigator has a certain understanding about important factors and has written a manual or guide for the interview. This guide does not necessarily need to be followed precisely but it is of importance that the interview encompasses all areas within it. While doing the interview, new ideas and understandings often appear that might replace or deepen matters in the interview guide. This has to be considered during the interview.[28]

The selection of survey units is of great importance for the survey. Wrong persons in the selection could lead to a completely valueless survey in relation to the original purpose. This means that the selection is not done randomly (statistically), but systematically out of known formulated criteria, theoretically and strategically defined. To obtain as big information content about the area as possible, biggest possible variation width needs to be ensured as well as select interview persons with abundant knowledge about the examined area. The latter embraces persons more aware of the situation than others or persons that usually reflect over it. There is a problem though, these persons could also bias the reality and give convincing, but distorted explanations. The character of a qualitative interviewing process is often very private which affect the interviewed person's willingness to attend in the survey as well as their ability to express themselves. When selecting these methods can be combined but regardless from selection method it is important to ensure that the

[27] (Höst, Regnell, & Runeson, 2006), p. 90-91
[28] (Holme & Krohn Solvang, 1997), p.99-100

selection fits the survey.[29] A recording device should always be used but it is important to inform the person being interviewed of this in advance.[30]

Doing qualitative interviews is a very time consuming and demanding way of gathering information. Information gathering and analysis often slide over each other and qualitative interviews therefore usually switch between information gathering and analyzing it.[31]

In this master thesis a number of interviews were held with 21 interviewees within different functions and processes at IKEA. These persons possessed relevant knowledge regarding the supplying planning process and year cycles and were in advance informed about the purpose of the interview. Some of the interviews were conducted via an internet meeting, where files and desktops could be shared while communicating through a conference telephone. The reason of this was that a few interview respondents were located abroad. Most of the interviews were held face to face at IKEA of Sweden in Älmhult. An interview guide was prepared to facilitate the conducting of interviews. The interview guide was constructed in a semi-structured way but during interviews the authors realized that this was not appropriate. Instead it became more of a discussion where the purpose of the interview guide was more to secure that all areas were covered. The interview guide is presented in Appendix A. All interviews were recorded and the most relevant information was compiled in an interview protocol which was sent out for validation. In cases were process maps were created by the authors, information from the interviews were used as a base for creating preliminary maps. These were then validated by the interviewees. The maps were converted into IKEA format with the help of a mapping consultant.

2.3.3 Literature studies

Literature studies have the advantage of gathering a great share of information within a short amount of time and with little economical recourses. It is a valuable source to get a hold of existing knowledge and theories concerning a specific area. The disadvantage with literature studies is the fact that it is

[29] (Holme & Krohn Solvang, 1997), p.101-105
[30] Ibid
[31] Ibid

secondary data and therefore the purpose and methods for collecting this information is not always clear.[32]

In this master thesis literature studies were the main source for creating the theoretical framework and a complementary source for collecting empirical data. It was also used to give the authors more extensive knowledge in Business Process Management and network planning. The literature utilized consists of factual study books and articles and internal IKEA documents.

2.3.4 Questionnaires

Questionnaires consist of a number of questions and answering alternatives which have been standardized and decided in advance. The answering alternatives could be of different character with either defined options or given the possibility to answer more open and descriptive. The way of choosing respondent selection can be varied along with what is hold conveniently to find an answer on the placed questions.[33]

The advantage with questionnaires is that a big amount of primary data can be collected with help of a relatively small work effort. Contrary it is difficult to get a good picture of the respondent and his function. Body language cannot be read and risks for misunderstanding is in general bigger compared to interviews. It should also be taken into consideration that compared to interviews questionnaires might give briefer answers and bigger internal and external falling off.[34]

2.3.5 Observations

Observations can be done in many different ways, for example attending or observing. The person being observed could be informed in advance or ”sneaked up on” and a range of different tools can be used, like a timekeeper or just subjective approximations. This data gathering method is often very time consuming but in some cases it results in more objective information.[35]

[32] (Björklund & Paulsson, 2003), p.67, 69
[33] (Björklund & Paulsson, 2003), p.68
[34] (Björklund & Paulsson, 2003), p.70
[35] (Björklund & Paulsson, 2003), p.69

2.4 Validity

Validity can be defined as to what extent measurements measure what they are intended to measure[36]. Validity can be seen from two different aspects. On one hand there is the theoretical aspect regarding defining and delimiting what is to be measured and the relationship between this and the variables used in the study. On the other hand there is an empirical aspect regarding to be able to prognosticate expected values from one series of measurement. If a study has high validity this means that the measuring instrument shall not generate any systematic errors. This can be obtained by having clear definitions of concepts, knowing what factors that could affect the result and by understanding cause-effects relations.[37]

The validity of a study can be increased by using several perspectives for achieving the same purpose, for instance measuring the same phenomenon with help from different methods. When using interviews in a study the validity can be increased by asking not biased, explicit questions.[38]

2.5 Reliability

Reliability can be defined as to what extent a measuring device shows the same results when measuring an object several times[39]. Repetition of measurement can be replaced by statistical methods that are able to compute the reliability from one series of measurement. When it comes to conducting interviews, afterwards presenting collected data to the respondent in a compiled way can secure that the interviewer has interpreted the data in a right way. When it comes to humans it can be hard to repeat measuring an object because of altered conditions in case of influences and knowledge.[40]

The reliability of a study can be increased by carefully collecting data and displaying methods of work. When using interviews in a study reliability can be

[36] (Höst, Regnell, & Runeson, 2006), p.41
[37] (Wallén, 1996), p.66
[38] (Björklund & Paulsson, 2003), p.60
[39] (Björklund & Paulsson, 2003), p.59
[40] (Wallén, 1996), p.66

increased by asking control questions, meaning that the same phenomenon is being measured but in another way.[41]

The relationship between validity and reliability is described in Figure 1. In the picture to the left both validity and reliability are poor. The picture in the middle illustrates high reliability but low validity and the picture to the right illustrates both high validity and reliability.

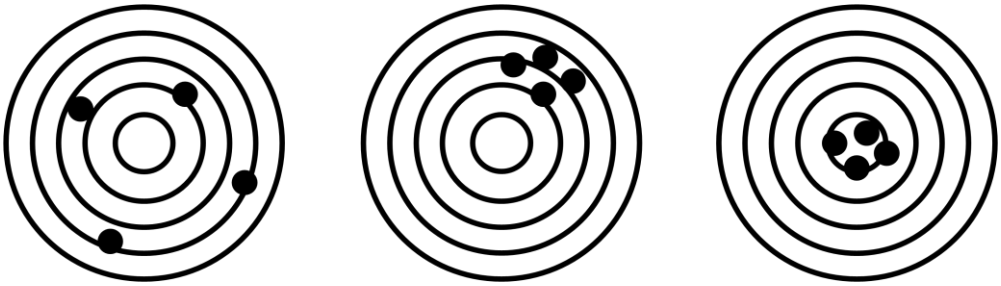

Figure 1. The relationship between validity and reliability.[42]

2.6 Objectivity

Objectivity can be defined as to what extent values of the persons involved in a study affect the results. The objectivity of a study can be increased by illustrating and motivating what choices are being made during a study. In that way the reader is given an opportunity to make up an own opinion about the results and therefore the objectivity of the study increases.[43]

2.7 Methodology criticism and credibility of sources

According to the authors the purpose of the master thesis and the demands from IKEA enforced the choice of methodological study to be a mix of descriptive and normative. In accordance to this an inductive approach was the most suitable methodological approach. If another study or approach would have been chosen this might had changed the outcome of the master thesis and considering the purpose and time frame also limit the value for IKEA.

[41] (Björklund & Paulsson, 2003), p.60
[42] Ibid
[43] (Björklund & Paulsson, 2003), p.59-62

The choice of mostly using qualitative studies when gathering empirical data was considered necessary to be able to fulfill the purpose. Most of the information used needed to be gathered through interviews since the outcome would not have been as fruitful otherwise. To select another technique for data collection was seen as inefficient. Questionnaires were believed to be time consuming and might not had been shown the same interest as interviews. Furthermore questionnaires were considered to create more room for misinterpretation, especially being sent out to different nationalities. The choice of mostly using information gathered through interviews can also be motivated by the fact that it is primary data in contrary to for instance literature studies where information can be biased or not supposed to be used for the same purpose.

The information gathered through interviews was interpreted by the authors. These interpretations were subjective and related with uncertainties. To decrease the risk of possible misunderstandings the interviews were recorded and information was compiled in an interview protocol and sent out for validation. To further validate the answers from the interviews some of the information used was confirmed by other sources independent of each other. This implied that the collected information was of high reliability. The authors cannot guarantee the objectivity of information given even though it was provided by people responsible for the areas being of interest in the master thesis. In spite of this the answers given contained both positive and negative aspects and were believed to present IKEA in a representative way. Considering the secondary empirical data gathered through internal IKEA documents these documents were believed to be of high validity and reliability. This assumption was based on the fact that the company itself uses this information as guidance and as templates for working methods.

The sources used to create the theoretical framework were considered to be of high validity. This because most sources are from factual study books written by researchers or academics with vast knowledge within the concerned areas. The reliability and objectivity were also considered to be high since the different sources contained similar information.

3 Theoretical framework

This chapter describes the theories relevant for the master thesis. To be able to grasp parts of the analysis an introduction to Network planning is given and theory regarding processes and the mapping of them is provided to understand parts of the empirics.

3.1 Network planning

The process of project planning is greatly aided by a set of techniques that handles the complexity of the time aspect of the planning.[44] These are used for developing a schedule for sequentially interdependent activities and can be useful for both internal and external oriented scheduling. The common name of these techniques is network analysis and the name for using them is network planning. Network planning can be used for bigger projects as well as in smaller assignments.[45]

The elementary steps in network planning are listed below:

1. Construct a network diagram containing all necessary activities and their precedence relations. A predecessor activity is defined as an activity that immediately precedes another activity without any other activities intervening.
2. Determine the duration of each activity and insert the times into the network.
3. Perform network calculations to establish the aggregated duration and to what degree the activities are critical.
4. If the aggregated completion date is later then necessary, consider modifying the duration so that the actual completion date may be within the required time frame.[46]

[44] (Slack, Chambers, Harland, Harrison, & Johnston, 1998), p.612
[45] (Wild, 2000), p356
[46] Ibid

3.1.1 Construction of network diagrams

As project complexity increases it becomes more and more necessary to in a logical way visualize the precedence relations of activities needed to complete the project. There are two ways of representing activities with help of network diagrams; Activity on arrow (AoA) and Activity on node (AoN).[47] AoN is used as a tool in this master thesis and therefore this method is described more thoroughly but since it is based on AoA both methods are explained.

3.1.1.1 Activity on arrow (AoA)

Activity on arrow is the most widely used method for constructing network diagrams and consists of two basic elements: activities and events. An activity is a time consuming task represented by an arrow or line and an event marks the beginning or end of an activity. An event is not time consuming and is represented by a circle. A sequence of events is referred to as a path where the activities are sequential and dependent of each other. Activities occurring in parallel on different paths are independent. A visual representation of an AoA network diagram is shown in Figure 2.

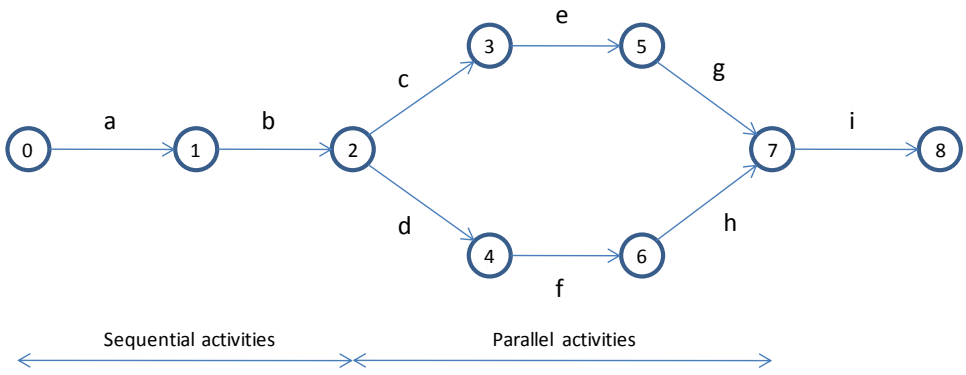

Figure 2. Activity on arrow network diagram.[48]

It is custom to let time flow from left to right in the diagrams and the event numbers follow the same logic where events with smaller numbers occur before events to the right, containing increasing numbers. Even though time

[47] (Slack, Chambers, Harland, Harrison, & Johnston, 1998), p. 614-617
[48] Based on (Wild, 2000), p.358

flows from left to right and precedence relations is shown, the length of the arrows are not related to the actual duration of the activities.[49]

Three rules for constructing an activity on arrow diagram is presented below:

1. An event cannot be reached until all activities leading to it are completed.
2. No activity can start until its tail event is reached.
3. No two activities can have the same head and tail events.[50]

To be able to avoid two activities having the same head and tail event dummy activities can be introduced. These are non time consuming activities whose only purpose is to maintain the logic in the network diagrams. Dummy activities are usually represented by dotted arrows or lines. As an example of how dummy activities are used one can study the four activities seen in Figure 3. The precedence relations for these activities are that *c* should be preceded by *a* and *b* while *d* only have to be preceded by *b*. If a dummy activity is not used the picture to the left in Figure 3 shows that *d* must be preceded by both *a* and *b*.[51] The correct way to construct a network diagram and maintain the logic is seen in the picture to the right in Figure 3.

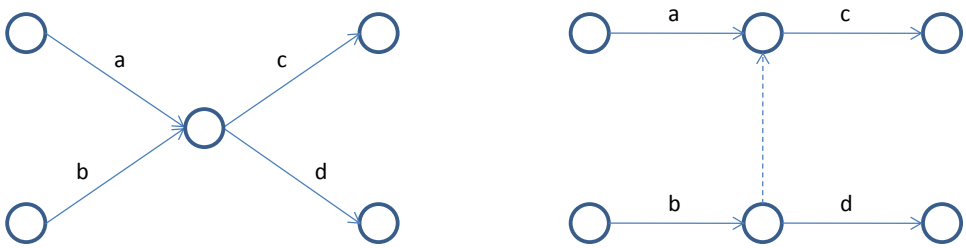

Figure 3. To the left: Network diagram with incorrect construction. To the right: Network diagram constructed in the correct way with help of a dummy activity.[52]

3.1.1.2 Activity on node (AoN)

This method has recently gained popularity because of project management software tools moving away from activity on arrow representations towards

[49] (Wild, 2000), p. 356-357
[50] (Slack, Chambers, Harland, Harrison, & Johnston, 1998), p.615
[51] (Axsäter, 1976), p.29
[52] (Axsäter, 1976), p. 30

standardized activity on node networks.[53] The networks consist of two basic elements: activities and arrows. An activity is a time consuming task represented by a node, often in shape of a box or oval. Arrows are used to connect the activities and define the precedence relations between them. It is custom to let time flow from left to right with the activities occurring first furthest to the left.[54]

In Figure 4 the activity named *a* is drawn first because of no predecessor activities. *B* is to be preceded by *a* and therefore an arrow is drawn from *a*, connecting the two activities showing that *a* must be completed before *b* can start. Next, both *c* and *d* have *b* as a predecessor activity. This is why their nodes are drawn with arrows coming from *b* meaning that *b* must be finished before they can start. At the end of the network diagram activity *i* has to be preceded by both *g* and *h*. The arrows drawn from these to *i* mean that *i* cannot begin until both *g* and *h* are completed. AoN network diagrams follow the same logic as AoA when it comes to activities and their dependencies.[55] In Figure 4 the difference between sequential and parallel activities is presented.

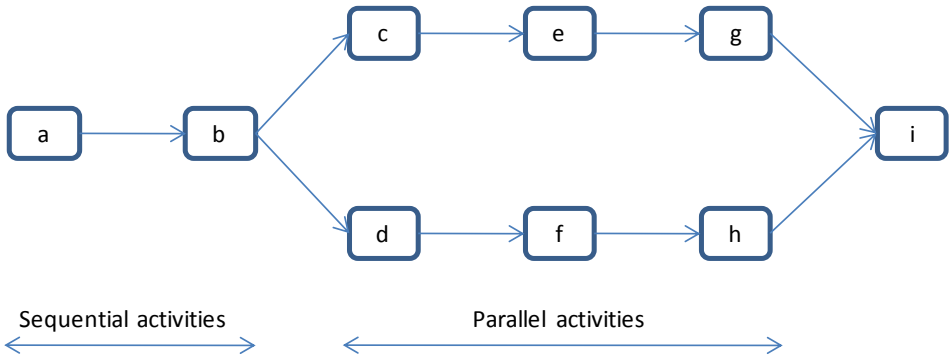

Figure 4. Activity on node network diagram.[56]

An advantage of using AoN when constructing a network diagram could be that it is often easier to move from the basic logic of a project's relationships to a network diagram using AoN compared to using AoA. Another advantage is that

[53] (Dawson & Dawson, 1995)
[54] (Slack, Chambers, Harland, Harrison, & Johnston, 1998), p.617
[55] (Wild, 2000), p.357-358
[56] Based on (Wild, 2000), p.358

dummy activities are not needed to maintain the logic in the network.[57] A visualization of this is shown in Figure 5 where the precedence relations for the activities are that *c* should be preceded by *a* and *b* while *d* only has to be preceded by *b*.

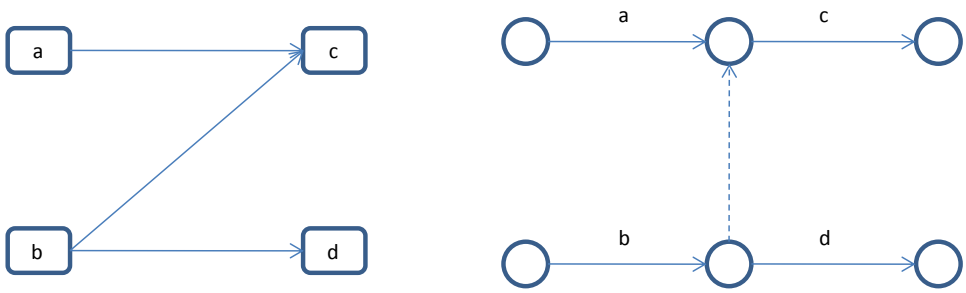

Figure 5. To the left: Activity on node Network diagram. To the right: Activity on arrow network diagram.[58]

3.1.2 Network diagrams calculations

Network diagrams calculations are primarily used for determining the overall duration for a project so that a completion date can be set or to see what alterations can be made in order to complete in time for a preset finish date.[59] Network diagrams calculations for AoA and AoN are performed in much the same way and give the same results.[60] Since the activity on node is used as a tool in this master thesis that method is applied when describing the calculations.

3.1.2.1 Earliest start times for activities (ES)

The earliest start time for an activity, *i*, can be defined as the shortest time from when a project starts till the activity starts.[61] Where several activities lead into one activity the succeeding activity cannot start until all preceding activities, *k*, are completed. This means that the one of these activities that finishes last determines the ES for the succeeding activity.[62]

$$ES_i = max_{k<i}[ES_k + d_k] \quad (3.1)$$

[57] (Slack, Chambers, Harland, Harrison, & Johnston, 1998), p.615
[58] Based on (Wild, 2000), p.400
[59] (Wild, 2000), p.361
[60] (Wild, 2000), p.400
[61] (Axsäter, 1976), p.31
[62] (Wild, 2000), p.361

3.1.2.2 Latest finish times for activities (LF)

The latest finish time for an activity, *i*, can be defined as the time a project finishes minus the durations of all activities succeeding activity *i*. Where this activity precedes more than one activity, the succeeding activity, *k*, with the earliest start time will determine the LF for activity *i*.[63]

$$LF_i = min_{k>i}[LF_k - d_k] \tag{3.2}$$

When the finish date for a project is not preset the LF for the project is usually set as the earliest start time for the last activity plus its duration. This because a project's LF should be as early as possible.[64]

3.1.2.3 Latest start times for activities (LS)

The latest start time for an activity, *i*, can be defined as its latest finish time minus its duration.[65]

$$LS_i = LF_i - d_i \tag{3.3}$$

3.1.2.4 Earliest finish times for activities (EF)

The earliest finish time for an activity, *i*, can be defined as its earliest start time plus its duration.[66]

$$EF_i = ES_i + d_i \tag{3.4}$$

3.1.2.5 Float

The earliest finish time for a project is determined by the longest path in the network. As a consequence there are paths in the network where activities have more available time than they require. The difference between available and required time for any activity is called float.

3.1.2.5.1 *Total Float*

Total Float for an activity, *i,* can be defined as latest finish time minus the earliest start time, representing the available time, minus the duration of the

[63] Ibid
[64] (Axsäter, 1976), p.34
[65] (Wild, 2000), p.363
[66] Ibid

activity, representing the required time. This float shows how much an activity can be delayed without delaying the finish time of the project.[67]

$$Total\ Float_i = LF_i - ES_i - d_i \quad (3.5)$$

3.1.2.5.2 *Free Float*

Free Float for an activity, *i,* can be defined as earliest start time of succeeding activities, *k*, minus earliest start time minus the duration of the activity *i*. This float shows how much an activity can be delayed without delaying a succeeding activity.[68]

$$Free\ Float_i = min_{k>i}[ES_k] - ES_i - d_i \quad (3.6)$$

3.1.2.6 Critical path

The critical path can be defined as the path in the network where the activities take the longest to complete. The float of these activities is zero and therefore these activities are called critical. Any delay in the activities on the critical path will delay the completion time for the project while activities on other paths at first consume some of the available float, not affecting the completion time of the project.[69] Every network has at least one critical path and this path indicates which activities should be supervised more carefully.[70]

3.1.3 Network Planning example

In Table 1 a list of activities which together represents a small project is presented. The table also shows the precedence relations and the duration of each activity. With help of this information the earliest finish time for the project and ES, LF, LS, EF and float for each activity can be calculated.

Table 1. List of activities which together represent a small project.

Activity	Predecessors	Duration (days)
a	-	6
b	-	4
c	a	3
d	a, b	7

[67] (Axsäter, 1976), p.32
[68] (Microsoft Office Project Help, 2009)
[69] (Wild, 2000), p.364
[70] (Axsäter, 1976), p.32

The first step is to construct an activity on node network diagram to represent the project. This representation can be seen in Figure 6.

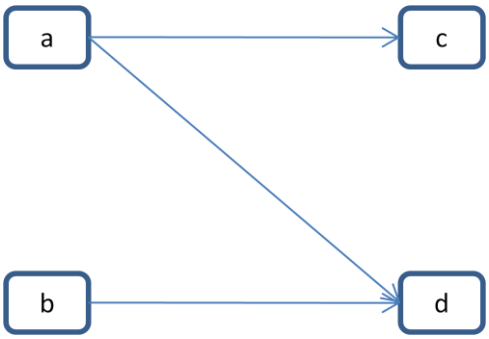

Figure 6. Representation of the project described in Table 1 in form of an activity on node network diagram.

The next step is to calculate the ES for each activity in order to determine the finish time for the project. The project starts at t=0, for instance on the 6th of November. Since *a* and *b* have no predecessors their ES is t=0. The ES calculations for *c* and *d* follow below.

$$ES_a = 0$$
$$ES_b = 0$$
$$ES_c = ES_a + d_a = 0 + 6 = 6$$
$$ES_d = max[ES_a + d_a;\ ES_b + d_b] = max[0 + 6;\ 0 + 4] = 6$$

The ES for the project will then be $ES_d + d_d = 6 + 7 = 13$. Since the completion time for the project should be as early as possible this time is set as the LF for the project. After determining the LF for the project the LF for each activity can be calculated. The LF calculations follow below.

$$LF_d = 13$$
$$LF_c = 13$$
$$LF_b = LF_d - d_d = 13 - 7 = 6$$
$$LF_a = min[LF_c - d_c;\ LF_d - d_d] = min[13 - 3; 13 - 7] = 6$$

Once the LF for each activity has been determined the total float for each activity can be calculated. The total float calculations follow below.

$$Float_a = LF_a - ES_a - d_a = 6 - 0 - 6 = 0$$
$$Float_b = LF_b - ES_b - d_b = 6 - 0 - 4 = 2$$
$$Float_c = LF_c - ES_c - d_c = 13 - 6 - 3 = 4$$
$$Float_d = LF_d - ES_d - d_d = 13 - 6 - 7 = 0$$

The LS and EF for activities are not needed to calculate float but can be determined by using the following formulas.

$$LS_i = LF_i - d_i$$
$$EF_i = ES_i + d_i$$

By itself the activity on node network diagram shown in Figure 6 only shows the precedence relations of the activities. However the nodes can be expanded to display all the information calculated above. The way the information is structured in a node is shown in Figure 7 and a network diagram presenting the additional information is shown in Figure 8. The critical path is represented by the red color and the dates presented are calculated as from the 6th of November. Since Saturday and Sunday are non working days these are excluded in the calculations.

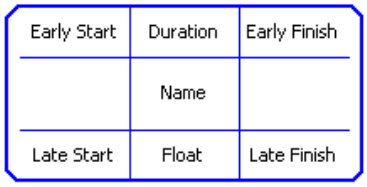

Figure 7. Template for network planning node.[71]

[71] Based on (Wild, 2000), p.401

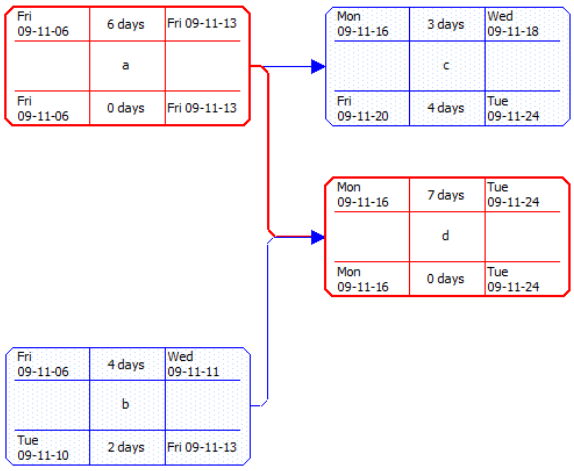

Figure 8. Example of activity on node diagram in Microsoft Project.

In activity on node network diagrams there is often no single point on the network representing start or finish. This can create some confusion, for instance regarding latest finish times for ending activities not critical for the finish time for the project. To facilitate the visual appearance of when a project starts and finishes nodes called *start* and *finish* can be introduced.[72] An example of this can be seen in Figure 9, otherwise showing the same information as Figure 8.

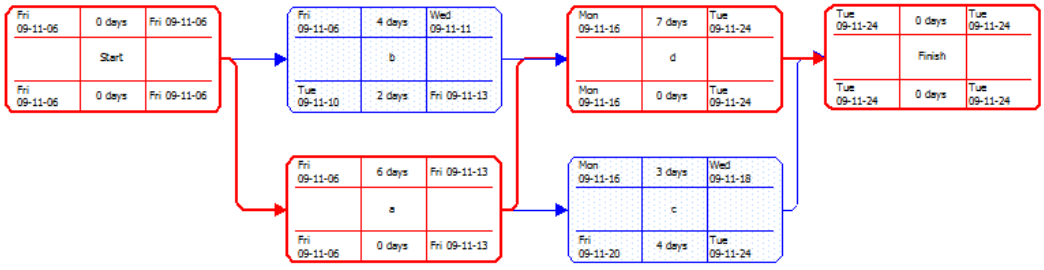

Figure 9. Example of activity on node diagram in Microsoft Project.

[72] (Wild, 2000), p.401

3.2 Gantt charts

When developing a network diagram it can often be useful to present the activities of a project against a time scale.[73] A network diagram in has no timescale but it is possible to come around this problem using a Gantt chart. This technique was first introduced by H.L. Gantt in 1917 and is today one of the most commonly used method for scheduling. Each activity is represented by a bar and the length of a bar is directly proportional to the calendar time, which indicates the duration of each activity.[74] The use of Gantt charts to represent activities when using network techniques can be appropriate when developing schedules that need to be communicated to others and visually displayed. The charts can for instance show earliest start date of activities, precedence relations, slack and uses color coding which can be useful to illustrate the critical path. An illustration of a Gantt chart describing activity name, start date, finish date, duration and precedence relations is shown in Figure 10.

ID	Task Name	Duration	Predecessors	Start	Finish
1	Start	0 days		Fri 09-11-06	Fri 09-11-06
2	a	6 days	1	Fri 09-11-06	Fri 09-11-13
3	b	4 days	1	Fri 09-11-06	Wed 09-11-11
4	c	3 days	2	Mon 09-11-16	Wed 09-11-18
5	d	7 days	2;3	Mon 09-11-16	Tue 09-11-24
6	Finish	0 days	4;5	Tue 09-11-24	Tue 09-11-24

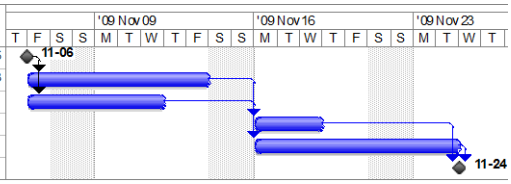

Figure 10. Gantt chart of example seen in Figure 9.

Gantt charts are not to be used as an optimizing tool but they provide a simple visual presentation.[75] There are two techniques for using Gantt charts as a tool when scheduling; reverse scheduling and forward scheduling. In reverse scheduling the duration of activities required for completing a project are determined by scheduling in reverse from a predefined completion date. In opposite, forward scheduling means that the duration of activities are scheduled from a predefined start date in order to achieve a completion date.[76]

[73] (Wild, 2000), p.384
[74] (Slack, Chambers, Harland, Harrison, & Johnston, 1998), p.613
[75] (Slack, Chambers, Harland, Harrison, & Johnston, 1998), p.376
[76] (Wild, 2000), p.315-318

3.3 Process Management

3.3.1 Processes

"A process is a repetitively used network of in order linked activities which uses information and resources to transform object in to object out, from identification to satisfaction of customer need."[77]

Apart from shorter definitions it describes what the process consists of and how it is related to the surrounding world. With network thinking it corresponds better to reality than with a strict sequencing view and it has a distinct start and end, starting with customer need to satisfaction of it. The definition also illustrates the importance of adding information and resources to make the transformation possible, creating value. An organization's choice of definition is critical because it is steering the view upon process work, what is included and what is excluded, what methods are being used and outermost what results are achieved.[78]

3.3.2 Process orientation

Process orientation aims to change the function orientated viewpoint on the organization. This means shifting to a process perspective on organizational form, systems, structures as well as attitudes, valuations and organization culture. If a business discovers and appreciates the process concept, a work of change usually takes place with the purpose to adapt the business to a new paradigm. Process orientation then implies processes as a benchmark for the way of seeing, designing, prosecute and develop the business. Many organizations though, have with awareness chosen not to see process orientation as something that demands a paradigm shift. The work of change might then influence a process orientated approach and the way of working but within a remaining unaffected structure.[79]

The view upon the business is very important because it is first when process orientation is fully used it can benefit from all new perspectives and advantages within it. The business is then acknowledging and utilizing processes as the structure creating customer value. Functions power to lead and develop the

[77] (Ljungberg & Larsson, 2001), p.44
[78] Ibid
[79] (Ljungberg & Larsson, 2001), p.88

business has been bereaved but their status is at least as high as before because they have transformed into competence- and resource centers.[80] Building and managing the organization's knowledge assets are key components to create value and to help sustain competitive advantage.[81]

3.3.3 Process identification

A condition to be able to control and develop the processes of an organization is to be able to identify and understand different types of processes. There are mainly three types of processes that are crucial to be identified in order to describe an organization in a proper way. These are core processes, support processes and steering processes. Core processes describe the most important value creating parts on a general level and give an overview of the organization. Supporting processes are not value creating themselves but are needed in order to support and make the core processes work as good as possible. Steering processes are needed to steer and coordinate the core and support processes.

3.3.4 Process documentation

To secure that work in the process is performed in a uniform and agreed way process documentation is important. This documentation consists of a number of various documents with different purposes. It includes process maps, working methods and other documentation which offer a broad picture of the process and how value is created. Good process documentation is useful in different situations for different persons and is the foundation for guiding the work in processes, educate and create understanding for the process and to analyze and improve the process.[82]

Something to be aware of regarding process documentation is that there is a difference between understanding the documentation and implementing it. Therefore, when documenting processes, it helps to consider who needs to review the process information, and for what purpose. People who need to implement them need to know what is supposed to take place and for what

[80] Ibid
[81] (Weinrach, 2006)
[82] (Supplying, 2009), p.48-49

reason. Another reason for process documentation is to not forget about the processes when distracted by other challenges.[83]

It is also important that the people responsible for the process documentation are knowledgeable about two types of knowledge that they acquire. There is a distinction between information and know-how and if it is tacit or explicit knowledge. Tacit knowledge is subconsciously understood and applied, difficult to articulate and developed from direct experience and action. It is usually shared through highly interactive conversation, storytelling, and shared experience. Tacit knowledge may hinder efforts of documenting a process, but it can be converted to explicit knowledge which is more precisely and formally expressed.[84]

3.3.4.1 Process mapping

Process maps are graphical illustrations, representing the events and sequences of activities of a process. Main reasons are to detect value adding and non-value adding activities and to simplify work. It is a tool for studying or analyzing a process or parts of a process. Process mapping is not a solution in itself but identification of how a process or current system operates is essential for identifying improvement opportunities.[85]

The purpose of process maps are most commonly process improvement and any process can be improved whether it has problems or not. The documentation gives a clear picture of the process which helps the analyst to easier identify problems and improvement alternatives. Complicated processes, defective output, unnecessary inspections, waiting and duplication of effort are some problems that can be detected by process documentation. This is why processes must be mapped and documented. If critical measures of performance such as cost, quality, service, job satisfaction and speed are in need of dramatic improvements, process documents are needed for reengineering purpose. This is a fundamental rethinking and radical design of business processes.[86] Current status, “As Is”, of a process must be well

[83] (Weinrach, 2006)
[84] (Ungan, 2006)
[85] (Savory & Olson, 2001)
[86] (Ungan, 2006)

understood before improvement areas can be identified and redesigned, developing a “To Be” map.[87]

The level of detail in mapping can vary depending on the purpose of documentation. Different segments may need different level of detail in maps and analysis depending on standardization purpose (very detailed), reengineering purpose (detailed) or how well a segment is working or not (more detailed if not). Sufficient level of detail is needed in problem areas to identify root causes of process problems. The level of detail will determine the type of knowledge to be acquired. When creating a detailed map, tacit knowledge is more likely to be acquired which will require a team. If only an overview of the process is needed, the map should not be detailed and an interview will be enough to document it.[88]

Processes are like all other systems related to other processes and can be named differently regarding to level of detail. A process is built up by parts of processes which in their turn are built up by activities. Sub processes are then inferior to processes and activities are inferior to sub processes as can be seen Figure 11.[89]

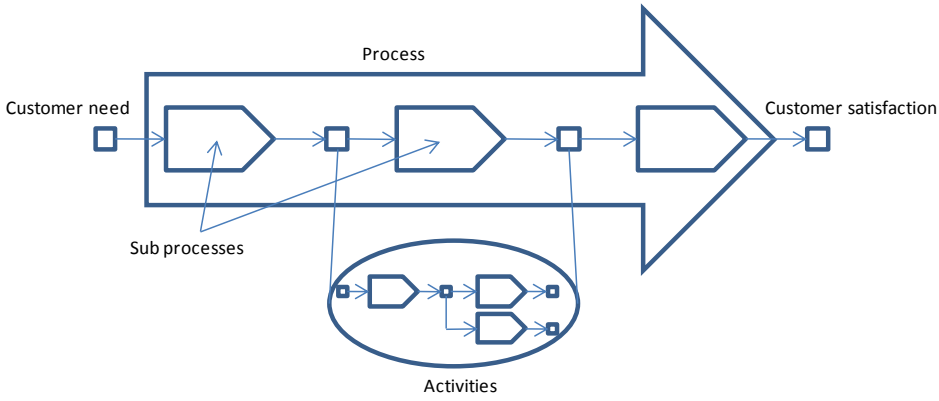

Figure 11. Process, sub processes and activities.[90]

[87] (Savory & Olson, 2001)
[88] (Ungan, 2006)
[89] (Ljungberg & Larsson, 2001), p. 193
[90] Based on (Ljungberg & Larsson, 2001), p.193

Recommended definition of a process contains five key words or "process components" which are *object in, activities, resources, information* and *object out*. The concepts and relations between them are explained below and can be seen Figure 12.[91]

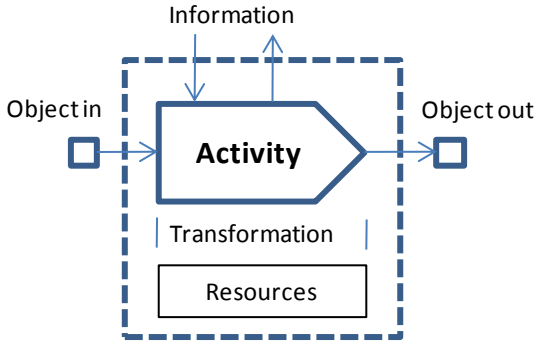

Figure 12. Process components.[92]

- *Object in* – Starts the process and in the ideal case value is added to this while the process runs. Object in comes out of the closest preceding activity or process, an internal or external supplier and represents a more or less expressed need. Activities within the process will not be able to initiate without object in, or objects in if many. Object in "triggers" the process.

- *Activities* – A sequence of actions that refines object in or other input.

- *Resources* – What is needed to perform the activity.

- *Information* – Supports and/or steers the process. Information facilitates to execute the process and have an effect on the performance. Information is normally not obtained from closest preceding activity in the process but from supporting processes.

- *Object out* – The result of an activity's transformation that takes place when an activity meets resources. Object in or other input in form of information are transformed into an object out. Object out becomes object in for the closest succeeding activity or sub process. The process

[91] (Ljungberg & Larsson, 2001), p.194
[92] Based on (Ljungberg & Larsson, 2001), p.194

is built up by a network of activities where the last activity's object out is the same as for the superior process. Resources like persons, equipment, facilities etc. are fixed to activities and sub processes and do not follow the objects through the process. Activities as well as resources affect the quality of an object out to a large extent.[93]

An activity can be connected to many different objects, both to start the process and the outcome of it. Some examples are illustrated in Figure 13 and Figure 14.[94]

Figure 13. Both object A and B needs to start the process. Both object C and D come out of the process.[95]

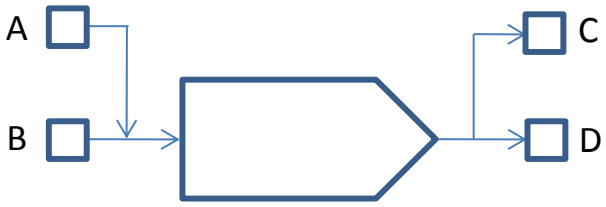

Figure 14. Either object A or B needs to start the process. Either object C or D comes out of the process.[96]

These types of connections can be applied on different types of flows within the process as well. Some examples are illustrated in Figure 15 and Figure 16.[97]

[93] (Ljungberg & Larsson, 2001), p.195
[94] (Ljungberg & Larsson, 2001), p.210-211
[95] Based on (Ljungberg & Larsson, 2001), p.210-211
[96] Based on (Ljungberg & Larsson, 2001), p.210
[97] (Ljungberg & Larsson, 2001), p.211

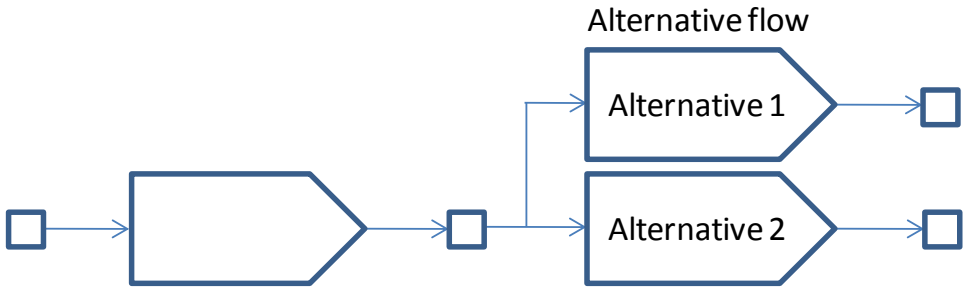

Figure 15. Alternative flow. Only one exit from the object, alternative 1 or 2.[98]

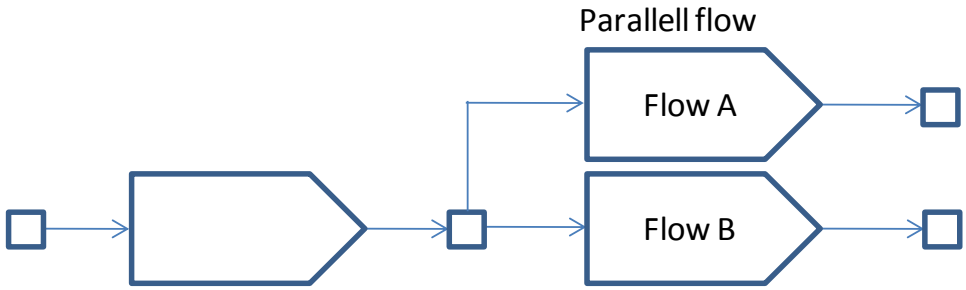

Figure 16. Parallel flow. Two exits from the object, both flow A and B.[99]

A process map needs to be honest and reflect the reality as it is in order to be useful for steering and developing the process. It should be easy to understand and include the most important components. A balance between user friendliness, content of information and to present the information in a right way is to be obtained. Objects and activities should have suitable names and as few symbols as possible should be used. Processes should be presented from left to right and the map should also be logical, with hierarchic relations between various levels of detail so that start and end point are the same no matter level of detail.[100]

To describe the difference between a project and a process a road could be used as a metaphor for the processes. It is a structure that is used over and over while a project could be seen as a specific journey on that road. Working project oriented does not mean working process oriented though. There are organizations working in projects who do not take care of their processes and

[98] Based on (Ljungberg & Larsson, 2001), p.211
[99] Ibid
[100] (Ljungberg & Larsson, 2001), p.212-214

this makes the purpose to improve a process as a whole difficult. The improvement implies to obtain a road as straight as possible and most of all make it to start and end in the right place.[101]

3.3.5 Measuring Processes

The purpose of measuring processes is to create knowledge which creates understanding and understanding is an important condition for development and improvement. Conducting a measuring system should pay big attention to chose and decide what to be measured as well as measuring it in the right way. To be able to do this it is also important to know why to measure it. To create the foundation of a process measuring system an inventory of the stakeholders' needs is therefore essential, measurable or not. These needs are established by external customers, the process in itself, internal strategy and organizational objectives. First then, needs are expressed in measurable terms and where no possible figures are available it is better to measure something that co-varies with intended measuring object. This to give some information even if it is not that precise. It is better to be approximately right than exactly wrong. Work with identifying and deciding measures favorably starts on main process level and continues to its parts of processes and should be started from the end of the process working towards the process beginning.[102] When effective process measures are established, findings that subtracting rather than adding measures can actually improve the process.[103]

When process mapping is in progress two sets of measures regarding to process performance can be collected. One set is broad in scope and applicable to all processes including cycle time, cost and quality. The other set includes effectiveness, efficiency and adaptability. Effectiveness measures how well objectives for the current process are achieved while efficiency express the amount of effort and resources needed to achieve the objectives. Adaptability indicates how quickly and easily the current process can be changed in order to meet various objectives.[104]

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[101] (Ljungberg & Larsson, 2001), p.47, 51
[102] (Ljungberg & Larsson, 2001), p.215-259
[103] (Weinrach, 2006)
[104] (Ungan, 2006)

4 Empirical study

This chapter describes the process structure at IKEA and the activities connected to the mid term capacity planning. The time aspects and precedence relations between activities are also explained in order to provide the full picture and to facilitate the analysis. The empirical study is mainly based on information given by the interviewees and statements in this chapter are taken from this information.

4.1 IKEA process structure

IKEA has three main processes and their shared aim is to transform customer need into customer success with help of their individual missions. The three main processes are described below and can be seen in Figure 17.

- *Creating the home furnishing offer* – The mission is to create and develop a product range that improves the everyday life at home. This with help of good function, design and customer experienced product quality at a low price.

- *Supplying* – The mission is to make IKEA product range available for the customers. This by buying, producing and distributing the goods at the highest possible customer experienced quality, under good social and environmental conditions at the lowest total cost.

- *Communicating & Selling* – The mission is to in an inspiring way help customers prepare, select and buy from the product range in store catalogue or other media.

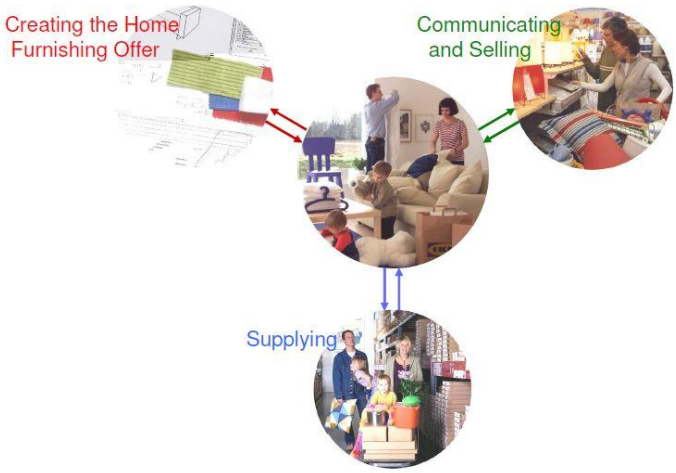

Figure 17. IKEA main processes.[105]

A process map of the main processes is called level 0. On this level sub processes and details are left out and the purpose is to give an accessible overview.

Within Supplying there are four core processes which are illustrated in Figure 18. A processes map on this level is called level 1 and gives an overview of the most important value creating parts as well as support and steering processes. Two of the core processes are connected to planning and the other two are connected to execution.

[105] (Supplying, 2009), p.16

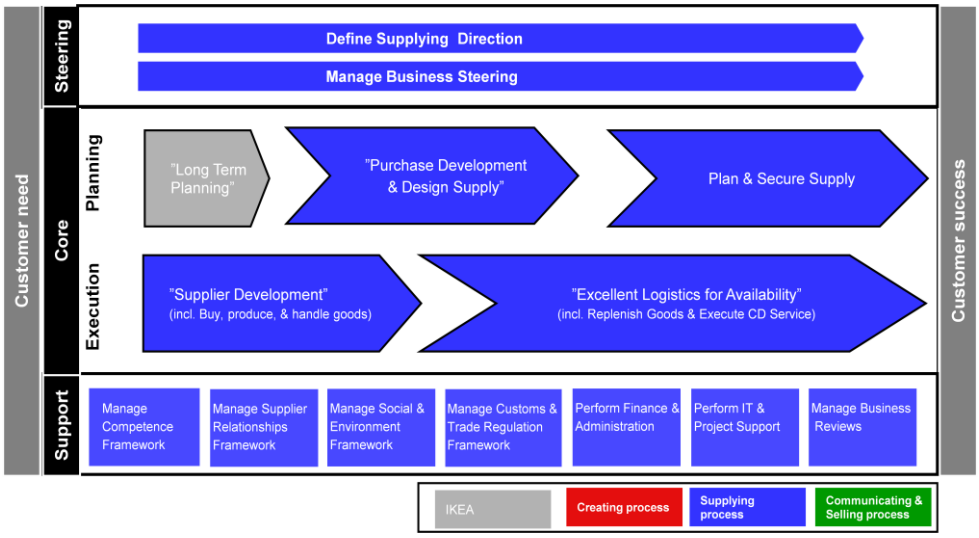

Figure 18. IKEA Supplying core process model.[106]

On the next level the systems of processes within a core process is shown. A process map on this level is called level 2 and is used to describe and create a general understanding of how a core process works. In Figure 19 the sub processes within Plan & Secure Supply are illustrated. Between the processes there are objects which connect them and show their precedence relations.

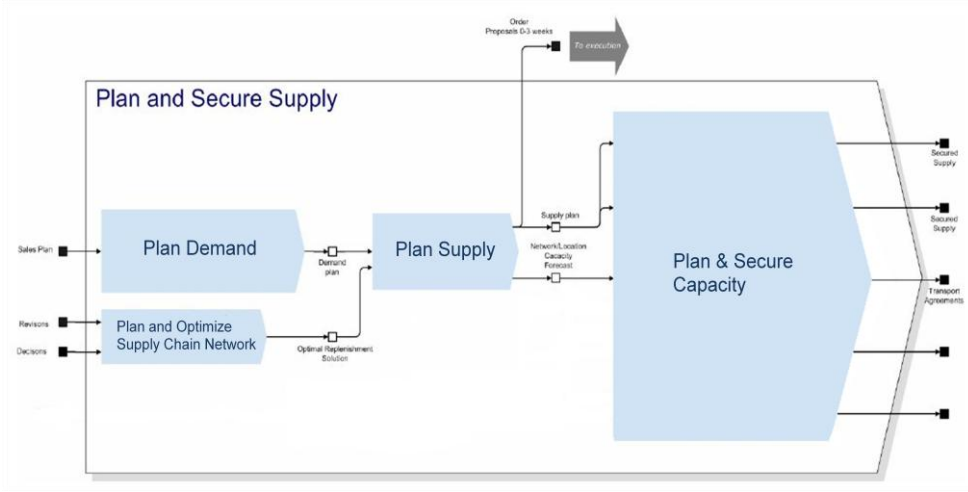

Figure 19. Illustration of Plan and Secure Supply on level 2.[107]

[106] (Supplying, 2009), p.17

The purpose of a process map on level 3 is to explain the process logic to process users. This more detailed level includes information needed in order to perform different sub processes or activities within a process on level 2. This map can also show systems being used in the process and who is responsible for it. In Figure 20 a sub process to Plan and Secure Capacity named Aggregated Capacity Planning is described on level 3.

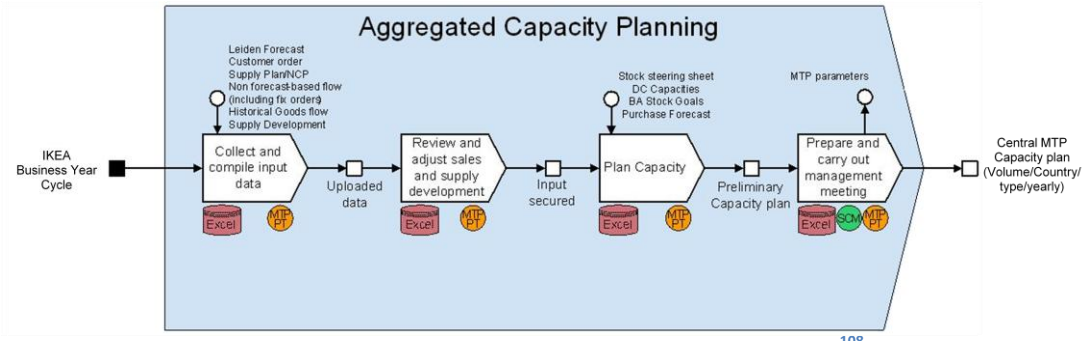

Figure 20. Process map on level 3 illustrating Aggregated Capacity Planning.[108]

4.2 Year Cycle

To facilitate planning work of the coming year IKEA has developed a concept called Year Cycle. These cycles describe different milestones, deadlines and responsibilities in order to secure awareness, understanding and commitment and were created with input from and in agreement with representatives from all processes and organizations across IKEA. There are six global Year Cycles but departments within the company are able to develop their own, for use on an operational, more detailed level. IKEA does not have one common Year Cycle and there are some mismatches between different cycles[109]. The year cycle connected to the main process Supplying is called IKEA Supply Planning Year Cycle. Regarding the capacity planning within the core process Plan & Secure Supply the most important milestones in the year cycle are the Sales Forecast Alignment and Update mid term need and capacity planning. The Sales Forecast update is the trigger that starts the capacity planning process and the Mid Term

[107] Based on (Supplying, 2009), p.51
[108] Based on (Supplying, 2009), p.51
[109] (Pesme, 2009)

Plan (MTP) provides the capacity needed in order to be able to fulfill the sales targets. The IKEA Supply Planning Year Cycle can be seen in Figure 21.

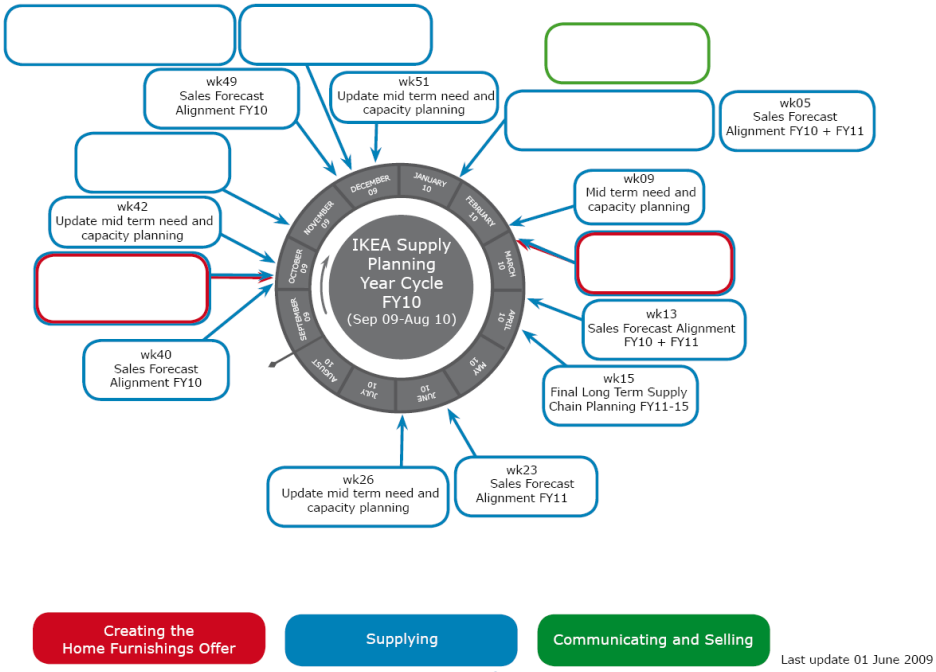

Figure 21*. IKEA Supply Planning Year Cycle FY10.[110]

4.3 Mid Term Planning

Mid term planning is a tactical planning process within Plan & Secure Capacity and it results in a flow and capacity plan for 0-x* weeks, called Mid Term Plan (MTP). Once per year a Long Term Plan (LTP) is created. This plan represents planning on a more strategic level for a longer time horizon, 0-5 years, but on an aggregated level also the same information as in the other MTPs. The creation of the LTP is supposed to take place within the core process Long Term Planning but since its framework is similar to the MTP's, an interim solution is to include it in Plan & Secure Supply. On aggregated level the MTP provides total volume needed per article and country. This is then broken down into more detailed level by different functions within the organization. The MTP is

[110] (IKEA Inside, 2009)

* Due to confidentiality reasons, only information relevant for the master thesis is shown.

* Removed due to confidentiality reasons.

updated bimonthly and the versions are used for different purposes. All of them are used for Bimonthly reporting which consists of a closing for the last two months and a forecast of costs for the remaining fiscal year (FY). Some of them are also used as input to the yearly pricing of catalogue articles and Cost goal for total Supply Chain next fiscal year. Weeks for completion of the MTPs and their purposes are presented in Figure 22.

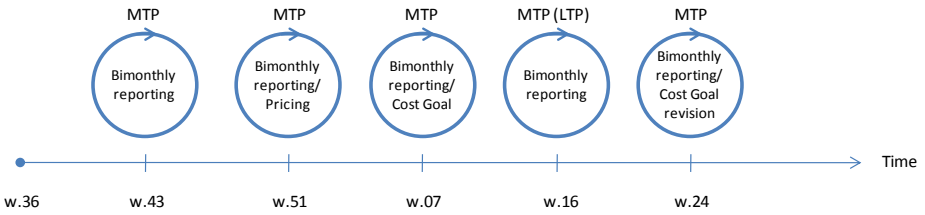

Figure 22. The different MTPs and their purposes.

4.4 Flows connected to capacity planning

The MTP is only one element of the complex process of capacity planning and to fulfill the purpose of each MTP a lot of preceding and succeeding parts are involved. The cycle of each MTP starts with a Group Sales Forecast on aggregated country level consolidated by the IKEA Group in Leiden. This forecast describes expected sales based on global goals, plans and forecasts from Retail units. When this forecast arrives at IoS a split from this level to Home Furnishing Business (HFB) level is made by IoS Business Steering and for each HFB sales frames called CAPP frames are set. Each HFB then needs to align their sales forecast on article level so it is in line with the top down goal. This alignment is made by Plan Demand which is a sub process within Plan & Secure Supply. The result is a Demand plan, calculated by the system Demand Planner. This plan is a forecast for each article on Retail unit level which is input to another process named Plan Supply. In this process the total supply of articles throughout the supply chain needed in order to meet the demand is planned. The outcome of this process, a Supply plan, is an input to a process named Plan & Secure Capacity. The capacity needed in order to fulfill sales targets and to cover the need of supply is calculated and results in a MTP. This MTP on aggregated level is then base for the actions needed in order to enable the Supply Chain to handle and secure the planned volume. On a more detailed level the functions create their own MTPs which then are input to the cost and

price calculations made by Finance Controlling at IKEA Supply AG (FC ISAG). The result of these calculations is then handed over to IKEA Group in Leiden which ends the cycle. The flow connected to capacity planning is described in Figure 23.

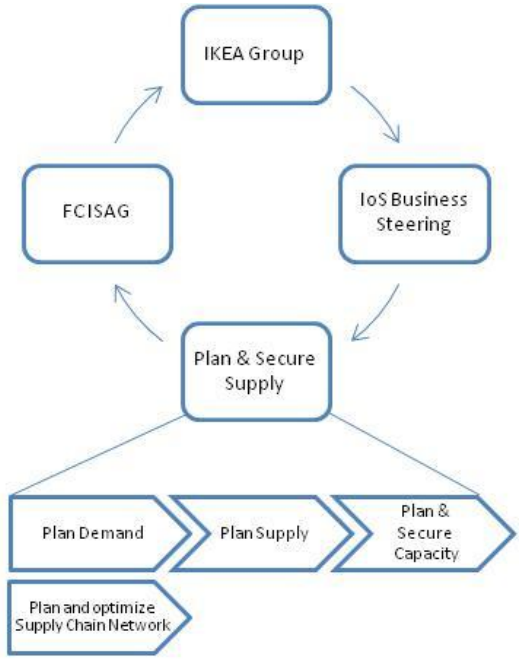

Figure 23. Flow connected to capacity planning.

To facilitate planning and to get an overview of the flow connected to capacity planning a Year Cycle has been developed in collaboration between the involved parts. The Flow Planning Year Cycle contains deadlines for parts, from IKEA Group to the end of Plan & Secure Capacity.

Today the flow connected to capacity planning does not work in an optimal way[111]. This because the Supply plan does not consider the total need of supply for IKEA which creates extra work within Plan & Secure Capacity concerning collecting and securing the input data. Regarding the capacity planning the Supply plan is still taken into consideration but does not trigger the process. Instead it is manually adjusted and tuned up in order to cover the total IKEA need based on the frames set by IKEA Group. Even if the Supply Plan would

[111] (Björnsson, 2009)

have been theoretically correct it would still not consider non forecast based range and customer orders. Today neither news and outgoing range nor fixed orders are adjusted for in the Supply Plan which makes it cover about 80 percent of the total IKEA need. The relation between the Supply Plan and the total IKEA need as well as to the Capacity Plan can be seen in Figure 24.

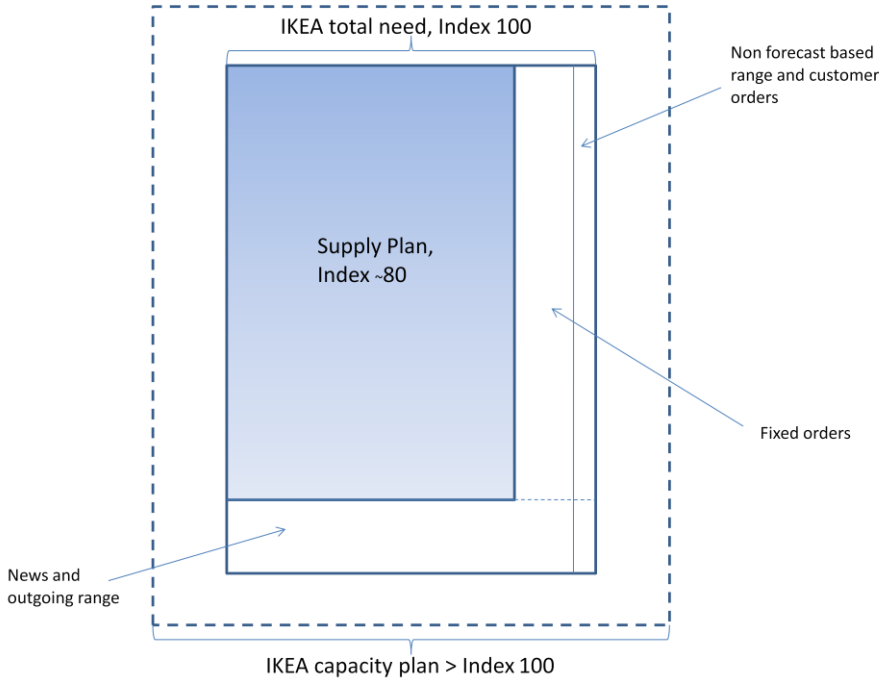

Figure 24. Supply Plan in relation to Capacity Plan.[112]

If the input to Plan & Secure Capacity was to be comprehensive the work connected to creating the aggregated MTP would consist of planning the capacity needed to secure the flow. The Capacity Plan exceeds the IKEA total need due to factors such as transport fill rates and avoiding shortages in distribution centers and stores. Since the Supply Plan is not correspondent to the IKEA total need additional input needs to be collected, adjusted and reviewed implying a different flow than seen in Figure 23. The actual flow connected to capacity planning is described in Figure 25.

[112] Based on (Björnsson, 2009)

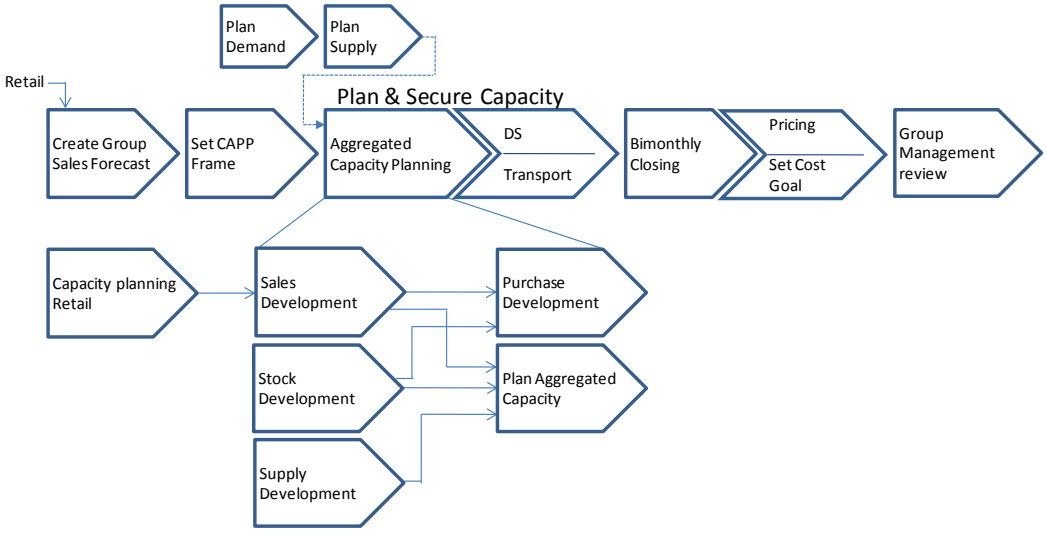

Figure 25. Actual flow connected to capacity planning.

The work connected to the processes seen in Figure 25 takes place bimonthly. The fact that the Demand Plan and Supply Plan are published each week and that the last available Supply Plan is used for verification rather than direct input to Aggregated Capacity Planning, is the reason for the dashed line in the figure. The choice of mapping the flow from Leiden to Leiden has resulted in mapped processes after Plan & Secure Capacity focusing on fulfilling the financial purpose. If the purpose would have been to map flow connected to decision making regarding securing capacity and availability, the processes after Plan & Secure Capacity would differ. This would indicate more focus being put on the execution processes Supplier Development and Excellent Logistics for Availability. Another purpose could also have affected which processes to succeed immediately after Aggregated Capacity Planning. For instance Retail Logistics, Trading and Categories might had been taken into consideration.

Process maps on a more detailed level have been developed by IKEA but in cases where maps did not exist these have been developed by the authors and can be seen in Appendix B.

4.4.1 Assumptions when mapping timelines

When mapping timelines, in some cases, assumptions about start and finish dates has been made by the authors:

- When insufficient information regarding actual duration the timeline has been based on internally established deadlines.
- When insufficient information regarding actual timeline the duration of a process has been calculated from the sum of its activities.
- The timeline for a process has been set based on the start date of a planning cycle and internal precedence relations.
- In processes where there can be possible revision requests finish dates are set to the ordinary finish date. This because it is hard to know the extent and duration of the work connected to these revisions.

4.4.2 Create Group Sales Forecast

The process named Create Group sales forecast is performed by the IKEA Group in Leiden and results in an aggregated sales forecast in money per country. The process is triggered by the fact that IKEA Group need the closing of books every two months and need figures on flow and costs in time for a new closing. The Group sales forecast is based on input from Retail such as sales figures for the last two months and forecasts for current and next year. The data from the stores arrives in the end of the week before the Group sales forecast is to be delivered to IoS. Depending on where Retail are in their business planning process the input and accuracy on the forecast differ. Before their business plan is finalized it is hard for Retail to provide value adding sales forecast for next year and this is why the first formal Group sales forecast for next year is done in week 4 after Retail have finalized their commercial agenda.

After the input data is compiled the information from Retail is analyzed and adjusted in order to be aligned to the business plan of IKEA Group for the current year. The outcome of this work is a preliminary Group sales forecast which then has to be washed and stamped by IKEA Group management. Management reviews the forecast and adjusts it to current Group tactics and there is a possibility that the forecast has to be analyzed and adjusted again to be in accordance to the IKEA Group management view at that time. The work connected to creating the Group sales forecast normally takes at the most 5 days.

IKEA Group get input from Retail units for total sales on country level as well as an indication on HFB level. Input on HFB level does not work so well today and is not aligned with the forecasts being done at IoS. The forecasts also differ on

country level and sales goals are not agreed between sales leaders in countries and the HFBs.

A process map for Create Group Sales Forecast can be seen in Appendix B. In Table 2 a list of time related information connected to the Sales Forecasts relevant for Create Group Sales Forecast is presented.

Table 2. Information relevant for the time aspects of Create Group Sales Forecast.

Related to	Predecessors*	Start		Finish		Successors	Deadline Flow planning
Sales FC w.38	-	w.38	FR.18/9	w.39	TH.24/9	Set CAPP frame, Sales Development	TU.29/9
Sales FC w.47	-	w.47	FR.20/11	w.49	TH.26/11	Set CAPP frame, Sales Development	FR.27/11
Sales FC w.03	-	w.03	FR.22/1	w.04	TH.28/1	Set CAPP frame, Sales Development	FR.29/1
Sales FC w.11	-	w.11	FR.19/3	w.12	TH.25/3	Set CAPP frame, Sales Development	FR.26/3
Sales FC w.20	-	w.20	FR.21/5	w.21	TH.27/5	Set CAPP frame, Sales Development	FR.28/5

* Retail is the predecessor but since it is outside the frame of the scope it is not included in the table.

4.4.3 Set CAPP frame

The CAPP frame is set by IoS Business Steering and the main purpose of the process is to from a top down perspective set a valid sales forecast for each HFB. The same week as the Group sales forecast arrives at IoS preparation work is performed based on HBF specific information such as sales goals, actual sales, trends and launches. The sales figures from the week before are provided latest on Tuesday but most of the preparations can be done prior to that. The preparation work takes 3 days and the outcome is a preliminary CAPP frame for each HFB. The Group sales forecast normally arrives on Wednesday or Thursday and then a comparison between the two forecasts is made. If the CAPP frame needs to be adjusted on aggregated level after matching it to Group sales forecast this work takes 1-2 days.

Before final CAPP frame is set it is sent out to the different HFBs so they can give their input on it but bigger deviations seldom occur. HFBs need a very good

reason not to accept the CAPP frame. On aggregated level Business Steering Manager Ian Mackie is responsible for setting the sales goals on HFB level. These sales goals are set to index 100, a frame that should be followed. The outcome of the process besides the sales frames on HFB level is a CAPP frame on aggregated level which is input to Plan Aggregated Capacity. The CAPP frame is visualized in an excel sheet and is sent out to aggregated capacity planning and to each HFB in the beginning of the week after the Leiden group forecast arrives. This normally happens on Tuesday or Wednesday. The challenge is then for every HFB to align their sales forecasts on article number level made from a bottom up perspective so it is in line with the top down goal. In this way a fairly reasonable forecast can be achieved. The bottom up forecasts almost always exceeds the CAPP frame.

Besides the aggregated sales forecast per country the Group sales forecast should contain sales forecast per HFB made by the countries. Today this is not working in a satisfying way and there are deviations between the sales forecast on each HFB made by the countries and the CAPP frame for each HFB.

A process map for Set CAPP frame can be seen in Appendix B. In Table 3 a list of time related information connected to the Sales Forecasts relevant for Set CAPP frame is presented.

Table 3. Information relevant for the time aspects of Set CAPP frame.

Related to	Predecessors	Start		Finish		Successors*	Deadline Flow planning
Sales FC w.38	Create Group Sales FC	w.39	MO.21/9	w.40	MO.28/9	Plan Aggregated Capacity	-
Sales FC w.47	Create Group Sales FC	w.48	MO.23/11	w.49	MO.30/11	Plan Aggregated Capacity	-
Sales FC w.03	Create Group Sales FC	w.04	MO.25/1	w.05	MO.1/2	Plan Aggregated Capacity	-
Sales FC w.11	Create Group Sales FC	w.12	MO.22/3	w.13	MO.29/3	Plan Aggregated Capacity	-
Sales FC w.20	Create Group Sales FC	w.21	MO.24/5	w.22	MO.31/5	Plan Aggregated Capacity	-

* Plan Demand is a successor but is not included due to explanation given in section 4.4.

4.4.4 Capacity planning Retail

Retail Logistics are in the process of finalizing their capacity planning and has not really been a part of the aggregated MTP. The only information provided to

Supply Chain Planning has therefore been revised customer delivery (CD) shares. This is information about which articles should be customer delivered from where and is decided in collaboration with Retail Sales. These decisions are based on commercial strategy as well as capacity constraints.

The new Retail capacity planning process will involve three more components, Stock weeks on store level, Direct Supply shares and price per cubic meter. A model is currently under development to predict the number of stock weeks on store level.[113] Regarding the Direct Supply shares there is a great deal of collaboration between capacity planners at Retail Logistics and Supply Developer Receivers (SDR). Retail Logistics provide SDR with the total goal for direct supply and SDR then provide Retail Logistics with logistical offers. After negotiations Retail Logistics then revise the direct supply goals for current and next fiscal year based on logistical offers together with some estimates. SDR then make a split of these goals into Direct Delivery (DD) and Transit share goals which are provided to the aggregated MTP. Price per cubic meter is done by Retail Logistics in collaboration with Retail Sales and affecting factors are the situation on the market, product range mix, price adjustments and information from IoS regarding global activities.

Retail also makes a detailed capacity plan on store level based on the aggregated MTP and a Location Capacity Plan (LCP). The LCP is the Supply Plan converted to volume and location. The outcome of this work is only used internally within Retail and has no further connection to the planning cycle.

Deadlines for all this information will be the same date as when the Group Sales FC arrives on Friday to IoS and taken into work with the Sales Development. There are deviations in time on when countries have to start to collect their data and prepare capacity and flow plans. However, as a rule of thumb, a five week preparation period is an average of time a country needs.

CALC is an internal system for setting prices towards Retail. Once per tertial there is a CALC run calculating new prices and this is connected to deciding distribution mode for articles. The number of MTPs and when they are done are today not aligned with these runs.

[113] (Roux, 2009)

In Table 4 a list of time related information connected to the Sales Forecasts relevant for Capacity planning Retail is presented.

Table 4. Information relevant for the time aspects of Capacity planning Retail.

Related to	Predecessors	Start	Finish		Successors	Deadline Flow planning
Sales FC w.38	-	≤ 5 weeks prior to finish	w.39	TH.24/9	Sales Dev.	-
Sales FC w.47	-	≤ 5 weeks prior to finish	w.48	TH.26/11	Sales Dev.	-
Sales FC w.03	-	≤ 5 weeks prior to finish	w.04	TH.28/1	Sales Dev.	-
Sales FC w.11	-	≤ 5 weeks prior to finish	w.12	TH.25/3	Sales Dev.	-
Sales FC w.20	-	≤ 5 weeks prior to finish	w.21	TH.27/5	Sales Dev.	-

4.4.5 Aggregated Capacity Planning

4.4.5.1 Sales Development

The work connected to Sales development can start as soon as the Group Sales Forecast arrives to IoS, normally on a Friday. The next 1 or 2 following days an analysis of its use in the aggregated capacity planning takes place on an aggregated level. In this analysis sales indexes on country level are calculated and compared to the indexes from previous year. If the forecast is for the next coming year, value is transformed into value per volume because when planning capacity it is the volume that is of interest. Price investments are calculated and added to a volume index on country level. Value per volume can change from year to year depending on price investments, density and the mix of range. Finally information from Retail about CD volumes is added and results in an outcome of estimated inbound flow to store on country level.

In Table 5 a list of time related information connected to the Sales Forecasts relevant for Sales development is presented.

Table 5. Information relevant for the time aspects of Sales development.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.38	Create Group Sales FC, Capacity planning Retail	w.39	FR.25/9	w.39	MO.28/9	Plan Aggregated Capacity	-
Sales FC w.47	Create Group Sales FC, Capacity planning Retail	w.48	FR.27/11	w.49	MO.30/11	Plan Aggregated Capacity	-
Sales FC w.03	Create Group Sales FC, Capacity planning Retail	w.04	FR.29/1	w.05	MO.1/2	Plan Aggregated Capacity	-
Sales FC w.11	Create Group Sales FC, Capacity planning Retail	w.12	FR.26/3	w.13	MO.29/3	Plan Aggregated Capacity	-
Sales FC w.20	Create Group Sales FC, Capacity planning Retail	w.21	FR.28/5	w.22	MO.31/5	Plan Aggregated Capacity	-

4.4.5.2 Supply Development

The purpose of Supply Development is to secure that a forecast on distribution mode in form of DD and Transit shares is provided to IoS in time for the aggregated capacity planning. The forecast considers distribution mode for articles on receiving country level and is made for 0-x* weeks.

In connection to each MTP templates regarding distribution mode are sent out from Supply Chain IoS to the Supply Developer Receiver (SDR). SDR is a function which in collaboration with Retail decides whether articles should go via DD, Transit or Distribution Center (DC). Besides input from Retail SDR also bases their decisions on the Group Sales forecast and the MTP revised during the last mid term planning. The templates are filled in by the SDR and normally sent back to IoS the same week as Leiden Group forecast arrives to IoS. Today SDR is given two weeks to gather and send in their input on distribution mode but this work has lately been done in a couple of days. The templates are reviewed by Supply Chain at IoS and after that a wash up meeting is held with Supply Chain Management. The review and wash up meeting takes at the most 1 day. The outcome of this is then input Aggregated Capacity Planning.

* Removed due to confidentiality reasons.

At IoS there are Sourcing Developers that decide what suppliers should provide what article on what receiving market. When it comes to decisions regarding distribution mode SDR reviews and revises these decisions a certain amount of times per year. The times for revision are connected to the CALC Year Cycle

which handles decisions concerning setting fair prices against Retail. The milestones in the year cycle are also important for Retail to be able to easier secure the need of future capacity. The revisions end in an agreement of distribution mode for articles between SDR and Retail and take place three times per year.

In Table 6 a list of time related information connected to the Sales Forecasts relevant for Supply development is presented.

Table 6. Information relevant for the time aspects of Supply development.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.38	-	w.38	MO.14/9	w.40	MO.28/9	Plan Aggregated Capacity	-
Sales FC w.47	-	w.46	MO.9/11	w.48	MO.23/11	Plan Aggregated Capacity	-
Sales FC w.03	-	w.03	MO.18/1	w.05	MO.1/2	Plan Aggregated Capacity	-
Sales FC w.11	-	w.11	MO.15/3	w.13	MO.29/3	Plan Aggregated Capacity	-
Sales FC w.20	-	w.19	MO.10/5	w.21	MO.24/5	Plan Aggregated Capacity	-

4.4.5.3 Stock Development

The purpose of Stock Development is to collect Stock prediction from different HFBs concerning information such as stock weeks, average stock and stock structure. The work connected to Stock Development starts on Monday the week before the Group Sales Forecast arrives at IoS. Supply Chain IoS sends out Stock prediction templates to the different HFB which then has 2 weeks to fill in these templates and send them back latest on Thursday the week after the Group Sales Forecast arrives.

The outcome of Stock Development is a consolidated Stock prediction from HFB and this Stock prediction is then input to the aggregated capacity planning. The Stock predictions done by HFB take place 3 times per year in connections to the Sales FC w.47, w.3 and w.20[114]. For the remaining Sales FC work done in Stock Development is based on old Stock predictions. The Stock prediction is calculated within Plan Supply and to get an outcome as accurate as possible the systems need two weeks of processing after Group Sales Forecast arrives to IoS. Today the Stock prediction is not aligned with the times Plan Aggregated Capacity need the input.

In Table 7 a list of time related information connected to the Sales Forecasts relevant for Stock development is presented.

Table 7. Information relevant for the time aspects of Stock development.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.38	-	w.38	MO.14/9	w.40	WE.30/9	Plan Aggregated Capacity	-
Sales FC w.47	-	w.47	MO.16/11	w.49	WE.2/12	Plan Aggregated Capacity	-
Sales FC w.03	-	w.03	MO.18/1	w.05	WE.3/2	Plan Aggregated Capacity	-
Sales FC w.11	-	w.11	MO.15/3	w.13	WE.31/3	Plan Aggregated Capacity	-
Sales FC w.20	-	w.20	MO.17/5	w.22	WE.2/6	Plan Aggregated Capacity	-

4.4.5.4 Purchase Development

The primary purpose of Purchase Development is to create a Purchase Forecast that implies how much is planned to be purchased for the current and next financial year. The forecast is made on the same aggregated level as the MTP done in the process Aggregated Capacity Planning and contains the anticipated purchase for IKEA for 0-x weeks expressed in notified value per country. The currency used in the forecast is Euro whose value is set to IKEA's fixed Euro rate of the current year.

The work connected to the Purchase forecast can start the week after the Group Sales Forecast arrives to IoS. Parallel to the work being done in Sales and Stock development some preparations in form of collecting and loading data

[114] (Giselson Olsson, 2009)

* Removed due to confidentiality reasons.

can be done but this is seldom the case since the work is not very time consuming. Based on the result of Sales, Stock and Price development a top down model of total purchase is created. To be able to know where goods are to be purchased an approximate Purchase Forecast is made based on the latest available Supply Plan and historical notified value. Because of the Supply Plan not covering all the flows the top down model is used as a tool to tune and adjust the purchase. The work connected to creating the forecast takes 2.5 days and the outcome is a preliminary Purchase Forecast which has to be reviewed in the management meeting where the aggregated MTP is created. This because there might be some deviations between the final sales and stock figures and the input taken from Sales and Stock Development. If adjustments are needed this work takes at the most 1 day and after that an official Purchase Forecast is sent to inbound planning within different functions and to FC ISAG.

Based on a split of the Purchase Forecast a currency forecast is created. This work takes 2-3 days including preparations and the receiver of the forecast is the Treasury Department at FC ISAG. If planning is made in advance the currency forecast could be made in 1 day. Today Aggregated Capacity Planning focuses at outbound planning where focus is on the receiver of goods. Inbound planning is based and driven by the Purchase Forecast and transport planning from a sender perspective where focus is on volumes from suppliers.

A process map for Purchase Development can be seen in Appendix B. In Table 8 a list of time related information connected to the Sales Forecasts relevant for Purchase Development is presented.

Table 8. Information relevant for the time aspects of Purchase Development.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.38	Sales Dev. Stock Dev.	w.40	FR.2/10	w.43	FR.23/10	Bimonthly reporting	WE.4/11
Sales FC w.47	Sales Dev. Stock Dev.	w.49	FR.4/12	w.52	MO.21/12	Bimonthly reporting, Pricing	WE.6/1
Sales FC w.03	Sales Dev. Stock Dev.	w.05	FR.5/2	w.07	TH.18/2	Bimonthly reporting, Set Cost Goal	WE.3/3
Sales FC w.11	Sales Dev. Stock Dev.	w.14	TU.6/4	w.15	FR.16/4	Bimonthly reporting	WE.5/5
Sales FC w.20	Sales Dev. Stock Dev.	w.22	FR.4/6	w.25	FR.18/6	Bimonthly reporting, Set Cost Goal	FR.2/7

4.4.5.5 Plan Aggregated Capacity

The purpose of this process is to create an aggregated capacity plan called central MTP. This MTP is expressed in volume (m^3) per country per article per year and covers flow from 0-x* weeks. Work connected to Aggregated Capacity planning starts on Tuesday the week after Group Sales Forecast arrives to IoS. During Tuesday to Wednesday this week a review and adjustment of Sales development and Supply development are made from a top down perspective in order to secure input to the capacity planning. Within Sales development the CAPP frame is taken into consideration and sales is looked into on country level. The outcome, volume per country divided into Cash and Carry and CD sales, is then sent to internal stakeholders. Regarding Supply development the flow is divided further into DC and DD shares and then sent out to internal stakeholders. After these two days the capacity planning starts with a review of Stock Development on Thursday where for instance turn rate, average stock, number of DCs and how sales and supply development effect stock development are looked into.

After these three days further detailed analysis are made within each area and preparations regarding management meeting and finishing a preliminary capacity plan are made. The analysis normally takes about 2 weeks, mostly because of extra work due to insufficient input, and additional calculations needs to be done. After this a management meeting is held where decisions regarding the final MTP are taken. To prepare and carry out the management meeting normally takes 1 day. After this the preliminary MTP is updated and the final MTP is published. Today the MTP is made in a receiver perspective but the aim is to also consider the sender perspective.

* Removed due to confidentiality reasons.

In Table 9 a list of time related information connected to the Sales Forecasts relevant for Plan Aggregated Capacity is presented.

Table 9. Information relevant for the time aspects of Plan Aggregated Capacity.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.38	Sales dev., Supply dev., Stock dev., Set CAPP frame	w.40	TU.29/9	w.43	TU.20/10	Detailed planning – DS capacity	WE.21/10
Sales FC w.47	Sales dev., Supply dev., Stock dev., Set CAPP frame	w.49	TU.1/12	w.51	WE.16/12	Detailed planning – DS, Transport capacity	WE.16/12 (FY10) FR.18/12 (FY11)
Sales FC w.03	Sales dev., Supply dev., Stock dev., Set CAPP frame	w.05	TU.2/2	w.07	MO.15/2	Detailed planning – DS, Transport capacity	WE.17/2 (FY10) MO.22/2 (FY11)
Sales FC w.11	Sales dev., Supply dev., Stock dev., Set CAPP frame	w.13	TU.30/3	w.16	MO.13/4	Detailed planning – DS capacity	MO.19/4
Sales FC w.20	Sales dev., Supply dev., Stock dev., Set CAPP frame	w.22	TU.1/6	w.24	TU.15/6	Detailed planning – DS capacity	FR.18/6

4.4.6 Detailed planning - Distribution Service Capacity

Planning for Distribution Service (DS) embody 5 different DS areas each containing 3-4 sub groups of DCs called DCGs. Capacity planning for DS is triggered by the aggregated MTP and is done 5 times a year including the LTP. Based on the Sales FC's different purposes different input for DS on an aggregated level is handed over to the receiving part FC ISAG. This input contains information about the planned flow through DCs and Customer Distribution Centers (CDC) for the remaining year and next year as well as actual figures for the past two months.

Since the beginning of FY10 a software called COGNOS Planning has been used for creating the MTP for DS. This software can handle larger amounts of data in a more structured way. Because of this time savings regarding the output have been made, especially when it comes to consolidation of the MTPs and the creation of the reports to FC ISAG.

In Table 10 a list of time related information connected to the Sales Forecasts relevant for Detailed planning – Distribution Service Capacity is presented.

Table 10. Information relevant for the time aspects of Detailed planning – Distribution Service Capacity.

Related to	Predecessors		Start		Finish	Successors	Deadline Flow planning
Sales FC w.38	Plan Aggregated Capacity	w.43	TH.22/10	w.45	WE.4/11	Bimonthly reporting	WE.4/11
Sales FC w.47	Plan Aggregated Capacity	w.51 w.01	TH.17/12 (FY10) TH.7/1 (FY11)	w.01 w.02	WE.6/1 WE.13/1	Bimonthly reporting, Pricing	WE.6/1 (FY10) WE.13/1 (FY11)
Sales FC w.03	Plan Aggregated Capacity	w.07 w.09	TH.18/2 (FY10) TH.4/3 (FY11)	w.09 w.10	WE.3/3 FR.12/3	Bimonthly reporting, Set Cost Goal	WE.3/3 (FY10) FR.12/3 (FY11)
Sales FC w.11	Plan Aggregated Capacity	w.16	TU.20/4	w.18	WE.5/5	Bimonthly reporting	WE.5/5
Sales FC w.20	Plan Aggregated Capacity	w.24 w.25	FR.21/6 (FY10) MO.28/6 (FY11)	w.25 w.26	FR.25/6 FR.2/7	Bimonthly reporting, Set Cost Goal	FR.25/6 (FY10) FR.2/7(FY11)

4.4.7 Detailed planning – Transport Capacity

Transport does not work with the mid term capacity planning bimonthly but takes the aggregated MTP into consideration when performing work connected to the Pricing and Cost Goal Process. This work takes place from December to July and the MTP then acts as a trigger. During the rest of the year the MTP is secondary and work connected to capacity is triggered by other events. The capacity plan created by Transport is called Transport Capacity Plan (TCP) and is expressed in annual flow in m^3 between two countries. The work connected to the creating of the TCP is based on the aggregated MTP, the Network Capacity Plan (NCP) which is the Supply plan converted into volume per supply relation, historical volumes and fill rates.

The TCP is an input to the work connected to the Pricing and Cost Goal process and costs for Transport on an aggregated level are handed over to FC ISAG twice per year. If FC ISAG is not satisfied with the figures they can ask Transport to revise them and hand in the figures once more. If revision regarding Pricing is needed this work takes at the most a couple of days. There is a possibility of the Cost Goal being revised on an aggregated level. If this occurs Transport sends in new costs but bases them on the same TCP as before. The time

between Transport receives the aggregated MTP and the TCP has to be delivered is considered pressed because of the lack of quality between the sender and receiver perspective on aggregated level.

In Table 11 a list of time related information connected to the Sales Forecasts relevant for Detailed planning – Transport Capacity is presented.

Table 11. Information relevant for the time aspects of Detailed planning – Transport Capacity.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.47	Plan Aggregated Capacity	w.51	TH.17/12	w.05	TH.4/2	Pricing	-
Sales FC w.03	Plan Aggregated Capacity	w.07 w.18	TH.18/2 MO.3/5	w.16 w.25	WE.21/4 TH.24/6	Set Cost Goal	-

4.4.8 Bimonthly reporting

The purpose of Bimonthly reporting is to bimonthly close the books demanded by IKEA Group and to create a forecast of supply chain costs for the remaining year. The process is performed by FC ISAG and triggered by the Purchase Forecast and the MTP made by DS. Based on these inputs a closing over figures for the last two months is done and this result then triggers the forecast calculations. Additional input to these calculations are cost forecasts from supply chain units covering the remaining fiscal year. The consolidated forecast is then reviewed by a management group and if a revision is demanded FC ISAG need to revise the forecast and possibly give feedback to supply chain units and demand alterations. Once per year, in the Bimonthly reporting connected to the Cost Goal, the forecast is reviewed by the INKA board and if they ask for a revision the work connected to calculating forecast needs to be looked into once again.

The time horizon for Bimonthly reporting is always the current fiscal year and covers 12 months in total. In the beginning of November actual figures for first two months of the year are closed and a forecast for the remaining 10 months is made. Bimonthly the process follows the same pattern and in the end of the year the Bimonthly reporting only consists of actual costs and flow figures. Regarding the work connected to each MTP Bimonthly reporting is made in advance to the Pricing and Cost Goal process.

Regarding the connection to the aggregated capacity planning the frequency and timelines are suitable for the bimonthly reporting. As long as there are changes and updates in volumes figures from the MTP are needed as input for calculating the bimonthly forecast. A process map for Bimonthly reporting can be seen in Appendix B.

In Table 12 a list of time related information connected to the Sales Forecasts relevant for Bimonthly reporting is presented.

Table 12. Information relevant for the time aspects of Bimonthly reporting.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.38	Detailed planning – DS Capacity, Purchase development	w.45	FR.6/11	w.47	FR.20/11	Group Management review	-
Sales FC w.47	Detailed planning – DS Capacity, Purchase development	w.01	FR.8/1	w.03	FR.22/1	Group Management review	-
Sales FC w.03	Detailed planning – DS Capacity, Purchase development	w.09	FR.5/3	w.12	MO.22/3	Group Management review, Set Cost Goal	-
Sales FC w.11	Detailed planning – DS Capacity, Purchase development	w.18	TH.6/5	w.20	FR.21/5	Group Management review	-
Sales FC w.20	Detailed planning – DS Capacity, Purchase development	w.27	WE.7/7	w.29	WE.21/7	Group Management review, Set Cost Goal	-

4.4.9 Pricing

The pricing process is done once per year and is used for pricing of articles that are to be in the catalogue for next FY. The goal of the pricing process is to give Retail fair prices. Articles should carry their right costs and not indirect costs because of bad packaging for example. To set these prices the internal CALC system is used. This process is done by FC ISAG and starts with a first preliminary CALC run where some first information such as purchase agreements, density weight package is needed. This together with the MTP made by DS and Purchase forecast is then the basis and trigger for calculating the parameters needed to be able to have an as accurate final CALC run as possible. Additional information such as pricing principles and input from DS,

Transport, Finance Supply Chain and Supply Chain general costs is needed as well for these calculations. The output is a first update of parameters which after a second preliminary CALC run with additional information received, results in a new base for calculations. Then the definite CALC run is made which results in final CALC run figures. All these calculations take about 3 weeks and a preliminary Cost Goal and Profit and Loss is an outcome from these calculations as well. When the forecast for the following year has been calculated this is compared to the latest forecast for current year.

After the definite CALC run FC ISAG analyze the prices and a reference group reviews the outcome. If some figures need to be revised FC ISAG review the figures and are responsible to secure that the concerned parties revise their figures. Then FC ISAG review the new figures and a partial CALC run for concerned units is made. After the outcome of the CALC run is accepted a presentation is held for important stake holders within the organization. Primary outcome is prices towards Retail for each article per Retail domain per country and secondary outcome is the total Profit and Loss Supply Chain consolidation.

It is of great importance that the updated MTP used for pricing is of good quality since ISAG only can adjust prices for x* % of the articles if volumes are dropping and prices need to be adapted and this is a risk ISAG have to carry. These articles are not in the catalogue and their prices can be revised each tertial. The deadlines for the CALC runs are set by tradition and because almost the whole IKEA is involved in the process by giving their parameters, these dates are very difficult to change.

* Removed due to confidentiality reasons.

A process map for Pricing can be seen in Appendix B. In Table 13 a list of time related information connected to the Sales Forecasts relevant for Pricing process is presented.

Table 13. Information relevant for the time aspects of Pricing process.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.47	Detailed planning – DS capacity, Purchase Development	w.02	TH.14/1	w.11	FR.18/3	-	-

4.4.10 Set Cost Goal

The process named Set Cost Goal is governed and performed by FC ISAG and the outcome is a Cost Goal for the whole supply chain covering the next FY. The unit for the final Cost Goal is Euro except for DS where the cost is expressed in Euro per cubic meter.

The work connected to the Cost Goal is triggered in the beginning of March by FC ISAG receiving the Purchase Forecast and the MTP made by DS. With help from additional input from the final CALC run, Finance Supply Chain, Bimonthly reporting and costs from supply chain units the Cost Goal is calculated. Regarding the costs, sub consolidations are made by Business Navigation at different units. The cost of flow is then sent to FC ISAG for further consolidation. When the Cost Goal for the following year has been calculated this is compared to the latest forecast for current year. This means that the Cost Goal worked out to be reported in end of April is compared to the forecast revision made in March.

To be able to have a Cost Goal that is as realistic as possible there is a possibility of a Cost Goal revision. The whole process is not performed once again but if changes during the spring are considerable they are put into calculations. The revisions can take place on several levels. If the calculations and analysis made by FC ISAG differ too much from the outcome of the supply chain units FC ISAG can give feedback and then the units make alterations accordingly. Normally the Cost Goal is handed in to Group Management in end of April. If they are not satisfied with FC ISAGS total consolidated group result for the Cost Goal they can ask them to revise and adjust it in time for the INKA board meeting in the end of May. If the board asks for a revision of the Cost Goal parts of the process

are performed once again and a new version of the Cost Goal is ready in the end of June. Updated Purchase Forecast and MTP input is received in beginning of July and if these figures deviate too much from the figures used for the Cost Goal new calculations and adjustments need to take place.

The receivers of the final Cost Goal are the general Supply Chain units and trading offices and FC ISAG gives them information regarding their goal on a deeper level. A process map for Set Cost Goal can be seen in Appendix B.

In Table 14 a list of time related information connected to the Sales Forecasts relevant for Set Cost Goal is presented.

Table 14. Information relevant for the time aspects of Set Cost Goal.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow Planning
Sales FC w.03	Detailed planning – DS Capacity, Purchase development	w.11	MO.15/3	w.17	FR.30/4	Group Management review	-
Sales FC w.20	Detailed planning – DS Capacity, Purchase development	w.27	MO.5/7	w.38	FR.24/9	Group Management review	-

4.4.11 Group Management review

As a result of the whole planning process FC ISAG creates financial forecasts of costs in the Bimonthly reporting and Set Cost Goal process. These are sent back to IKEA Group Management in Leiden and loaded from a system called COGNOS Controller. This is done every two months and when the Cost Goal for Supply Chain is to be reviewed. This review takes place in the end of the month and the input from FC ISAG is discussed in a telephone conference and compared to believed cost development of the IKEA Group. If these forecasts are not aligned a revision can be requested by the IKEA Group management which triggers new calculations for previous parts in the planning cycle. Once the forecasts are in line the Group reporting is made and the outcome of this is a consolidated financial forecast on Group level which is sent out to affected management. The financial forecasts connected to the Cost Goal are then input to the INKA Board meeting. If there is any need for changes after the INKA Board meeting another revision request is sent out which triggers another

round of revisions. The work connected to the Group Management review takes 1 day.

The outcome of FC ISAGs work connected to their forecasts has no further connection to the next Group Sales Forecast created. The new sales forecast should be based on Retail's latest sales expectations and not on cost forecasts based on the previous sales forecast. The purpose of the cost forecasts is to in first hand see that the numbers support the sales expectations they are based on.

A process map for Group Management review can be seen in Appendix B. In Table 15 a list of time related information connected to the Sales Forecasts relevant for Group Management review is presented.

Table 15. Information relevant for the time aspects of Group Management review.

Related to	Predecessors	Start		Finish		Successors	Deadline Flow planning
Sales FC w.38	Bimonthly reporting	w.48	MO.23/11	w.47	MO.23/11	-	-
Sales FC w.47	Bimonthly reporting	w.04	MO.25/1	w.04	MO.25/1	-	-
Sales FC w.03	Bimonthly reporting, Set Cost Goal	w.12 w.18	TU.23/3 MO.3/5	w.12 w.18	TU.23/3 MO.3/5	-	-
Sales FC w.11	Bimonthly reporting	w.21	MO.24/5	w.21	MO.24/5	-	-
Sales FC w.20	Bimonthly reporting, Set Cost Goal	w.29 w.38	TH.22/7 MO.27/9	w.29 w.38	TH.22/7 MO.27/9	-	-

5 Analysis

In this chapter the theoretical framework is used to analyze the empirical data. At first planning cycle drivers are identified and possible improvement scenarios are analyzed. Furthermore problems and solutions regarding flow connected to capacity planning are discussed. Finally total durations and float within the planning cycles are compared and evaluated.

5.1 Planning cycle drivers

The number of planning cycles and their timelines are today based on the financial reporting cycle. IKEA Group need to close the books every two months and in order to do this figures on flow and related costs need to be reported in time for a new closing. This financial reporting is the planning cycle driver and all the activities connected to capacity planning need to adapt their timelines to fit these deadlines.

Actual figures for the last two months are needed in order to perform closing of the books. According to decisions taken within IKEA, DS need to report the MTP for current FY and actual figures on the same date. Since the actuals are taken from the systems on the first Tuesday of each month they cannot publish the MTP before even if the work connected to it is finished. The timeline for the work connected to Bimonthly reporting is based on the decision point that closing of the books for the last two months needs to be performed. As long as the financial reporting is repeated bimonthly, closing the books for two full months, it can be hard to see any quality benefits in time savings.

A possible planning cycle driver can be found in the beginning of the cycle. Retail input provided to Create Group Sales Forecast is reported bimonthly and this could also be a reason for the timelines of the planning cycles being as they are today. Since the reporting for instance consists of actual sales for the last two months it would be hard to start a cycle earlier as long as the reporting is bimonthly. Starting a cycle later would not be desirable because this implies older input data, leading to decreased quality.

As it is today decreasing the time between Create Group Sales Forecast and Bimonthly reporting would not lead to better quality regarding input and

output because of the planning cycle drivers. These points of decisions need to be changed in order to facilitate quality improvements and due to the large extent of involved parts, decisions likely need to be taken on a high management level. If the assumption that decision points could be changed is made, several possible scenarios evolve. One scenario could be to delay the start of Create Group Sales Forecast, presuming that Retail are able to include more recent data on actual sales in their reporting. This would lead to increased quality of input data and consequently quality of output data from Detailed Planning DS Capacity. The effects of this scenario are illustrated in the middle of Figure 26. The upper scenario in Figure 26 illustrates unutilized time savings because of no changed dates of planning cycle drivers. Another scenario could be to start Bimonthly reporting earlier implying Supply Chain reacting faster on the MTP made by DS. This is actually the same quality improvement as in the first scenario and can be seen in the lower part of Figure 26.

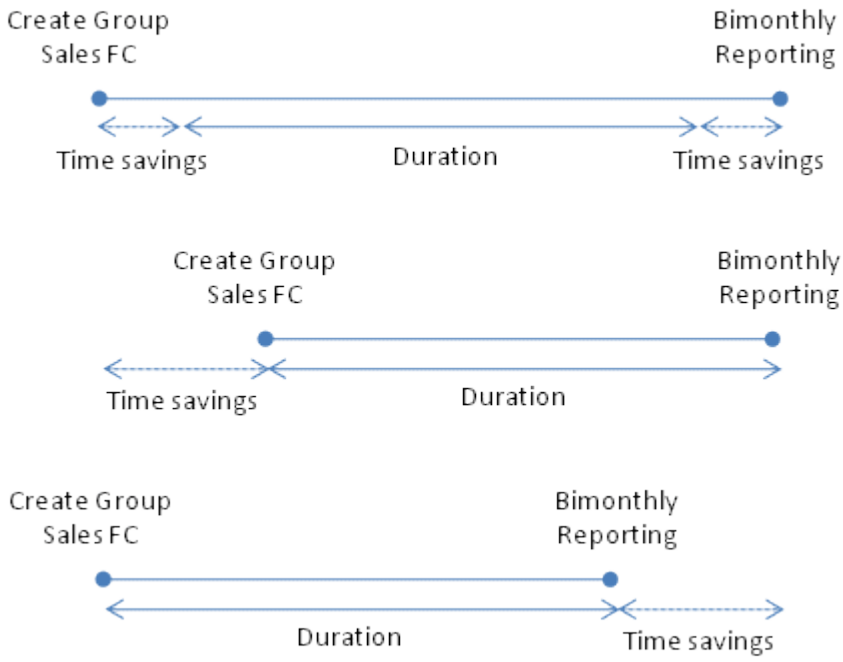

Figure 26. Scenarios of increased quality through time savings.

Regardless if the dates for the planning cycle drivers are changed or not Supply Chain could react quicker on input data if DS where not restricted to report

their MTP and actuals on the same date. Another solution to achieve better quality could be to disconnect the flow connected to capacity planning from the financial reporting cycle. This would enable capacity planning to take place more often, valid for a shorter time horizon. However, even if it would benefit Supply Chain this would imply extra work load for all processes up to Detailed planning DS Capacity.

5.2 Flow connected to capacity planning

Regarding Create Group Sales Forecast, besides the aggregated sales forecast per country the forecast should contain sales forecast per HFB made by the countries. Today this is not working in a satisfying way and there are deviations between the sales forecast on each HFB made by the countries and the CAPP frame for each HFB. This can imply problems when forecasts are to be set on more detailed level and when the Demand Planner calculates the forecast split per country. The forecasts do differ on country level and sales goals are not agreed between sales leaders in countries and the HFBs. IoS might have better understanding about how the range is developing but could probably never get the same local knowledge of the market situations in the countries and stores only by looking at numbers. A solution could be a process with continuous communication between countries and HFB on total sales per HFB and country. In this way the gap could decrease. Bimonthly meetings could be held between sales leaders and HFB responsibles and sales development could be planned together.

Regarding Set CAPP frame, one problem has been that the bottom up forecasts almost automatically exceeds the CAPP frame which creates a lot of extra work aligning the forecasts. One reason for this optimism from the HFBs could be that news is taken into consideration. Today the alignment is necessary because an unrealistic forecast, just a few percentages wrong on aggregated level, could mean huge effects on capacity planning implying great costs, for instance with storage or purchase agreements suddenly to be solved.

In terms of Capacity planning Retail and Supply Development, the number of MTPs are not aligned with the tertial CALC runs indicating extra work load for Retail and SDR. A possible solution for this could be to revise CD, DD and Transit shares only in connection to the CALC revisions. Today SDR sometimes have to

give a forecast of DD and Transit shares before having closed the agreements with Retail which affects the quality of the information. If the deadlines were to be synchronized SDR could give much more actual and up to date input to Supply Development. But since the outcome of the capacity planning is used for financial aspects it could be hard to update the MTP less often than every two months. On the other hand the deadlines for the CALC runs are set by tradition and because almost the whole of IKEA is involved in the process by giving their parameters, these dates could be very difficult to change. Either way, as long as there are 5 planning cycles connected to capacity planning each year there will always be at least two that are out of alignment with the CALC revisions.

One suggestion that would improve the output of Supply Development for one more cycle, the one starting in w.03, would be to push the MTP deadline for SDR to send input to one week later. In this way the agreements of new distribution setups between SDR and Retail are completed in time, indicating more recent and actual data being sent to IoS. The delay implies less time available for analysis within Plan Aggregated Capacity but since the input quality has improved the analysis would probably still be done in time for management meeting. The suggested scenario for improving input quality regarding Supply Development is illustrated in Figure 27.

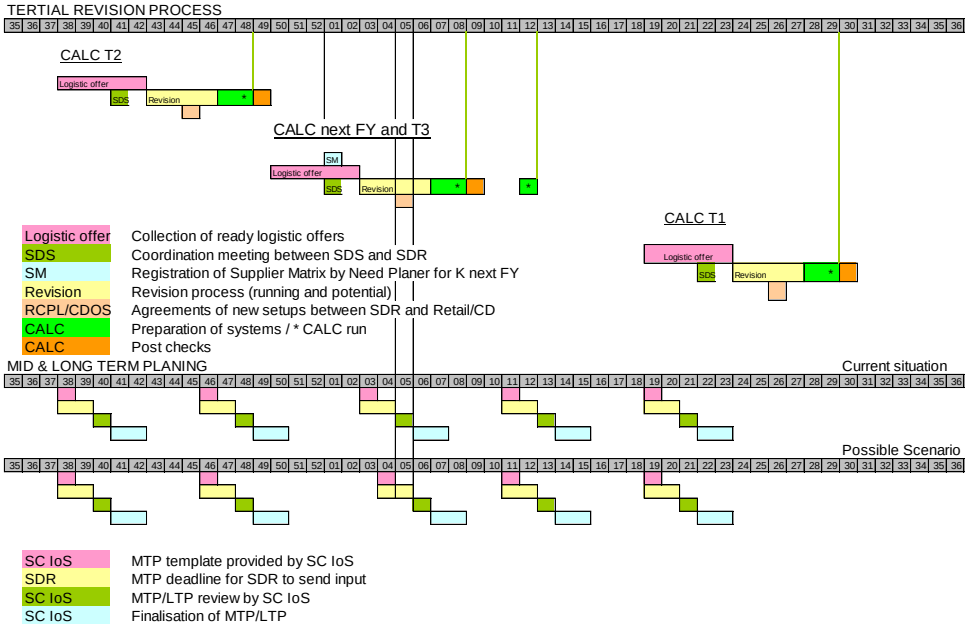

Figure 27. Possible scenario for improving input quality regarding Supply Development.

When it comes to Stock Development, Stock prediction is not aligned with the times that the input is needed by Plan Aggregated Capacity. Therefore insufficient input information from the different HFBs creates extra workload within Plan Aggregated Capacity. The problem is that Stock prediction needs to be handed in three days after the Group Sales Forecast arrives to IoS and this is not enough time to take the latest Sales Forecast into consideration. Instead the Group Sales Forecast and alignment from last planning cycle are used as input which is not optimal because flows easily could have changed during the last months. The lack of sufficient information in the Stock prediction implies that many things, such as matrixes and input on DCG level, instead need to be collected and reviewed in Plan Aggregated Capacity. A solution for this problem could be to move the start of the Plan Aggregated Capacity two weeks later and in this way be able to get much more accurate input on Stock prediction. The increased input quality would lead to less time being spent on review and analysis and if time savings could be made, the Bimonthly reporting deadline could likely still be held.

Another way of solving the issue with Stock prediction could be to have a management meeting on Friday the week after Group Sales Forecast arrives to

IoS. In this meeting frames would be set from a top down perspective, not knowing all the detailed information. The Stock prediction being made in Stock Development would be based on Sales Development and then estimations would be made. Then there could be another decision point two weeks later where a more detailed Stock Development would be performed, likely by DS, and compared to the Stock predictions from the HFBs. This suggestion would require that sufficient resources are available.

Regarding Aggregated Capacity Planning, the MTP is today made in a receiver perspective, only knowing volumes to receiving countries. This might be a problem when trying to plan the flow of goods from supplier to final customer on an aggregated level, for instance not optimizing transport solutions. A suggestion could be to increase the connection between the sender and receiver perspective being able to plan all flows, from supplier to store in the same system. In that way information regarding where goods are going and coming from can be given.

The use of the software COGNOS Planning within Detailed planning DS Capacity has resulted in time savings, especially concerning output. The design of COGNOS Planning allows larger amount of data to be handled in a more structured way. If this software was to be implemented throughout the planning cycle, time savings within other processes might be enabled as well. However, one uniform database would decrease time being spent transforming data between different interfaces. Such an implementation might not directly imply time savings because of inexperience of the new system. This learning phase could be reduced by internal education of how to use the system.

Today Microsoft Excel is used within Aggregated Capacity Planning. This software is very flexible and changes can easily be made manually, but there are limitations regarding possible amount of data being handled. In COGNOS Planning changes would be more difficult to perform manually due to its structured system. Hence, a condition for implementing COGNOS Planning would be a stable process where parameters to consider are established. A future ambition is to include the sender perspective in the aggregated MTP. This implies more information, for instance about sending country, and COGNOS Planning would be a good tool to support this. In order to implement COGNOS Planning throughout the processes connected to capacity planning,

decisions have to be taken on higher management level. Until the process organization is fully established it might be hard to determine where and by whom these decisions should be taken.

5.3 Total duration of the planning cycles

When the flow connected to capacity planning starts and ends is a matter of definition and purpose. Since the Group Sales Forecast is the base for further forecasts made by succeeding processes in the planning cycle the Create Group Sales Forecast process can be seen as the start. On the other hand, the input data given by Retail is up till 2 months old. Other processes start earlier as well but this work is connected to collecting and compiling input data and not to create new forecasts on an aggregated level.

Regarding the end of the planning cycle there can be three possible scenarios depending on the purpose. One purpose for the flow connected to capacity planning is to make the Supply Chain react to the MTP indicating that the cycle ends when DS publish their capacity plan for current FY. DS also publish a MTP for next FY one week later. But since shorter time horizon implies less uncertainty in the forecast, the publication date of the MTP for current FY was chosen to end the cycle. Total duration for the planning cycles related to the different Sales FC can be seen in Figure 28.

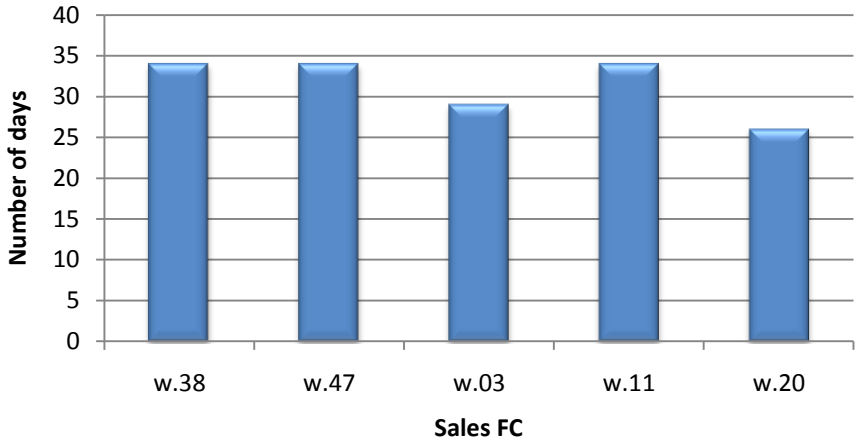

Figure 28. Total duration for planning processes ending with DS publishing their MTP for current FY.

The duration of the planning cycles seem to be quite stable between 26-34 days. The average duration to end a planning cycle is 31 days which correspond to approximately 6 weeks of work. These durations are based on primary input data which in many cases are different from established deadlines. Input on durations for following processes, used for the other two purposes, are entirely correspondent to these deadlines.

Another purpose is to give input to the financial departments in order for them to perform the Bimonthly reporting. In this case the planning cycle ends with the process Group Management review. Total duration for the planning cycles related to the different Sales FC can be seen in Figure 29.

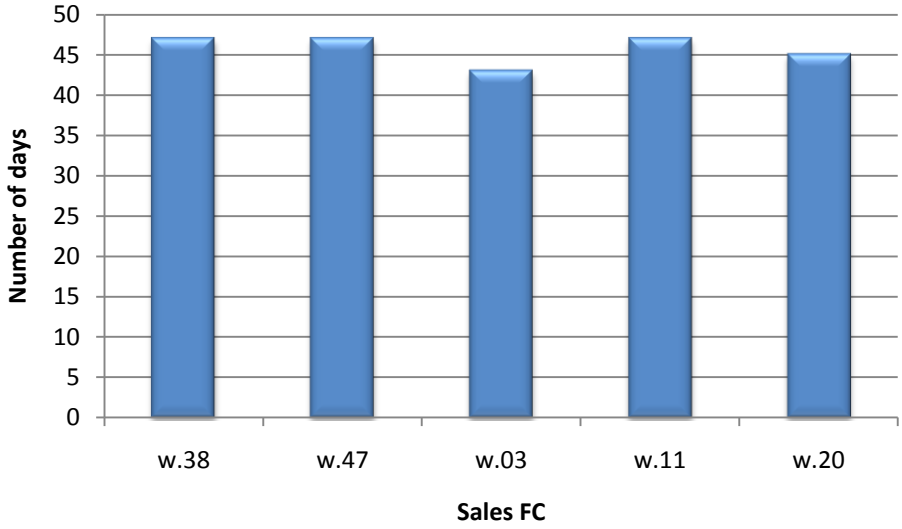

Figure 29. Total duration for planning processes ending with Group Management review.

The duration of the planning cycles seem to be quite stable and the average is 46 days which corresponds to approximately 9 weeks of work.

A third purpose for the flow connected to capacity planning is to give input to the Pricing and Set Cost Goal process. Pricing is connected to the Sales FC in w.47 and Set Cost Goal to the one in w.03. If there is a need for revision of the Cost Goal this is connected to the Sales FC in w.20. Total duration for the planning cycles related to the different Sales FC can be seen in Figure 30.

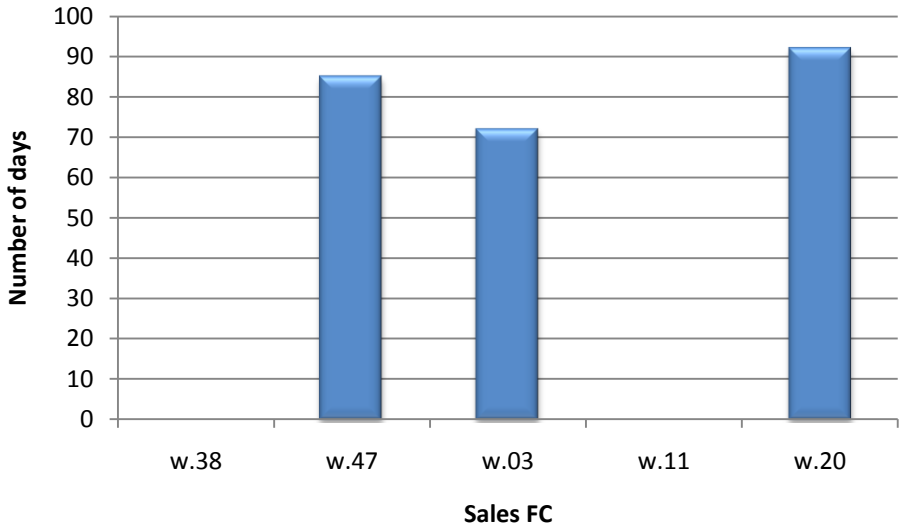

Figure 30. Total duration for planning processes ending with Pricing and Set Cost Goal.

The durations of these planning cycles are difficult to compare since work being performed within Pricing is different from the work done within Set Cost Goal.

Regardless of where the planning cycle ends the outcome has no further connection to the next Group Sales Forecast being created. This implies that there is no connection between the end and the beginning of the cycle, indicating an open loop. Therefore it would theoretically be possible to change the start date of a new cycle. This could by itself affect connections within the cycle leading to better quality both regarding input and output.

5.4 Actual finish versus Deadline Flow Planning Year Cycle FY10

The Flow Planning Year Cycle considers deadlines from Create Group Sales FC as far as to when DS publish their MTP for next FY. Since collected input data for these parts sometime differ from established deadlines this indicates that changes regarding dates for deadlines could be made. The number of days with float described in Figure 31 shows how many days concerned processes can be delayed without exceeding their deadline. As seen in the figure there are possibilities to speed up these planning processes. This to be more reactive to updates in order to ensure availability and optimize stock requirements.

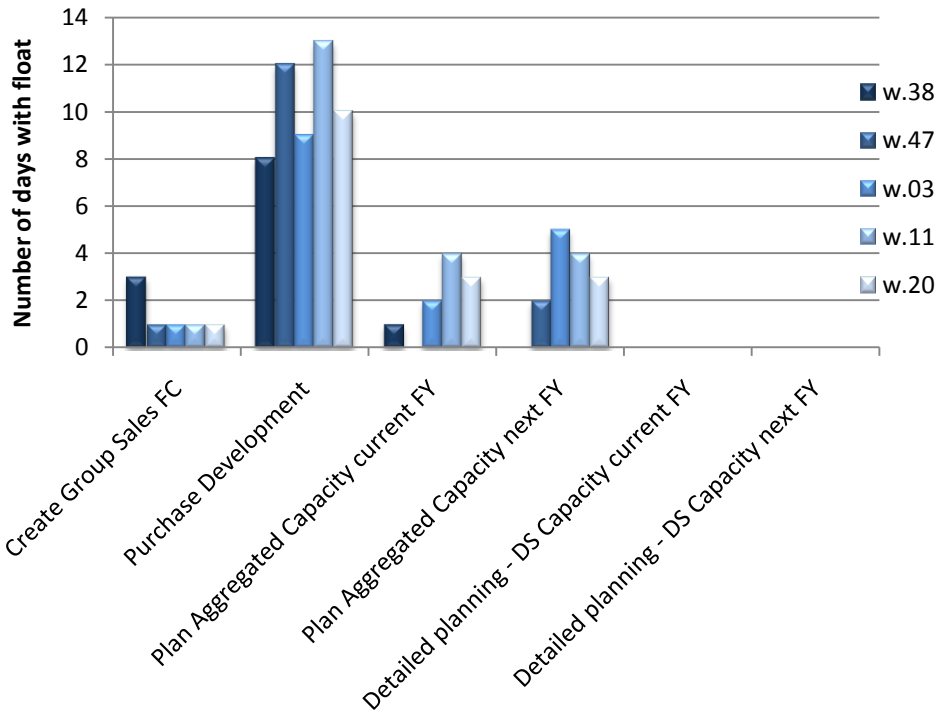

Figure 31. Float between Actual finish and Deadline Flow Planning Year Cycle.

The actual finish of Purchase Development is 3 days after the work connected Plan Aggregated Capacity has finished. The reason for Purchase Development having so much float is that the Purchase Forecast is not needed by the succeeding process, Bimonthly reporting, until DS have published their MTP for current FY.

5.5 Float within the planning cycles

Regardless if there is float between established deadlines and actual finish times it is of interest to analyze the float originating from actual timelines within the planning cycles. Total float is representative for a whole path and cannot be consumed by each activity individually. This means that total float is the total amount of time that can be shared between the activities in the cycles without delaying the end date. If an immediately preceding activity is delayed this decreases the total float of the succeeding activity with as many days as the

predecessor is delayed. Free float on the other hand is valid for the activity itself and indicates how much it can be delayed without delaying the succeeding activity.

The mapped timelines of the activities assume that the planning cycle has not started yet and shows when the work is supposed to take place. If the conditions were to be changed during a planning cycle this would affect the float throughout the activities in a cycle. A comparison between the different planning cycles regarding percent of activities with float is presented in Figure 32.

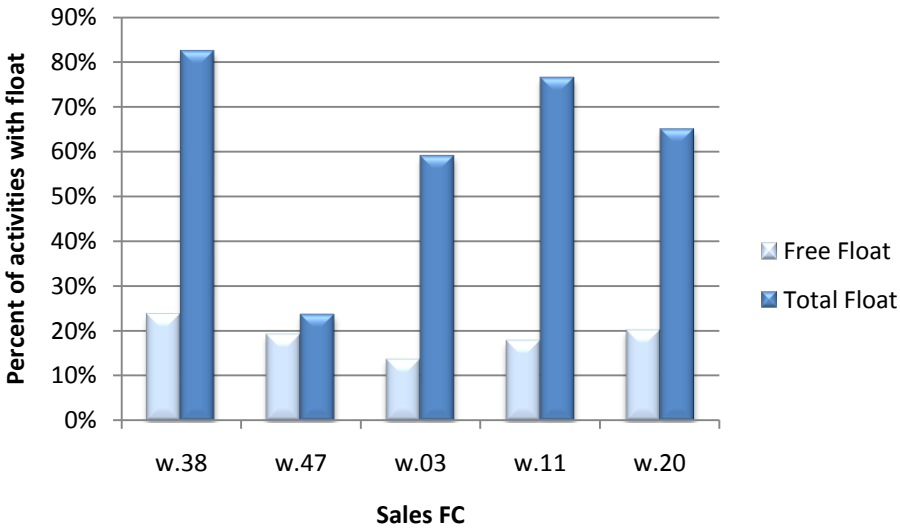

Figure 32. Percent of activities with float.

The relatively small amount of activities with free float indicates that most of the activities are initiated immediately after their predecessors finish. High percentage of activities with total float indicates that there are few activities that are critical. Therefore improvements regarding decreasing the time between start and finish could be possible to make in cycles where this occur. To determine the actual time savings for each planning cycle, analysis of the timelines related to the different Sales forecasts has been made.

5.5.1 Float related to Sales Forecasts already carried out

Since the planning cycles related to Sales FC w.38, w.47 and w.03 already has taken place or is under progress the analysis of these are more of what could have been done and can be used as a base for the timeline of similar forecasts next year.

Within all planning cycles the activities without float are critical which means that if these are delayed the finish date of the cycle will be delayed with the same amount of time as well. The reason for activities within Purchase Development having so large amount of float is as earlier mentioned the precedence relations between Detailed Planning DS Capacity, Purchase Development and Bimonthly reporting. Motives for scheduling Purchase Development where it is today could be to in the future involve the sender perspective in the MTPs or that the outcome is needed for other purposes. The reason for Prepare CAPP frame per HFB having free float could be a consequence of interpretations and the assumptions made by the authors. This does not affect total duration or possible delay in the cycles since the activity according to delimitations made, does not have any predecessors. Total float and Free float for activities related to Sales FC w.38, w.47 and w.03 can be seen in Figure 33, Figure 34 and Figure 35.

For the planning cycle related to Sales FC w.38 there is total float for all the activities up to Closing of the last two months, the first activity within the process Bimonthly Closing. Due to current precedence relations the start of the planning cycle could have been delayed 2 days without delaying the Group Management review. The total duration of the whole planning cycle would then have decreased with 2 days. The planning cycle ending with DS publishing their MTP could have been shortened with 1 day in total since the date for publication would have taken place one day after the actual date. Total float and Free float for activities related to Sales FC w.38 can be seen in Figure 33.

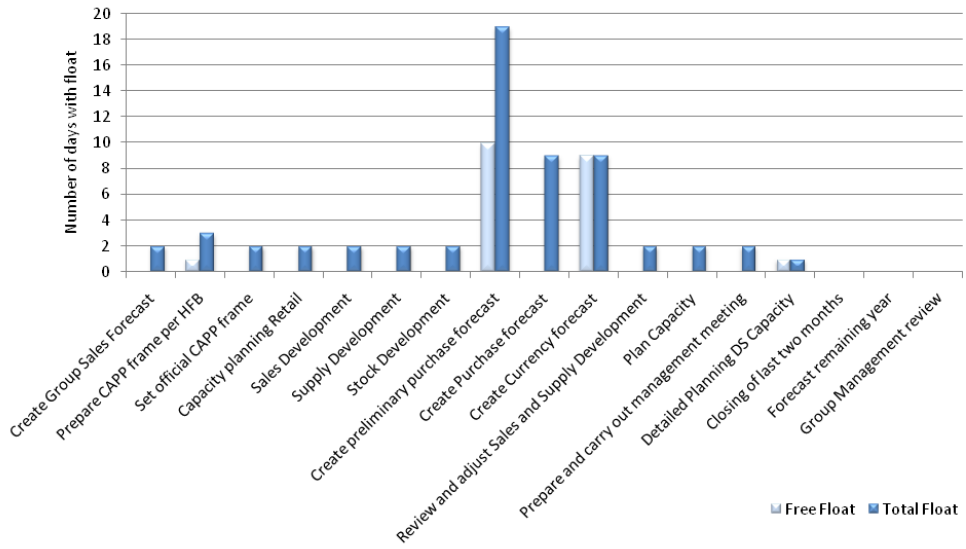

Figure 33. Float for activities related to Sales FC w.38.

For the planning cycle related to Sales FC w.47 there is a critical path throughout the whole cycle indicating no room for decreasing total duration for this cycle. The reason for Supply development having 5 days of both total and free float could be a consequence of misconception from respondents when giving information to the authors. It could also be a result of interpretations and the assumptions made by the authors. If the float really existed the work connected to Supply Development could have started 1 week later. Either way the total duration of the whole planning cycle would not change. Total float and Free float for activities related to Sales FC w.47 can be seen in Figure 34.

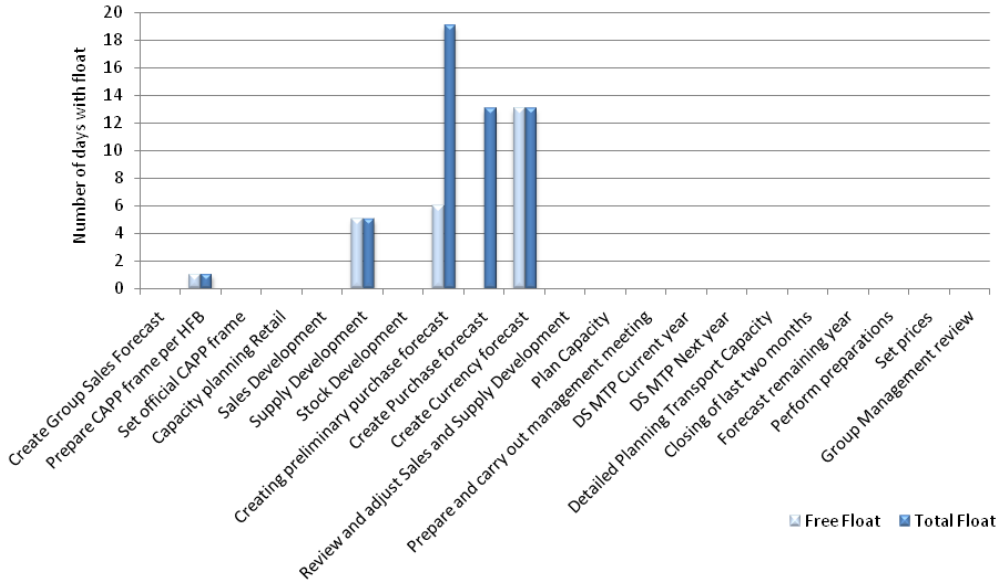

Figure 34. Float for activities related to Sales FC w.47.

For the planning cycle related to Sales FC w.03 there is total float for all the activities up to Prepare and carry out management meeting, the last activity within the Plan aggregated capacity process. Due to current precedence relations the start of the planning cycle could have been delayed 2 days without delaying the Group Management reviews. The planning cycle ending with DS publishing their MTP could therefore have been shortened with 2 days in total. Total float and Free float for activities related to Sales FC w.03 can be seen in Figure 35.

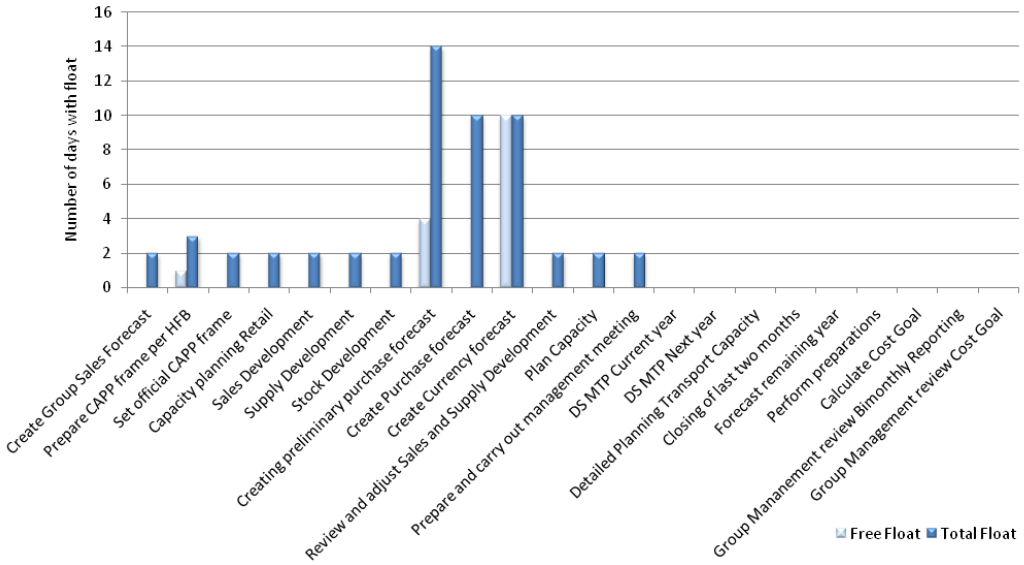

Figure 35. Float for activities related to Sales FC w.03.

5.5.2 Float related to Sales Forecasts not yet carried out

The planning cycles related to Sales FC w.11 and w.20 has not yet been carried out implying that actual changes in the timelines still can take place. The float for Purchase Development and Prepare CAPP frame per HFB follow the same pattern as previous planning cycles and Supply Development for w.20 follows the same pattern as w.47. For both cycles the last activity with total float is Prepare and carry out management meeting which corresponds to w.03. The cycle related to w.11 can be delayed or shortened 4 days respectively 3 days for w.20. Total float and Free float for activities related to Sales FC w.11 and w.20 can be seen in Figure 36 and Figure 37.

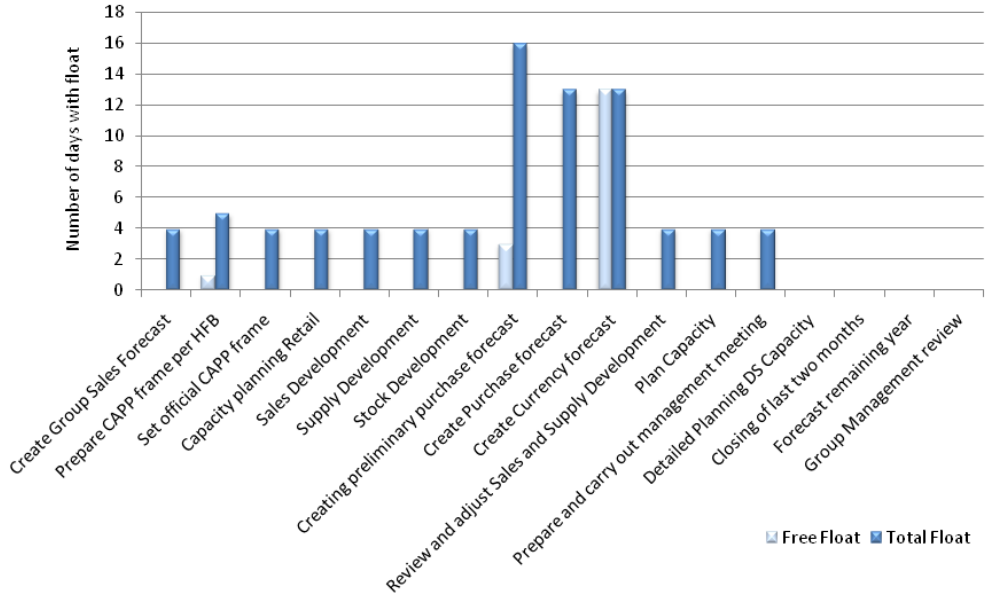

Figure 36. Float for activities related to Sales FC w.11.

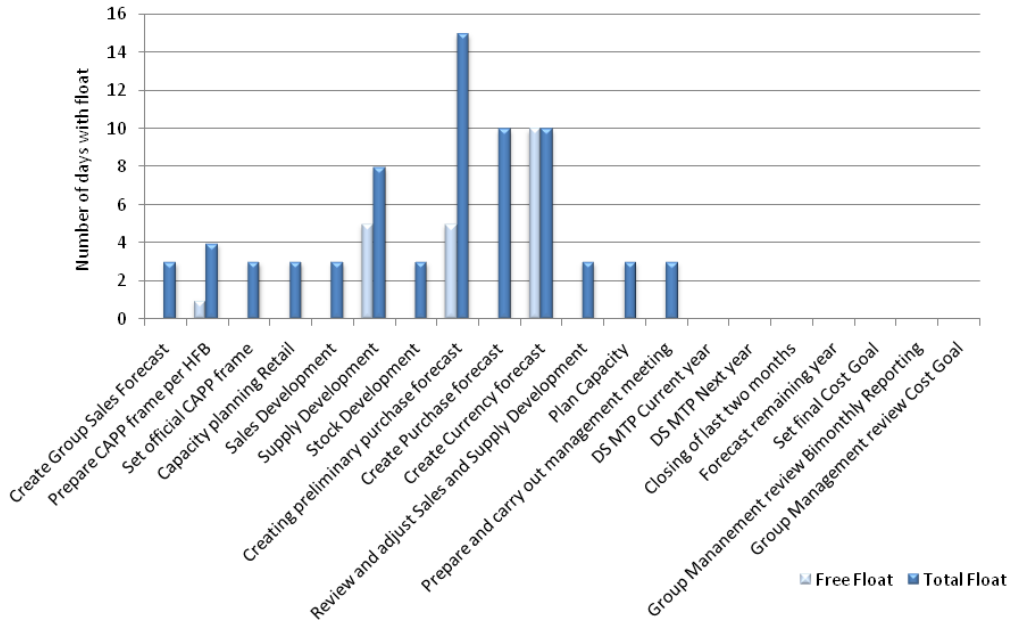

Figure 37. Float for activities related to Sales FC w.20.

The possible time savings that the total float indicates would lead to 11,8 respectively 11,5 percent decrease of the total duration for the planning cycles related to Sales FC w.11 and w.20, ending with Detailed Planning DS Capacity. Since the other planning cycles already have been carried out or is under progress these are of less relevance. Possible percentage of time savings can be seen in Figure 38.

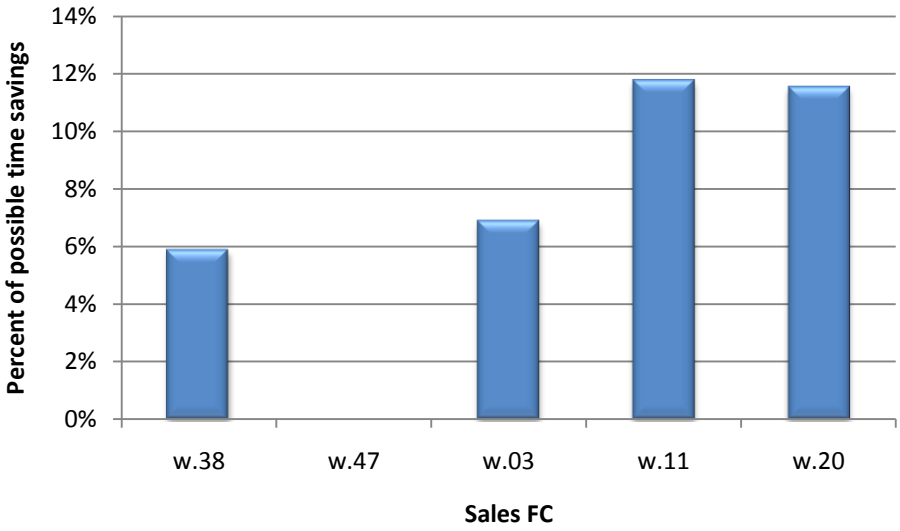

Figure 38. Possible percentage of time savings up to DS publish their MTP for current FY.

5.5.3 Effects of Float and Critical Path

The critical path for the different planning cycles starts more or less after Prepare and carry out management meeting, except for w.47. If the possible time savings were to be implemented there would be a critical line throughout the cycle, implying no room for delay at all. The question is if this would be desirable since one day of delay could lead to complications. Float might be desirable since it works as a buffer allowing some delay without jeopardizing purposes being fulfilled in time. On the other hand there is willingness to decrease the duration between start and finish time in order to increase the quality of input and output. To solve this, work either needs to be done faster by rationalizing activities or by increasing resources. In this way time savings could be made without removing all the float. Another possible solution would

be to make the flow within the planning cycles more structured and stable so that the probability of delay decreases. In this way float would be less necessary.

Activities on the critical line starting after Prepare and carry out management meeting finish on dates corresponding to established deadlines. To comment whether these activities actually are critical or not, analysis on a more detailed level regarding timelines needs to be performed. However if DS could finish their work connected the MTP earlier this would create total float for succeeding activities. But since these activities do not provide any input connected to the creating of the next Group Sales FC they are of less relevance when determining where to make time savings within the capacity planning cycle.

6 Conclusions and recommendations

This chapter presents the conclusions drawn from the analysis as well as recommendations of how to enhance the quality of the planning cycles and decrease the duration of them.

6.1 Conclusions

Capacity planning and the processes connected to it represent a complex context with a lot of factors influencing the outcome. One of the biggest issues is to secure the quality, both regarding input and output. This has shed light upon the structure and timelines of the planning cycles in order to identify, review and develop suggestions of how to solve underlying problems.

The number of planning cycles and their timelines are today based on the financial reporting cycle and all the activities connected to capacity planning need to adapt their timelines to fit these deadlines. However, the mapping of processes connected to Plan & Secure Capacity has shown that the outcome of a planning cycle has no further connection to the next Group Sales Forecast being created. This implies an open loop where the primary purpose of Plan & Secure Capacity ends with DS publishing their MTP.

The possibility to secure quality in the planning processes decreases with increased time span between input and output. This fact makes it desirable to shorten the timelines in order to be more reactive to updates, to ensure availability and optimize stock requirements. Regardless if the planning cycle drivers are changed or not, Supply Chain could react faster on input data in order to secure capacity and availability if DS could report their MTP when they finish the work connected to it. Today the actuals is a restriction that could delay the reporting.

The financial reporting cycle is most likely hard to change due to the large extent of involved parts. To increase the quality of the planning cycle through time savings it would therefore be more probable to delay the start of Create Group Sales Forecast. Of course this implies that Retail are able to report their

input later, including more recent data. If the collection and consolidation of this input could be done in less than 2.5 weeks, this would increase the quality even more. Delaying the start would also improve the output quality of Supply Development for one more cycle. This because the delay would allow SDR and Retail to close their agreements regarding distribution mode implying actual figures being reported instead of forecasts. In this way two out of three planning cycles would be aligned with the tertial CALC runs. To align the third CALC run might be difficult because of its timeline occurring in the middle of the summer.

Regardless if the total duration of the planning cycles are shortened, better output quality could be achieved by rescheduling timelines to get as recent and updated input data as possible. Within Aggregated Capacity Planning primarily Stock Development would benefit from delay of input data reporting. This delay would imply that the latest Group Sales Forecast can be taken into consideration, increasing the quality of the Stock prediction.

Today there are deviations between the sales forecasts made by the HFBs and the ones made by the countries. To solve this problem increased communication between the two parts is necessary. A solution could be a process with continuous contact about total sales per HFB and country. In this way greater understanding for each other's point of view could be achieved and future sales development could be planned together.

Within Aggregated Capacity Planning there are three processes directly connected to collecting and compiling input data. These exists due to insufficient information in the Supply Plan and if the input data would have covered all relevant flows more time could be spent on the actual planning within Aggregated Capacity Planning. In this way the input would be secured and the activity named collect and compile input data could be removed from the process.

The small amount of activities with free float indicates that most of the activities are initiated immediately after the predecessors finish. On the other hand there is a large amount of activities with total float showing that few of them are critical. There are possibilities for time savings in 4 of 5 cycles. If these time savings were to be made a critical path would appear and to not jeopardize delaying the finish date of the project it demands a structured and

stable process. Once this is achieved, COGNOS Planning would be an option for enabling further time savings. If the software is implemented throughout the planning cycle the input and output quality would be secured in another way because of a more structured system with limitations for manual adjustments. As the creation of the aggregated MTP is today, Excel is a sufficient tool for handling information. However, one uniform interface would simplify the communication between different parts in the cycle.

Where and when the planning cycles connected to Plan & Secure Capacity actually start and finish is a matter of purpose and definition and total duration is a consequence of these decisions. The average time between Create Group Forecast and DS publishing their MTP is 31 days for the planning cycles in FY10. Adding the fact that the data Group Sales Forecast is based on is up to 10,5 weeks old, increases the total duration significantly.

In order to come to a conclusion regarding total duration of the planning cycles, decisions about included processes and appropriate timelines need to be taken. These decisions require that processes and responsibilities are established and today this is not the case. Once this is done, a holistic perspective can be achieved and guidelines for timelines could be set in a more proper way by developing a “to be” map. The established timelines for processes within the planning cycles could be used in the process documentation as a complement to the working methods.

6.2 Recommendations

This master thesis has focused on the planning cycle ending with the financial reporting. This has led to mapping connections between Plan & Secure Capacity and the succeeding processes focusing on finance and administration. Other succeeding processes whose timelines would be of interest to map are the processes within Supplying focusing on decision making regarding securing capacity. This to examine the total duration until the capacity really is secured. Therefore IKEA is recommended to map the timelines of the affected processes and in cases where information regarding processes is inadequate an "as is" description of the flow should be mapped.

Another issue of interest would be to investigate whether actual figures, being reported bimonthly, really needs to be reported together with the MTP. If not, the MTP could be published earlier and Supply Chain could be more reactive.

Since the Group Sales Forecasts are not based on the outcome of the Group Management review, the date for creating a new forecast is theoretically not restricted by the financial reporting. To investigate the possibilities and effects of changing the frequency of planning cycles could therefore be of interest for IKEA.

The mapping of actual timelines has been performed on a quite general level. Durations have been measured in days and the mapping level for activities has not been consequent. To achieve a more complete "as is" description, timelines of activities need to be mapped on a more detailed level. Once this is done more actual time savings can be revealed.

A future ambition within Plan & Secure Capacity is to include the sender perspective in the aggregated MTP. To avoid unnecessary difficulties regarding handling data it would be convenient to plan all flows from supplier to store in the same system. It is recommended to investigate if COGNOS Planning could be this system and the possibilities to implement it should be examined.

In order to implement COGNOS Planning throughout the processes connected to capacity planning, decisions have to be taken on higher management level. The process organization needs to be fully established and stable in order to make these decisions. Therefore IKEA is recommended to first put a more

unison effort to facilitate the implementation and establishment of the processes.

Once the processes are established a second step could be to align all global Year Cycles to one uniform Year Cycle. Since the focus of “One IKEA” is “toghetherness”, having work within all affected processes connected to one common Year Cycle would support this focus. Hence, it could be of interest for IKEA to further investigate this matter.

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Roux, J. (2009, 12 4).

Appendix A - Interview Guide

Introduction

- Presentation of the project
    - Description with help from pictures
- Formalities
    - Verify the length of the interview
    - How answers are to be used
    - What other people are to be interviewed?
    - Whether it is ok to record the interview?
        - The recording will be deleted
    - Notes from the meeting will be sent to respondent for verification
    - How the respondent can follow the development of the project
- Purpose of the interview
    - To gather information regarding time planning of processes affected by the IKEA Supply Planning Year Cycle

Questions

1. Personal Background
    a. Name
    b. Title
    c. Responsibilities
    d. For how long have you worked within IKEA?
2. Processes
    a. Decisions
        i. What decisions do you make?
        ii. When do you need to make this/these decisions?
        iii. When do you, at the latest, need to start your process in order to make this/these decisions?
        iv. What information do you need in order to make decisions?

v. When do you need this information?

vi. What level of quality on your information do you need?

1. Is this fulfilled?

a. If yes

i. Go to **vi.**

b. If no

i. What's the cause of this?

ii. What's the consequenses?

vii. For what time horizon are your decisions valid?

b. Duration

i. Assuming that everything proceeds as normal, what's the most likely time required to process an object?

ii. Assuming that everything proceeds better than normally, what's the minimum possible time required to process an object?

iii. Assuming that everything goes wrong (but excluding major catastrophes), what's the maximum possible time required to process an object?

c. Object out

i. What is the object out of your process?

ii. How long time is needed to deliver an object out?

iii. When do you need to deliver at the latest?

iv. To whom do you deliver your object out?

d. Trigger/object in

i. What triggers your process?

ii. When do you need your object in?

iii. When can you start at the earliest?

iv. When do you start processing your object in?

v. When can you start at the latest?

vi. From whom do you get your object in?

vii. What information do you need in order to start processing an object in?

e. Other

i. Do you have any buffer time?

1. If yes

a. Where and how much?

2. if no

a. Do you think that anything could be done to decrease the duration of the process?

ii. Do any delays occur?

1. If yes

a. What causes delays?

b. Are there any activities that create a bottle neck?

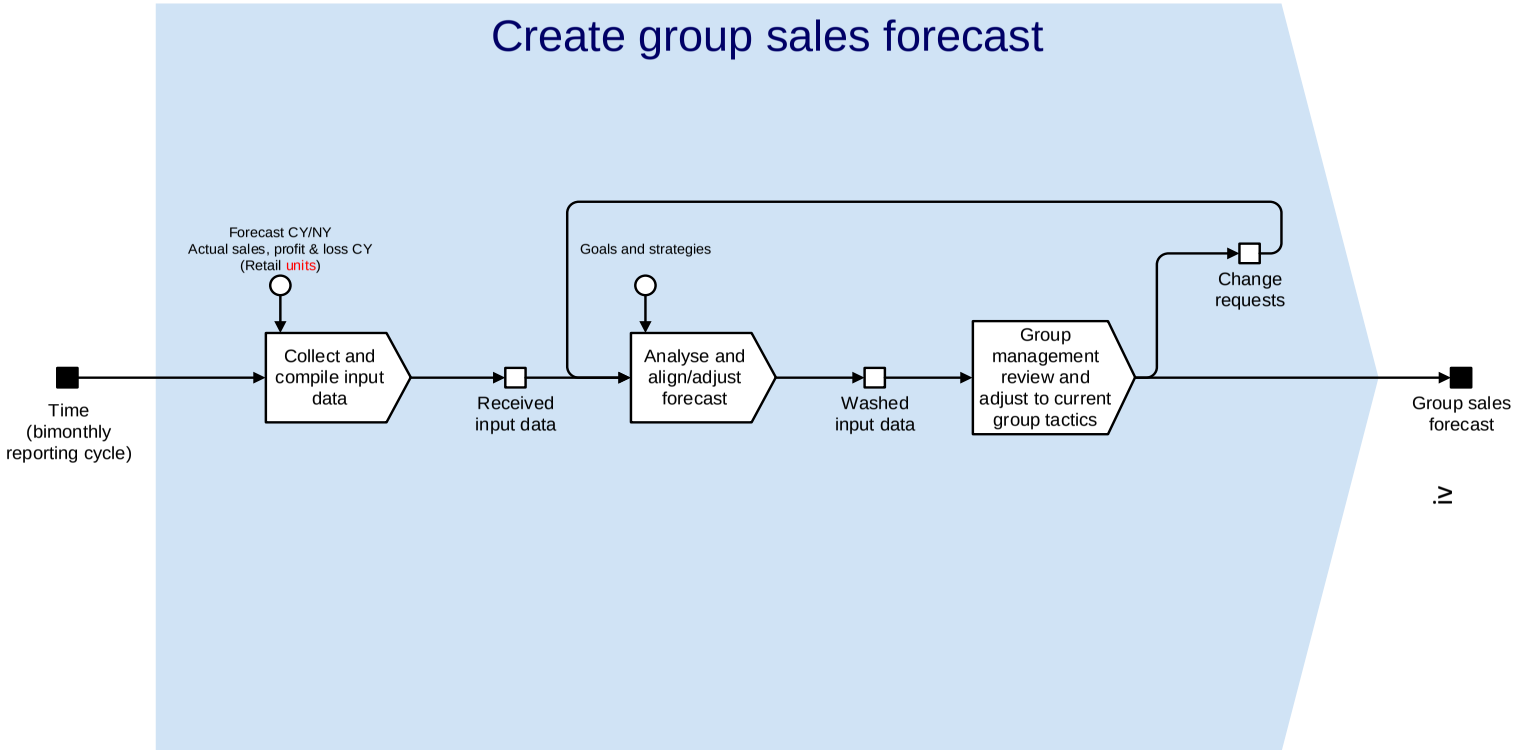
i. How often, effects?

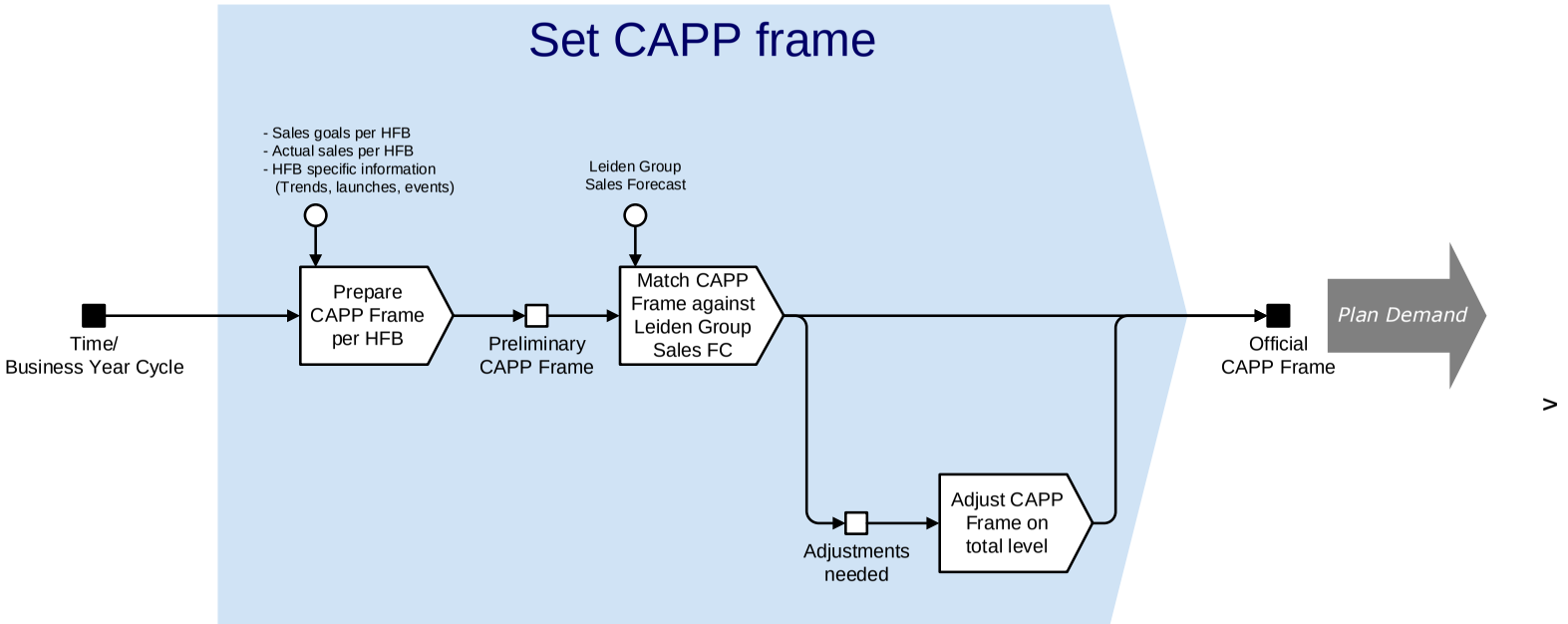
c. Who is responsible for the delays?

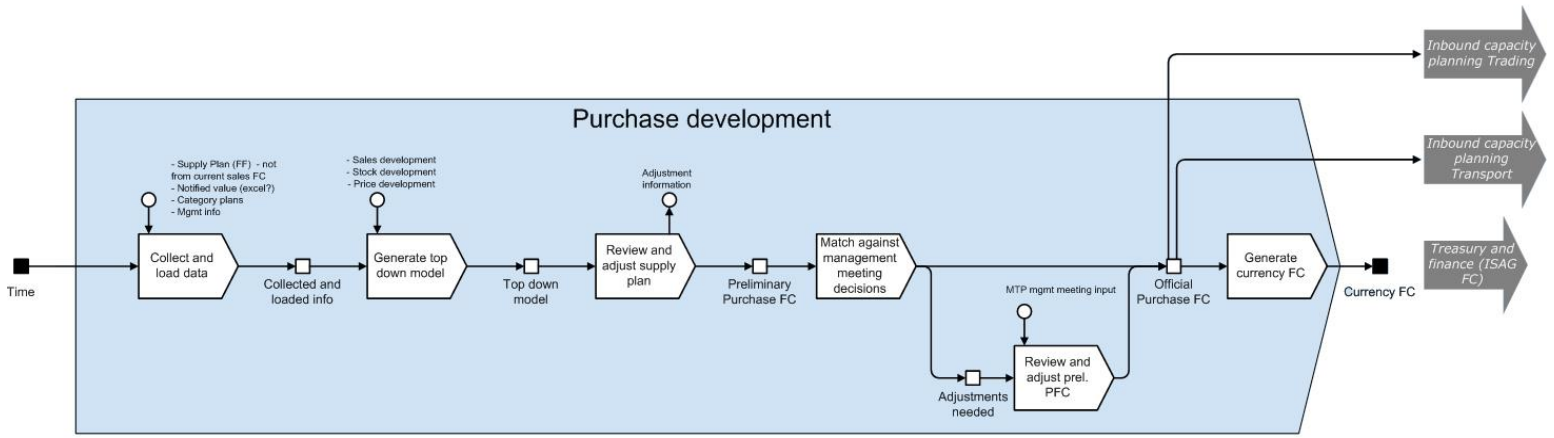
d. How often does delay occur?

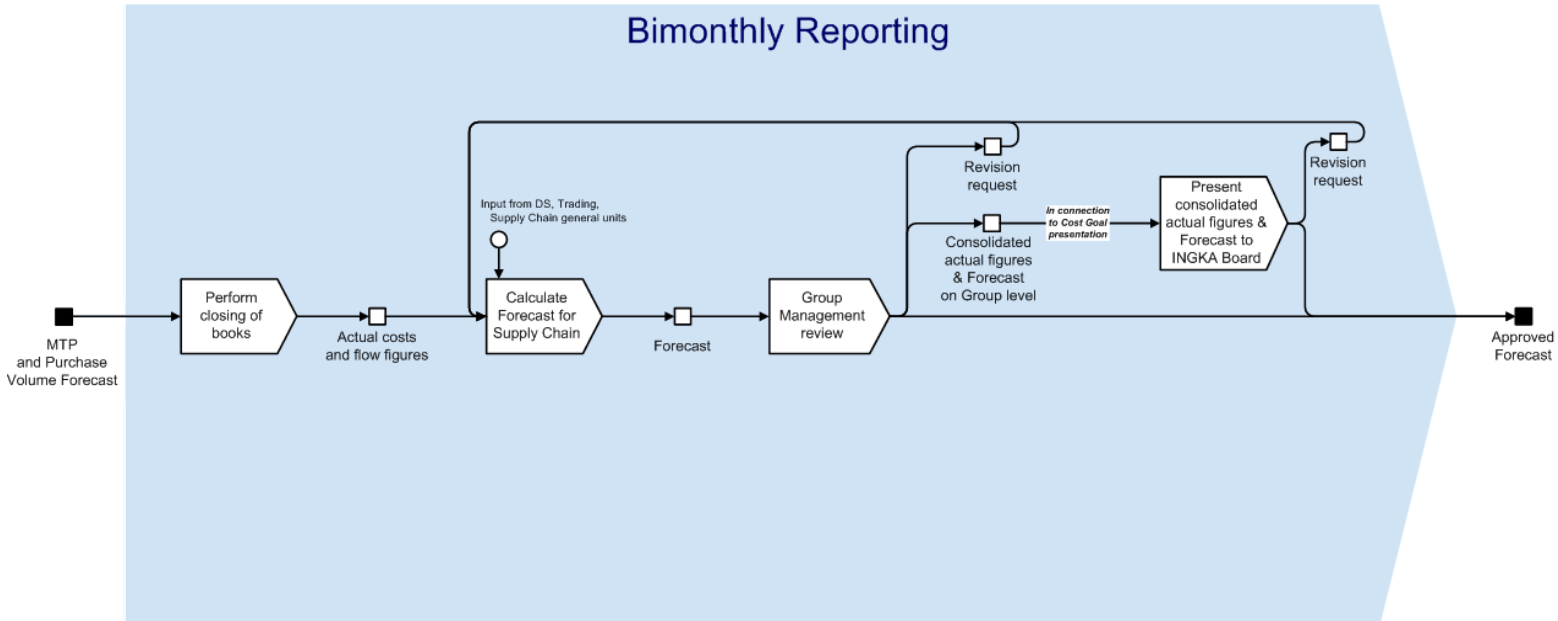
e. What can be made to avoid delays?

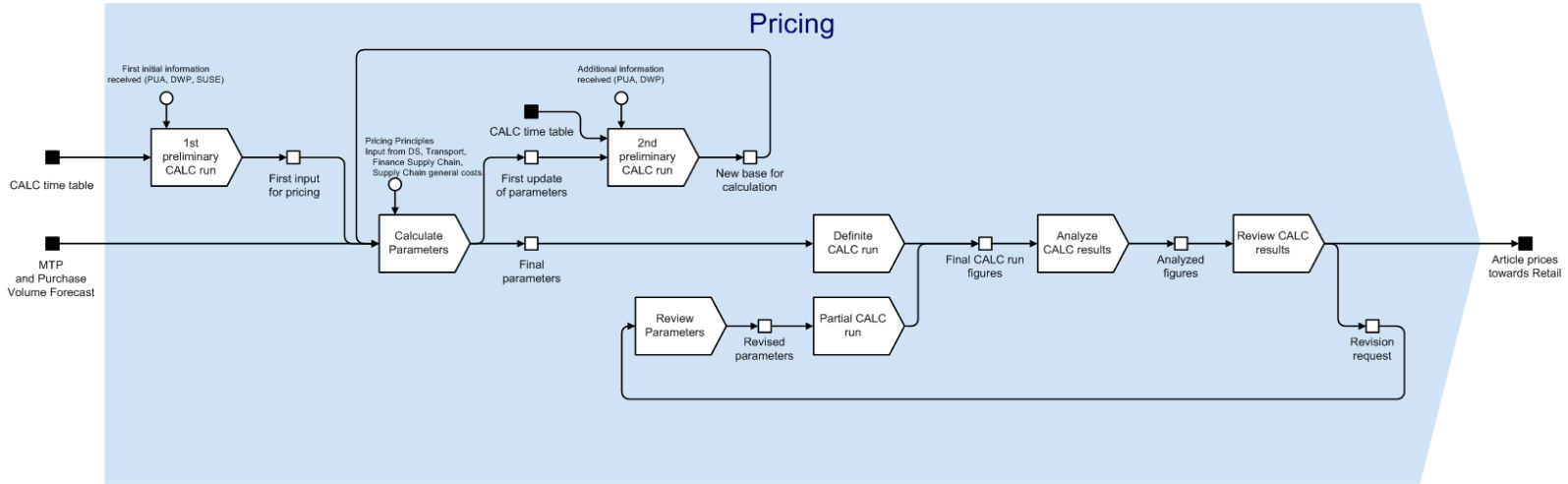
f. Could lack of resources be a reason for delays?

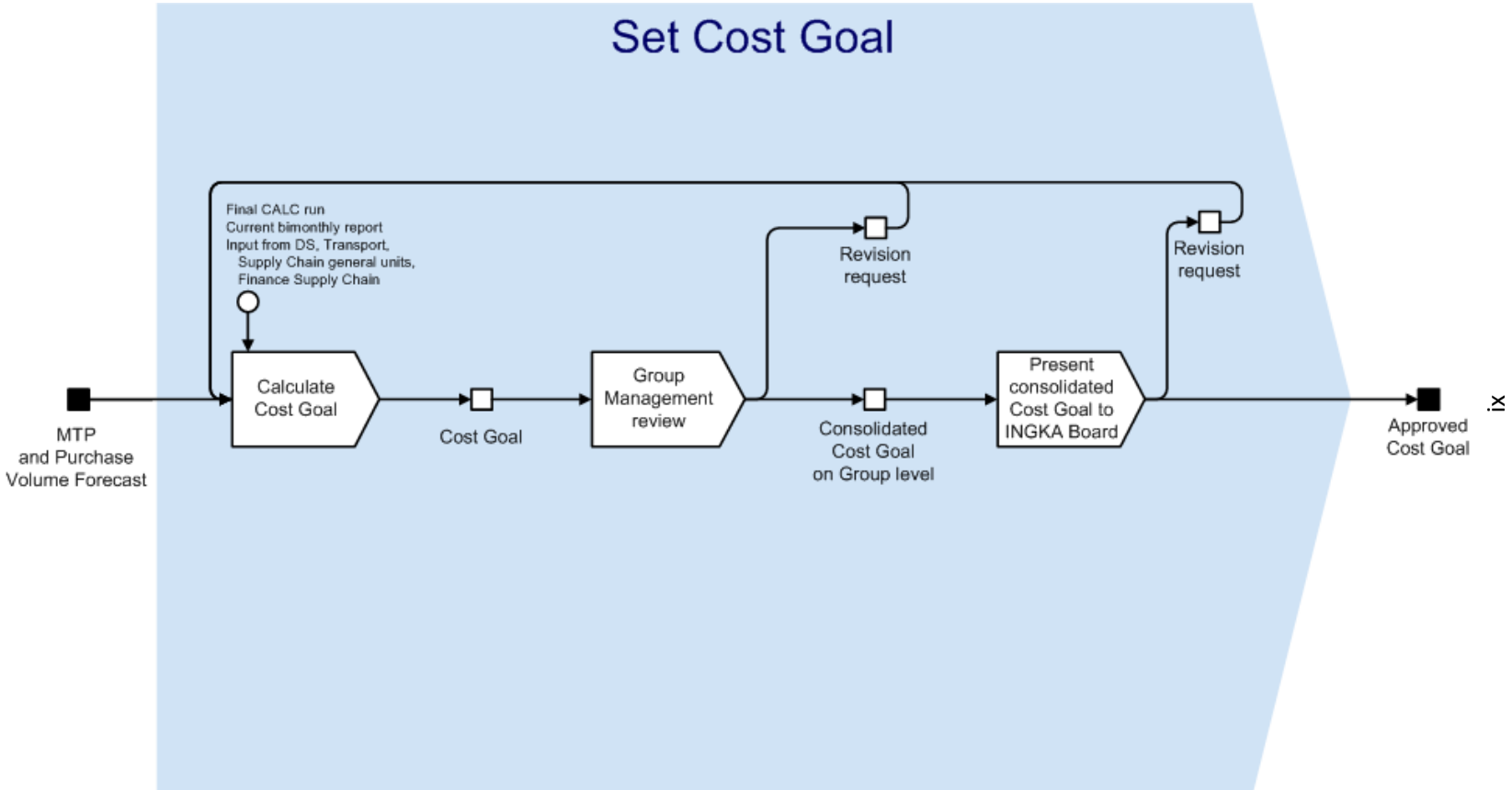

Create group sales forecast
Forecast CY/NY
Actual sales, profit & loss CY
(Retail units)
Goals and strategies
Change requests
Collect and compile input data
Analyse and align/adjust forecast
Group management review and adjust to current group tactics
Time (bimonthly reporting cycle)
Received input data
Washed input data
Group sales forecast

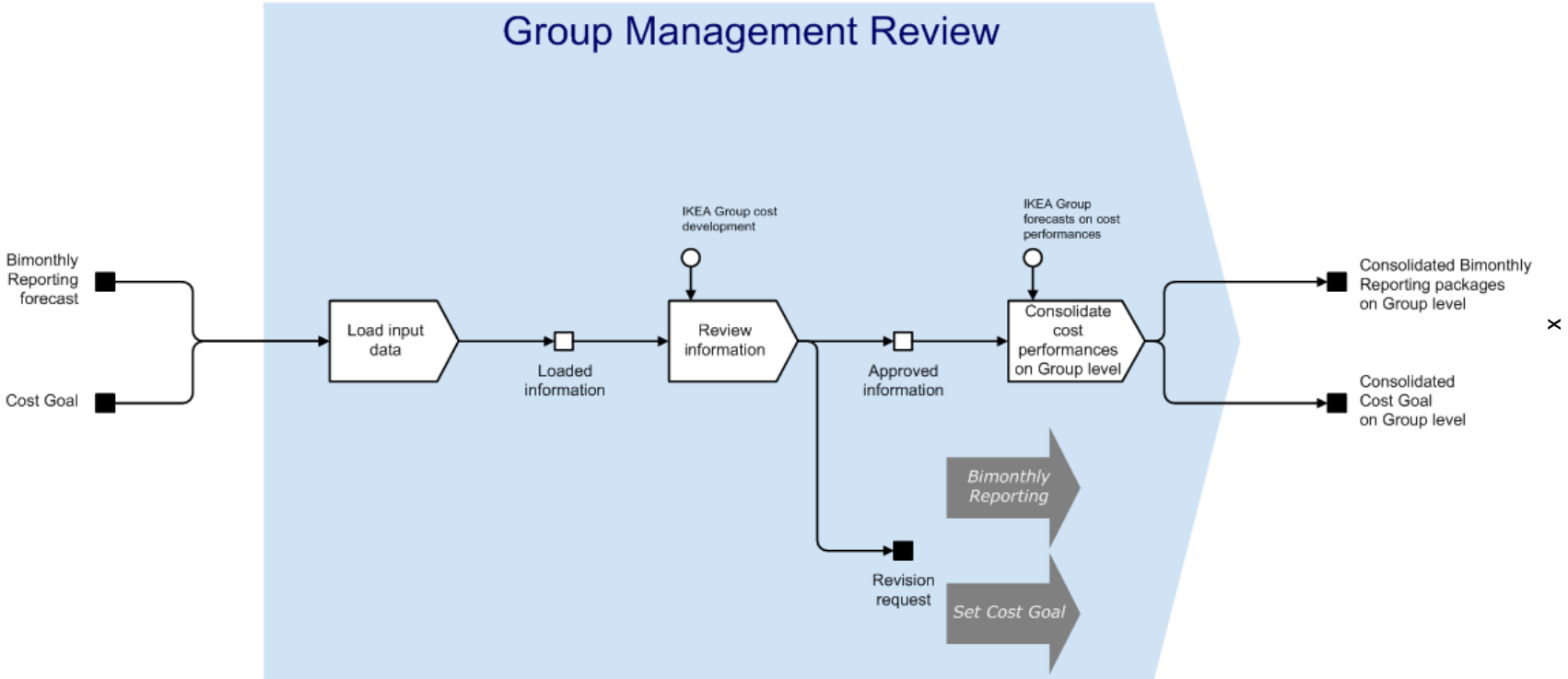

Set CAPP frame
- Sales goals per HFB
- Actual sales per HFB
- HFB specific information
(Trends, launches, events)
Leiden Group
Sales Forecast
Time/
Business Year Cycle
Prepare
CAPP Frame
per HFB
Preliminary
CAPP Frame
Match CAPP
Frame against
Leiden Group
Sales FC
Official
CAPP Frame
Plan Demand
Adjustments
needed
Adjust CAPP
Frame on
total level


Purchase development
Time
- Supply Plan (FF) - not from current sales FC
- Notified value (excel?)
- Category plans
- Mgmt info
Collect and load data
Collected and loaded info
- Sales development
- Stock development
- Price development
Generate top down model
Top down model
Adjustment information
Review and adjust supply plan
Preliminary Purchase FC
Match against management meeting decisions
Adjustments needed
MTP mgmt meeting input
Review and adjust prel. PFC
Official Purchase FC
Generate currency FC
Currency FC
Inbound capacity planning Trading
Inbound capacity planning Transport
Treasury and finance (ISAG FC)


Bimonthly Reporting
MTP
and Purchase
Volume Forecast
Perform
closing of
books
Actual costs
and flow figures
Input from DS, Trading,
Supply Chain general units
Calculate
Forecast for
Supply Chain
Forecast
Group
Management
review
Revision
request
Consolidated
actual figures
& Forecast
on Group level
In connection
to Cost Goal
presentation
Present
consolidated
actual figures &
Forecast to
INGKA Board
Revision
request
Approved
Forecast


Pricing
First initial information received (PUA, DWP, SUSE)
Additional information received (PUA, DWP)
CALC time table
1st preliminary CALC run
2nd preliminary CALC run
Pricing Principles Input from DS, Transport, Finance Supply Chain, Supply Chain general costs
First input for pricing
First update of parameters
New base for calculation
Calculate Parameters
Final parameters
MTP and Purchase Volume Forecast
Definite CALC run
Final CALC run figures
Analyze CALC results
Analyzed figures
Review CALC results
Article prices towards Retail
Review Parameters
Revised parameters
Partial CALC run
Revision request


Set Cost Goal
Final CALC run
Current bimonthly report
Input from DS, Transport,
Supply Chain general units,
Finance Supply Chain
Calculate Cost Goal
Cost Goal
Group Management review
Revision request
Consolidated Cost Goal on Group level
Present consolidated Cost Goal to INGKA Board
Revision request
MTP and Purchase Volume Forecast
Approved Cost Goal


Group Management Review
Bimonthly Reporting forecast
Cost Goal
Load input data
Loaded information
IKEA Group cost development
Review information
Approved information
IKEA Group forecasts on cost performances
Consolidate cost performances on Group level
Consolidated Bimonthly Reporting packages on Group level
Consolidated Cost Goal on Group level
Revision request
Bimonthly Reporting
Set Cost Goal